Commission of the European Communities

THE EUROPE PLUS THIRTY REPORT

XII/694/75-E

C O N T E N T S

LETTER OF TRANSMISSION

To the President of the Commission of the European Communities

Dear Mr. Ortoli,

On 14th January 1974, the Council of Ministers of the European Communities, on a proposal of the Commission of the European Communities, resolved as follows:

"THE COUNCIL OF THE EUROPEAN COMMUNITIES

Having regard to the Treaties establishing the European Communities;

Having regard to the draft from the Commission;

Having regard to the Opinion of the European Parliament;

Whereas the Heads of State or of Government meeting in Paris on 19 and 20 October 1972 expressed their resolve to define objectives and ensure the development of a common policy in the field of science and technology;

Whereas the programme which is the subject of this Resolution is a necessary element for defining the long-term action of the Communities and ensures technical backing for future decisions of Community Institutions in the scientific and technological field,

HAS ADOPTED THIS RESOLUTION:

The Council hereby approves the programme, which will have a duration of one year, as set out in the Annex hereto, which Annex forms an integral part of this Resolution.

The Council takes note of the fact that the Commission proposal is no more than a preliminary experimental programme and that the Commission intends to submit specific proposals in the near future on the basis of the results of this preliminary programme, and with the assistance of the Scientific and Technical Research Committee.

ANNEX

ACTION PROGRAMME
AS REGARDS FORECASTING, ASSESSMENT AND METHODOLOGY

In order to ensure the development of a Community policy in the scientific and technological field the European Communities must try to determine how existing scientific and technological capacity can best be used for the purpose of keeping the objectives and instruments of a common policy under constant review. The guidelines given by the Paris Summit Conference make long-term forecasting, an attempt to 'check research by research', and a study of the effects of scientific and technological development on society and the economy, particularly necessary.

In order to achieve the aims set out hereunder it is proposed to initiate a preparatory phase (preliminary experimental programme) during which an attempt will be made to determine to what extent, by what means and according to what timetable the European Communities will be able to contribute to solving these problems. The preparatory phase will be limited to one year; it will not prejudice any future decisions.

The object of the preparatory phase is to provide answers to two specific questions:

1. In the context of the common scientific and technological policy, should the European Communities undertake a majority study entitled 'Europe Plus 30'(1) concerning the foreseeable or possible developments over the next thirty years, which are likely to affect the progress of Europe; and, if so, will this study make it possible in particular to create a forecasting instrument which can be constantly updated ?

   If the answer were 'yes', it would be necessary to define, with the help of an analytical table of the studies and forecasts already carried out:

   - the method or methods to be used;
   - the characteristics which define the content, i.e.:
     - the limiting conditions;
     - the areas to be included;
     - the structure of the study;
     - the implementing procedures.

   If the answer were 'no', it would be necessary to define the possible alternatives to aid in effective decision-making, in the field of research and technological planning.

2. Should the European Communities create their own Technology Assessment Office in an attempt to evaluate in advance the effects of scientific and technological development on the society and economy of the Community ?

   If the answer were 'yes', it would be necessary to define, with the help of an analytical table of organisations and institutes and of work which has been carried out:

   - the institutional structure of the European Technology Assessment Office and its relationship with the Community Institutions;
   - the way in which this office could be integrated into the Communities' planning and decision-making processes; and
   - the way in which the creation of a new centralised organisation could be avoided by making use of existing organisations where possible.

   If the answer were 'no', it would be necessary to determine what other possibilities were available to the Community for carrying out the task of technological assessment.

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(1) The study of the relevant questions will be carried out in cooperation with the European Foundation for the Improvement of Living and Working Conditions which it is proposed to set up.

Achievement

The Commission will assume responsibility for carrying out the project as efficiently as possible. In order to have access to outside expertise, the Commission may employ experts on a contractual basis. The duration of the project shall not exceed one year from the date on which the first contracts are signed.

Means

The maximum cost of this preparatory phase is estimated at 500,000 u.a. (including expert assistance, possible mission expenses and any complementary studies carried out outside)."

On April 1st 1974, the Commission appointed me Chairman and Director of the study described in the Annex. It has been carried out by a Project Board, mainly supervisory and advisory, and a Project Team, mainly concerned with drafting the present report and with studies ancillary thereto. The boundary between the functions of the two bodies has been flexible; some members of the Project Board have drafted sections of this report, and all members of the Project Team have advised on the general conduct of the project. The work has been carried out in general cooperation rather than by any rigid demarcation of functions, though the Project Board was charged by its terms of reference to transmit to the Commission a separate opinion on the report. This, too, is transmitted by the present letter.

The Resolution of the Council of Ministers called for a one-year study. Between May and September 1974 the Project Board was selected jointly by the Commission and the Director, the Project Team was selected by the Director, and various preliminary meetings were held. The study proper began with the first full meeting of the Project Team in early October 1974. The Project Team has met at Les Salines in France (June 1974; partial and preliminary meeting), at Wiston House in Britain (October 1974), at Bergisch Gladbach in Germany (January 1975), and at Venice in Italy (April 1975). There have also been several partial meetings. The Project Board has met 5 times in Brussels, and once in London. In June 1975 this Report was submitted to the Commission in draft, and in July the Commission transmitted its observations, which were mostly on matters of fact. The present final report takes account of those observations, but remains the sole responsibility of the Europe Plus Thirty Group, comprising the Project Board, the Project Team and the Chairman - Director.

The work was coordinated and administered from an office in London kindly let to us by the U.K. Science Research Council.

The members of the Project Board and Project Team were as follows:

PROJECT BOARD

Dr. L. Bölkow	Geschäftsführer der Messerschmidt-Bölkow-Blohm G.m.b.H.
Prof. A. Buzzati-Traverso	Senior Scientific Adviser to the United Nations Environmental Programme, formerly Assistant-Director for Science, UNESCO.
Prof. H.B.G. Casimir	President of the Royal Academy of Arts & Sciences, Amsterdam.
Prof. Umberto Colombo	Director of Corporate Research and Strategic Planning, Montedison, Milan,
Prof. R. Dahrendorf(1)	Director of London School of Economics, Formerly a European Commissioner.
Prof. Bertrand de Jouvenel	Founder of Association Internationale Futuribles.
Lord Kennet, Chairman	Formerly Parliamentary Secretary for Housing and Local Government, U.K. Government.
Dr. Alexander King	Chairman, International Federation of Institutes of Advanced Study, Co-founder Club of Rome, formerly Director General for Scientific Affairs, OECD.
Dr. H. Hermann Koelle	Professor of Space Technology and Systems Engineering. Founding President, Berlin Centre for Futures Research.
Dr. Max Kohnstamm	Principal of the European University Institute.
Mr. Keith Pavitt	Senior Fellow, Science Policy Research Unit, Sussex University. Member of Directorate for Scientific Affairs, OECD.
Prof. P. Piganiol	Association Internationale Futuribles, Paris.
Prof. I. Prigogine	Professeur à l'Université Libre de Bruxelles.
Prof. P. Nørregaard Rasmussen	Professor of Economics at the University of Copenhagen.
Senator Mary T.W. Robinson	Professor of Law, Trinity College, Dublin. Barrister.

(1) From October 1974

Prof. R. Saint-Paul	Président du Département Economie et Gestion au Conservatoire National des Arts et Métiers; Directeur du Centre Science, Technologie et Société; Paris.
Dr. Ing. J. Seetzen	ASA/ Arbeitsgemeinschaft der Grossforschungs-Einrichtungen. Director General of former IIMT, Milan.
Prof. H. Thiemann	Counsellor and R & D Coordinator, Nestlé Alimentana S.A., Vevey; Formerly Director General, Battelle, Geneva.
Prof. P. de Wolff	Professor of Econometrics, University of Amsterdam.

PROJECT TEAM

Dr. Bernhard Badura	Universität Konstanz, Fachbereich Soziologie.
Dott. Ugo Businaro	Fiat, Turin, Direzione Centrale Ricerca e Sviluppo.
M. Bernard Cazes	Commissariat-Général du Plan, d'Equipement et de la Productivité, Paris.
Prof. M. de Cecco	Prof. of International Economics, University of Siena; Visiting Professor at The Royal Institute of International Affairs, London.
Dr. Sam Cole	University of Sussex, Science Policy Research Unit.
Prof. Dr. Meinolf Dierkes	Adjunct-Professor of Public Affairs at Carnegie-Mellon University, Pittsburgh. Head of Applied Social and Behavioural Science Research Division of the Battelle Inst., Frankfurt.
Prof. Dr. H. Flohn	Meteorologisches Institut, Bonn.
Sir George Godber	Formerly Chief Medical Officer, England.
Dr. François Hetman	OECD, Directorate for Scientific Affairs.

Prof. Dr. J. de Hoogh	Landbouw-Economisch Instituut, The Hague.
Prof. Torsten Husén	Professor of Education, University of Stockholm. Director, Institute for the Study of International Problems in Education.
Mr. Erling Joergensen	Danmarks Statistik, President of Central Council of Education of Denmark.
Lord Kennet, Director	Formerly Parliamentary Secretary for Housing and Local Government, U.K. Government.
Prof. Dr. Beate Kohler	Professor of Political Science, Technische Hochschule, Darmstadt.
Mr. Gerald Leach	International Institute for Environment and Development, London.
Dr. H. Paschen	Studiengruppe für Systemforschung, Heidelberg.
Prof. P. Piganiol	Association Internationale Futuribles, Paris.
Mr.Terence Price	Secretary General, The Uranium Institute. Formerly Director of the Defence Operational Analysis Establishment, United Kingdom.
Prof. ir. O. Rademaker	Technische Hogeschool, Eindhoven.
Prof. Giuseppe Sacco	Professor of Industrial Economics & Policy, Department of Political Science, Florence University.
Dr. Craig Sinclair	Consultant, Environment Directorate, OECD.
Prof. Dr. Kurt Sontheimer	Professor of Politics, Geschwister-Scholl-Institut für Politische Wissenschaft, Universität München.
Mr. L. Thiriet	Commissariat à l'Energie Atomique, Département des Programmes , Paris.
Mr. J. M. Thomson (1)	Head of the European Intercity Transport Study, OECD, Paris.
Prof. Guillaume Wunsch	Département de Démographie, Université Catholique de Louvain.
Mr. Walter C.L. Zegveld	Assistant Director, Organization for Industrial Research TNO; Head, Industrial Liaison Department TNO.

(1) From March 1975

The Administrator of the Project and Secretary of the Project Board was Brigadier C.T. Honeybourne, the Research Assistant was Charles Landry, and the secretaries were Anne Wood and Catherine Gaynor.

We have had the benefit of consultation with the Secretary General of the Council of Ministers, and with the President, several members and several officials of the European Parliament. We have also naturally been in constant touch with the Commission of the European Communities and its dependent organs, throughout our work, and particularly with its Directorate General XII, for Research, Science, and Education, to which we were attached.
We would like to thank Commissioners Dahrendorf and Brunner, and Director General Schuster and his staff, for their continuous help and support.

The organisations and individuals who have helped the project as a whole and single members of it are unfortunately too numerous to list. We have had the sensation of apparently ubiquitous and unconditional support, and wherever we have asked for help and advice we have received it. It has grieved us to have to turn away a great many organisations and individuals who have offered us their resources.

The Annex to the Council Resolution of 14th January 1974 which we quote above, and which constitutes the terms of reference for our study, places forecasting, assessment, and methodology in the context of the European Communities' scientific and technological policy. This could be read as a limitation on the content of our study. But the phrase which directly governs its content is this: "A.... study....concerning the foreseeable or possible developments over the next thirty years which are likely to affect the progress of Europe". Such developments are multifarious, and transcend science and technology.

We have interpreted these phrases liberally. Science and technology affect everything else, and everything else affects science and technology. They can in no way be separated off from the rest of life: we are a scientific and technological society, and there are interactions everywhere, as we are at pains to point out.

The fact that this study has been limited to one year (in practice rather less) has forced us to choose a particular method of work, namely a rather large number of people working together part-time. The alternative method, a smaller number of qualified people working together full-time, would have taken too long, since first-rate people cannot undertake full-time jobs without warning.

The Project Board and Project Team consisted mainly of scientists drawn from many fields, social as well as natural. During this work none of us has been, as we are used to do, directly exercising our professional skills; we have been bending our expertise to the less familiar task of devising a new instrument to assist policy-makers. In a group so disparate, it is only natural that not everyone of us should agree with everything in the report. What matters is that all of us, both in the Project Team and the Project Board, endorse it as a whole.

This report, and the opinion of the Project Board upon it, we now submit. It goes without saying that we are ready to undertake any further consultation, advice, or enquiry, for which the Council of Ministers or the Commission of the European Communities may call upon us.

Yours sincerely,

Kennet,
Chairman and Director.

22nd September 1975

6th June, 1975.

Opinion of the Project Board of Europe Plus Thirty

In accordance with paragraph 2 of its Terms of Reference where it is stated "The Board shall give the Commission an opinion on the final report of the Team":

Noting the Resolution of the Council of Ministers of 14 January 1974 where it is stated: "The Council takes note of the fact .... that the Commission intends to submit specific proposals in the near future on the basis of the results of this preliminary programme";

Noting that the preliminary programme concerned has been carried out by the Europe Plus Thirty Project Team during 1974 and 1975 and that its results are the report of the Project Team;

Having advised the Project Director on the method and progress of the work, in accordance with para 3 of its terms of reference, having been aware of the progress of the work at all stages and having contributed thereto;

Having carefully considered the Report of the Project Team submitted by the Project Director;

The Project Board transmits the following opinion thereon to the Commission of the European Communities:

1) The Report constitutes a valuable set of recommendations to the Commission in answer to the questions contained in the Annex to the above mentioned Council Resolution.

2) The Board endorses unanimously the basic philosophy of the Report, stressing the need for a forward-looking view and indicating the possibilities for a systematic and rational approach to it at Community level. This does not mean that every member agrees with all aspects of the report : constructive criticism, partly of a technical nature, will constitute an important input to the future work to be undertaken.

3) The Board is unanimous in approving the recommendation of the report that a continuing instrument "Europe Plus Thirty" should be set up and that it should gradually build up to the optimum staff level.

4) Given the present period of rapid evolution which demands that political decisions be taken on the basis of comprehensive integrated forecasting studies, the Board stresses to the Commission the urgency of this matter.

Signed	:	Kennet	: Chairman of the Project Board and Project Director
	:	Professor N. Rasmussen	: Chairman ad interim of the Project Board for the purpose of formulating the above opinion.
	:	Project Board members	: Dr. L. Bülkow Professor A. Buzzati-Traverso Professor Dr. H.B.G. Casimir Professor U. Colombo Professor R. Dahrendorf Professor Bertrand de Jouvenel Dr. Alexander King Professor Dr. Ing. H.H. Koelle Dr. M. Kohnstamm Mr. K. Pavitt Professor P. Piganiol Professor I. Prigogine Senator Mary T.W. Robinson Professor R. Saint-Paul Dr. Ing. J. Seetzen Professor Dr. H. Thiemann Professor P. de Wolff

MAIN RECOMMENDATIONS

We recommend that:

1) A long-term forecasting instrument, Europe Plus Thirty, should be set up to serve the institutions of the European Communities and, so far as the latter may desire, their member governments. It should work to a time horizon of 5 years and longer. (General Introduction, Part I.1, pages 19 - 20, Part IV, pages 1 and 2).

2) Technology Assessment should be carried out by the continuing instrument Europe Plus Thirty, as an integral part of its work. (Part III, Part IV, pages 1 and 2).

3) The forecasting should be integrated, by which we mean two things:

   (a) Not limited to a single sector, but encompassing and integrating all sectors relevant to the long-term future of the European Communities, or to the particular problem area under examination (Part I.4, Part II.1, page 1).

   (b) Integrated with the European Communities' policy-making process. (PartsI.3 and I.4, Part IV).

4) The forecasting should be so devised that a range of possible goals and possible ways to reach them can be examined. No one goal or policy would be recommended above others. (General Introduction).

5) Europe Plus Thirty should adopt a flexible and adaptive method of work, employing a wide range of quantitative and non-quantitative methods. (Part I.3.).

6) It should work in 3 ways: by assembling work done elsewhere, by letting contracts, and by in-house research. (Part IV, pages 4 to 7).

7) Europe Plus Thirty should have, as well as "generalists", (Part IV, pages 11 - 12), an in-house staff with knowledge of the following subjects:-

Agriculture, fisheries and forestries	Part II. 4
Social structures and values	" II. 6
Education	" II. 7
Science and Technology	" II. 8
Industry	" II. 9
Energy	" II.10
Materials	" II.11
Environment	" II.12
Transport	" II.13
Economics & Finance	" II.15
Defence & Disarmament	" II.16
Politics & Institutions	" II.17
Technology Assessment	Part III

8) For the following subjects Europe Plus Thirty should primarily rely on outside advice:-

Climate	Part II. 2
Population	" II. 3
Health	" II. 5
Communications	" II.14

9) (a) The governing body of Europe Plus Thirty should be a Board of 12 members, appointed by the Commission of the European Communities. (Part IV, pages 7 to 9).

(b) The staff of Europe Plus Thirty should be headed by a director assisted by two deputy directors. (Part IV pages 9 and 10).

(c) The staff should be gradually built up to 75 graduate professionals. (Part IV pages 10 to 14).

(d) Publication of work should be the rule, but unpublished studies should not be excluded if there is good reason. (Part IV pages 14 to 15).

(e) Europe Plus Thirty should be at the service of the Commission and Parliament, and also, if they wish it, of the Member Governments. The relationship of Europe Plus Thirty to the Institutions of the European Communities should be kept permanently under review by the Board of Europe Plus Thirty. (Part IV, pages 15 to 18).

(f) At least 75% of Europe Plus Thirty's finance should come from the Commission (Part IV, pages 19 and 20).

GENERAL INTRODUCTION

Gen. 1. The world is bursting in on us. It is less important that we are French, German, British, and so on, than that we are Europeans, and less important that we are Europeans than that we are human beings. Because of the recent revolutions in transport, communications, and weaponry, it is world forces and world factors which shape our lives, and sometimes threaten them. But it is still as citizens of a single nation that we entrust power to those who must guide and protect us. Events are global, while political legitimacy remains national.

Gen. 2. That this paradox makes it harder for us to control our fate and invent our future, is well understood. We as Europeans, acting at the middle level, should therefore direct our ingenuity to finding ways of reducing the effect of the paradox. If we can achieve greater control of events by broadening political legitimacy, we should do so; this is the impelling logic of the European Communities.(1) And if we can achieve greater control of events by thinking ahead, we should do that also; that is the impelling logic of forecasting.

Gen. 3. The rapid political change and extreme economic uncertainty of the world today are forcing all our countries to take cognizance of trends, and of the interaction between them, which hitherto it was possible to ignore. At both national and Community levels we should develop whatever means we can for identifying necessary relationships

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(1) In law there is no such thing as "the European Community"; there are only the European Economic Community, the European Coal and Steel Community, and Euratom. At first, each of the three had its own Commission; but in 1967 the three Commissions were amalgamated, becoming the Commission of the European Communities, while the three Communities themselves remain legally distinct.

In political and social reality, on the other hand, there is certainly such a thing as "The European Community". In this Report we use words as the context requires. "The European Communities" are the three legally separate entities. "The European Community" is the single socio-political entity.

"The Commission of the European Communities" is the full legal title of the famous body in Brussels. "The European Commission" or "Commission" is the common name of the same body, reflecting the political and social reality. The adjective "Community" (as in "Community level", or"Community system") we use to mean of or pertaining to either the single socio-political Community, or one or other of the separate legal Communities, as the context shows.

between the policy sector and long-term planning, and, in the light of these, elaborating alternative policies and strategies. The object must always be to examine what is possible for Europe, and what is impossible; the latter is generally easier to identify than the former, and provides a welcome element of certainty in an activity where certainty is by definition scarce.

Gen. 4. The interdependence of nations has long been accepted in a general and superficial way, but it has now reached a new intensity. The vastness of international transactions, especially the ever-increasing demand for energy and raw materials with all its payments, investment, and monetary consequences, has greatly increased the importance of factors external to each country, leaving strictly limited possibilities of initiative to all but the biggest.

Gen. 5. The energy crisis has shown how a problem in one field can penetrate the whole economic, social and political fabric. Rapid population increase, rising demand for food and especially protein, changing expectations concerning economic growth, agricultural innovation, climatic change, and many other problems on the horizon, may well have equally far-reaching and disconcerting effects, some of them quite soon. We have in fact reached a situation where the interactions are so important that it is difficult even to identify discrete problems, let alone to apply discrete solutions. Yet the machinery of our governments, designed for earlier and simpler days, is still organised sector by sector and can only with difficulty assess inter-policy conflicts, or synergisms, by interdepartmental committees or by coordination at the top. And the same is true of the European Communities.

Gen. 6. It seems to be generally accepted that a doubling of the population of the world in just over thirty years is inevitable. By far the greater part of this expansion will take place in the less developed countries. In 1920, the present European Community countries contained 9.7% of the world's population, in 1970 it was 6.9% and in 2000 it is unlikely to be more than 4.6%.(1) This changing proportion cannot fail to have

(1) EEC figure for 2000 from the OECD report of 1974: for 1920 and 1970 from the U.N. Demographic Yearbook. Estimates of world population from various U.N. sources.

major political consequences for the whole world, quite apart from the direct effects of the increase such as pressure on food and raw materials. The much smaller population increase probable in the industrial countries will also have an incommensurate effect on the demand for energy and materials, since their per capita consumption is, today, between 20 and 40 times that of the less developed world.

Gen. 7. The internal social effects of these changes would be very different in the less developed and in the industrial countries. In the former, a doubling of the present population, of very young average age, would trebl . the workforce, with inevitable employment difficulties. In the latter, zero or very small growth rates would lead to a considerable increase in the average age and hence a gradual reduction in the active, though not in the consuming, population.

Gen. 8. Neo-Malthusian doubts are now raised everywhere about the possibility of economic growth continuing indefinitely, because population doubling and the development of the poor regions would add so enormously to the global demands for raw materials and energy. The problem in the decades to come will not be so much the absolute exhaustion of resources but greatly increased costs, including energy costs, for working the more difficult energy deposits, which are all that will be left. The energy crisis has given us a foretaste of difficulties which could become quite common. But - and here is the contradiction - we have allowed energy to become the key to continued material growth. The very great increase which must be expected in the demand for food can apparently only be met by a corresponding increase in the energy inputs, particularly for mechanised agriculture, and the desalination of water. Similarly, nearly all substitution for scarce or expensive materials seems to require a large increase in the use of energy. Two trends are here on a collision course.

Gen. 9. We can no longer maintain the simplifying distinction of the "three worlds" or "four worlds". There is a continuous spectrum of societies, and the harmonisation of disparities within this one world is clearly not mainly a humanitarian or philanthropic problem as it has so often been presented in the past; it is the world's major political issue. Already the OAPEC countries give more aid per capita

than the OECD countries. Already there has been a call, within the General Assembly of the United Nations, and in OPEC, for the creation of a New International Economic Order. This must be taken as the first sign of a movement, likely to appeal to the sense of justice of the majority of mankind, which the developed countries will find it unwise to ignore and impossible to repress.

Gen.10. Our political systems are ill adapted to face major discontinuity and neither precedent nor the traditional indicators give much guidance. The democratic system with its 3 - 7 year electoral cycle concentrates political action upon immediate issues, and there is little opportunity or incentive to elaborate longer-term policies. Thinking about the future is therefore all too often relegated to party research groups, or academe, and to multinational corporations.

Gen.11. The time scales of the worlds of politics, of administration, and of science are greatly different; this is a fundamental fact of national and world development. Research and development are essentially (and increasingly) long-term processes. From the appearance of a new concept in the mind of a scientist to its generalised application in the form of a new product, process, institution, or industry, can be thirty years or more. In such contemporary economic thinking as bases itself on the need to ensure uninterrupted economic growth, there is an implicit reliance on the "technological fix", that is the asssumption that economic forces will themselves summon up, from the cornucopia of science, a continuous flow of necessary innovations. It has been so, and it may continue to be so. But it is running a notable risk to assume that technology will always respond smoothly to increasing needs. Lead times are important, and a smooth "fit" is not likely; the risk is of recurrent crises.

Gen.12. To meet all these dangers, then, democracy itself must be endowed with new tools in education, in participation, in communication, and in management. It is not our task to suggest what these might be. Our task is to suggest a new tool for democracy in thinking about these dangers, in understanding them, and especially in thinking about and understanding them <u>all together</u>. Mapping out alternative policies, and delimiting the possible from the impossible, can be regarded as a form of insurance against the uncertainties of a changing world. An individual who does not protect himself and his

family by insuring against contingencies is regarded as irresponsible; on the national scale (except in the defence field) such foresight has too seldom been expected.

Gen.13. What we have said applies to all nations, but particularly to those of the European Community. Western Europe today has relatively few natural resources, but a highly skilled, educated and enterprising population, abundantly capable of innovation in technology, in social evolution, and in politics. What we lack in materia grezza we make up in materia grigia. The European Communities therefore not only must but can come to grips with the complexity of the situation and design the change they want, rather than merely react belatedly to events.

Gen.14. But we cannot confine ourselves to a study of the Community as a system, since it is an "open system" within the world. And as there are reasons to think that the major features of the 1945-1975 period are now undergoing a fundamental change, to look back at least to the period of 1914-1944 seems necessary if we are to envisage our true context and understand our social momentum.

Gen.15. The period 1914-1944 began and ended with great wars which shook the whole of Europe, and through it the world. It was marked by the upsurge of new forms of governments, communist and fascist, which, however important their differences, both stood in stark contradiction to the belief current in pre-1914 Europe, and apparently triumphant at the time of the peace treaties of 1919 - 1920, that every state was bound to repeat the parliamentary form of government developed in Britain. In the economic world the main event was the Great Depression, the break-up of international trade and capital movements. The distress of unemployment gave rise to a new imperative which was to dominate the next period, 1945-1975: the imperative of full employment. It also gave rise to social institutions which added a new dimension to public finance: that of social welfare.

Gen.16. In 1914 there had been no distinction between the political use of the word Europe, and the geographical one . Nobody then would have thought of Europe in the narrow sense of Western Europe (the outcome of the Second World War). The 1914-1944 period ended and the 1945-1975 period began with the division of Europe into two parts. Russia, which had played an important part in the first stages of the 1914 war, had then

changed its regime and stepped out of it. For these reasons it did not take part in the peace making of 1919 and 1920 and was thereafter considered by the Allies as outside Europe, an "outsideness" which was later extended to the other countries of Europe reached by the Russian armies in 1945. The alternative futures for Europe which we will have to consider cannot assume that a division which has lasted a mere thirty years will continue to prevail over centuries of cultural and political affinity.

Gen.17. Not only is the Community only a part of Europe, it also depends upon phenomena outside Europe altogether. The main feature of the last 30 years has been the role of America in Europe, and it is mainly by the position in 1945 of the outposts of the Allied armies, in which America predominated, that Western Europe is now defined. Our tremendous post-war economic development was seeded and made possible by American aid, and the receipt of this aid was the first occasion for European powers to put together their experts in spelling out the needs of Europe and measuring the "gap" between these countries' capacity to finance their imports, and their possible means of payment. These sessions between experts played no mean part in the formation of the concept of Western Europe as an economic unit.

Gen.18. While attention was focused on economic growth, there occurred a capital change in the map of the world, from which the great overseas empires of all Western European states were cancelled, chiefest of them the British Empire. The lands which owed some form of allegiance to the British crown had covered nearly three times the extent of geographical Europe, and contained nearly twice its population. Now they have gone their own way. The British Commonwealth and the French-speaking world retain a unity based only on language and on some elements of law and higher education. One may see in the new Lomé Convention a possible embryo of a Community Commonwealth, but the situation is probably a transitory one, since Asia and Latin America are excluded.

Gen.19. If one takes a long backward view, it appears that our small peninsula of Eurasia was for some five centuries the source of changes in other parts of the world, the launching pad of impacts on their societies and civilisations. How brutal these impacts were at first need not be dwelt upon here. The point of present interest is that the peoples whose histories have been changed by the impact of Europe have now acquired a freedom of action allowing them, in turn, to affect the

history of Europe. Notwithstanding its great distance from Europe (in terms of seafaring two centuries ago) and notwithstanding the smallness of its population, the nascent American nation was the first to have a return impact upon Europe; indeed, its War of Independence generated a wave of influence which played a great part in the toppling of the French monarchy, and the introduction of bourgeois democracy in all Europe.

Gen.20. The Third World could once be thought of as in some way "outside". But in the years to come, we must think of Europe as "within" a world system where relative weights may change very rapidly. There have been calculations of the decades, or generations, which the poor countries would take to catch up with the American per caput product as it then stood, but this was a narrow view indeed. Political roles do not wait upon the achievement of a standard of living. The very period during which Western Europe became substantially dependent on Third World resources was also that during which Europe lost any form of overt control over them. Soon after the French oil find in the Sahara, Algeria ceased to be part of France. Nigerian oil and independence emerged together. Britain has been steadily reducing its presence in the Middle East since 1945. At the moment that Angola proved a great reserve of oil, Portugal at last had to concede independence.

Gen.21 It seems clear that the next thirty years will be marked by continuing vast changes in the relationships of Europe with the rest of the world; among them those arising from the disappearance of European ownership in other lands, from the increasing external ownership of Europe, and from two-way migrations of workers of different sorts and qualifications.

Gen.22. May we expect a class war to develop on a world scale? Should industrialised societies as a whole, given their consumption of materials and energy, now be regarded as among the world's exploiters, and the poorer societies as a whole be regarded as the world's exploited? Was the recent "energy crisis", in which some of the whole world's have-nots stood shoulder to shoulder to raise the price of the main thing the world's haves needed from them, analagous to the first strikes in the industrialised world, when each country's have-nots stood shoulder to shoulder to raise the price of their labour? If there is indeed a world class war, will any international assembly be ready in time to articulate and mitigate it, as the parliaments of the Western world articulated and mitigated our national class wars? Will the U.N. family of organisations become equal to

the task ? Or will the world class war follow instead the bloody pattern of the Russian one ? These questions are susceptible of rational discussion, and within this field of discourse alternative aims and policies can be formulated, assessed and compared.

Gen.23. Thus far, we have, in a sense, been discussing the question: "What is Europe that it should need forecasting ?" We must now turn to the question: "What is forecasting that Europe should need it ?"

Gen.24. We all try to interrogate the future, mainly in order to help us decide what to do. The peoples who used to (and those who still do) open animals to see their entrails, or cast pebbles or drops of wine on the ground, or go to the cloudy and euphonious oracle, did so not for curiosity but because they had a decision to make. (Shall we give battle? Shall I build a house?) Divination was for action; divination, like judgment and like will, was a component of decision.

Gen.25. Equally, in modern times, forecasting is seldom done for its own sake; it is done to help someone take decisions. Even in the least planned national economies, economic forecasting is supposed to help manufacturers, merchants and entrepreneurs to place themselves in a position of their own choice in the real world of unfolding events; and the more centrally planned a society is, the more will forecasting seek to help a government which, by definition, takes many and weighty decisions,and the less will it be distinguished from the planned enforcement of those decisions themselves.

Gen.26. In recent years a whole academic world of forecasting has grown up, and many sub-worlds within it. We will none of us forget that much of it was initiated in the U.S., and that some of it contributed to policies of the Kennedy and Johnson administrations which, in Vietnam and in the strategic relationship with the Soviet Union, almost entirely failed in their purposes. It is also right to remember that this whole structure of techniques is only a concentration in specialist hands of a universal human function, and that although the "scientific" competence of the American thinktanks was often high, their political, historical and philosophical competence was sometimes low or even non-existent.

Gen.27. So far forecasting has mainly been done by people trained in the physical sciences, and the more number-based social sciences; the epistemology of forecasting is still in its infancy. For the time being, practitioners from these sciences might agree that the usefulness of long-term forecasting is clearest in certain fields, which fall into two groups. First: if decisions or actions taken now or in the near future can produce important consequences in the long term, then forecasts for a correspondingly long period are useful. Some major infrastructural investments (for instance, in transport and education) are irreversible, and inevitably last for a very long time. Again, the development of new technologies may produce permanent changes in people's lives. Second: forecasting in some fields itself demands forecasts of associated factors in other fields which might not in themselves have given rise to a need for long-term forecasting.

Gen.28. What exactly is meant by a long-term forecast? It usually consists of deductions from a set of assumptions and hypotheses, and propositions or discourses surrounding those deductions. The assumptions are usually quite numerous, but are not always made explicit. For instance, it is sometimes assumed explicitly that there will be no world war during the forecast period; more commonly, that assumption is left implicit along with a great many others. The art of forecasting lies largely in the development and use of deductive methods, allied with the application of commonsense, imagination and judgement.

Gen.29. The assumptions on which a forecast is founded may arise in various ways. Some may be technical or other assumptions within the sector where the forecast is being made. Others may derive from forecasts already made in other sectors; for instance, forecasts in many sectors need to draw on population and income projections. Forecasts in one sector appear as inputs to others, and the comprehensive and coordinated interchange of sector forecasts is thus a large part of integrated forecasting. A third sort of assumptions concern policy; they postulate, for the purpose of the forecast, that certain policies shall continue or shall be changed in specified ways.

Gen.30. All these sorts of assumptions can be varied for the purpose of the exercise, and thus lead to different forecasts. Some of them may be varied within postulated limits of uncertainty, by taking upper and lower limits. Policy assumptions can be varied if it is desired to forecast the consequences of alternative policy choices. It is possible in this way to examine rather speculative hypotheses and thus to assist a public power (in

our case, the European Communities) in promoting, if it so wishes, public debate on alternative directions and opportunities.

Gen.31. The prime object of forecasting is to provide estimates relating to the future, based on rigorous analysis of the present and past, as a contribution to the assessment of existing or possible new policies. The forecast, of course, is only one element in such an assessment. A secondary object of forecasting can be to help society at large to appreciate the longer-term prospects facing it, and the potentialities for change. It can be a contribution to the self-consciousness of a society, and thus to its self-government.

Gen.32. But forecasting should by no means be confined to the elaboration of that which can be expressed numerically, however wisely that may be done. It must also keep a firm and distinct hold of political and social reality, and any forecasting team must include people who know how to do that. This means people with experience, preferably direct, of politics, since they are the people who know without calculation whether a given calculation leads into the area of impossibility by implying, for instance, that the old may welcome change or the young forego it, that those "whose wrongs give edge unto their swords" can be oppressed for ever, or that ignorance, any more than injustice, can be perpetuated. Forecasting for human beings can only be done by the whole human being, and calculation is only one among the human gifts.

Gen.33. To say anything about the future, we must know the past. There is only faint forecasting without the projection of historical trends. In the fields we shall discuss later, historical time series data are to be had to very varying degrees. The extrapolation of single trends enables you to know (supposing you have good data) what would happen if everything went on happening as it had happened before, if nothing ran out, and if the impact of some other trend or trends did not disturb the one you were extrapolating. The provisos are obviously at least as important as the extrapolation, which is why this necessary but humdrum part of forecasting is now recognised, when it is done alone, as being naive. Things do run out; other trends do hit yours, and they are quite often trends no one was measuring at all. (For example, the oil price increase of 1973-74 could not have been foreseen by extrapolating the oil price trend, or the oil depletion curve, or from their interaction. But it could have been foreseen by extrapolating two

political trends: that of post-colonial politics in general, and that of the reaction of governments everywhere to the occupation of their territories by invading armies. The probable interaction of these trends with that of the oil price was not hard to discern. But since they could not be cast in the form of "historical time series data", they were invisible to the specialist eye.

Gen.34. If by systems analysis and modelling we work out the cross-impacts of various current trends upon each other, for instance energy use, materials use, agricultural productivity, population growth, we very soon hit disaster in all sorts of ways. But disaster has often been foreseen in the past, and did not occur, because "we saw it coming" and we took avoiding action. By changing policy we changed the trends, and cancelled the foreseen impacts.

Gen.35. Cassandra was always right and always disbelieved. She said: "The city will be taken and sacked." The people were already besieged; capture and sack was precisely what they feared, so they put her prophecy down to defeatism and did nothing they had not done before. And the city was taken and sacked.

Gen.36. We must remember why Cassandra was always right and always disbelieved: her ears and eyes had been cleansed by the Serpent of Understanding when she was a child, so that she should read the signs of nature aright. When she grew up Apollo, the god of moderation and harmony, wooed her, but she refused him. Since he could not take away the gift of prophecy, he left her with the curse of incredibility. The Serpent had made her a good statistician, systems analyst, and scenario writer, but she refused the god of daylight and political reasoning. If she had said: "The Greeks may be preparing some trick; let us think of all the tricks they might prepare and guard against them", then these propositions could have been debated and have led to action. But no; she refused to explain herself, and went straight for the theatrical effect of the unqualified future tense: "The city will be taken and sacked." She was an immoderate mystagogue, and her mystagogy caused the city to be destroyed when her prescience could have saved it.

Gen.37. <u>A prophecy of woe is only true when disbelieved, and only belief can falsify it</u>. Otherwise put: if people believe their present courses will lead to disaster, they will amend their courses. Otherwise put again: the publication of unfavourable trends leads to their correction.

But Cassandra must always haunt us; if we do not explain the publications and make sure they are accepted for what they are, the city will again be lost, and it's a bigger city now.

Gen.38. One thing Cassandra did not do was to put her prophecy in the conditional mood: "If we did nothing, the city would be taken and sacked. On the other hand if we did this, that or the other, it would not - it's up to us". Setting forth alternative courses of action (of which inaction is one), and measuring their effects on a trend projection, is, in the case of a "bad" trend projection, a way of helping people to bend away from it. It is a way of correcting any naive tendency to "believe" a projection, as if it were a prediction.

Gen.39. There should be no hesitation in admitting that in a field which depends as much on epistemology as forecasting does, we in Western Europe are hampered in any international project by our language differences. In English, which happens to be the language in which this report was edited, there are at least thirty tenses and tense uses which apply to the future(1).

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(1) Take the verb to go, and consider a person who has not gone somewhere, but whose going is under discussion. We can say:

He will go	He should be going
He would go	He could be going
He can go	He must be going
He could go	He ought to be going
He shall go	He may be going
He should go	He might be going
He must go	He was to be going
He has to go	He is bound to be going
He ought to go	He is bound to go
He may go	He has to be going
He might go	He was going
He is to go	He is about to go
He was to go	He will be about to go
He is going	He was about to go
He will be going	He is by way of going
He would be going	He is by way of being about to go

Add to this the double negatives, as in "He can't not go" - etc.

Gen.40. Every one of these has a different meaning, and probably none of them can be automatically translated, in all contexts, into any one tense in any other language. The other European languages all have their own wealth of distinctions in the future use of verbs (though perhaps none has quite the unbridled fertility of English) and probably from none of them can any of these uses be translated one-for-one into any of the others. This general fact constitutes the first difficulty in any attempt at forecasting by an international team of workers. But it is fortunate that our languages are so rich in inflections of meaning, and a full and conscious use of those inflections is one good way of avoiding the misuse of forecasting. Very many of the common objections to forecasting spring from a confusion between shall, will, and would. You can only say that, for instance, wealth shall be more evenly distributed if you yourself have decided it shall, and if you are in a position to enforce your decision. You can only say wealth will be more evenly distributed if you believe nothing can stop it becoming more evenly distributed, whatever happens. And you can only say wealth would be more evenly distributed if you go on to describe the conditions which must be met if it is to be so. Shall is the language of decision, will is the language of prediction, and would is the language of forecasting. It was because she said will that Cassandra was disbelieved and, because disbelieved, vindicated.

Gen.41. We turn now to the meaning we shall ourselves assign to the word forecasting. We agree with Bertrand de Jouvenel[1] in disliking not only the word prediction - all agree that is a mug's game - but also projection and even forecasting itself. We agree with him that conjecture is the safest word. We like the French word he coined, Futuribles, a word which can be translated into Italian but not into the other Community languages, even by neologisms. It rests on the oldest sense of the Latin word futurus, which means about to be generated. It is also the future participle of the verb to be, and it has a strongly passive ring to it. Somebody has to do something now if there is to be a future; they have, precisely, to beget it on the present. All this meaning inheres in his French neologism futuribles; it means all those things we might beget upon the present and which might

(1) L'Art de la Conjecture; Paris 1958

therefore turn out to constitute the future [1]. Action there must be; it is unavoidable; we can, therefore must, shape our futures. (If we don't someone else will.) Diversity there is: things will turn out in one of many possible ways, and that is why we have a variety of choice until the last minute. And certainty there is too, but it resides only in the negative. We can never be certain what things will happen, but we can be certain that some things will not. It may be that the greatest service a forecaster can render a decision-maker is in delimiting the impossible.

Gen.42. But we are going to use the word forecasting throughout this report. We do not mean by it simply the casting forward of past experience or projection, though we include that. We use it rather in the way one says "cast your mind forward", like "cast your mind back"; "try to imagine", like "try to remember". By forecasting we mean simply casting around ahead of us by the application of all the mental processes which may rationally be applied to the future, save one alone: decision.

Gen.43. It is clear that there is no point in forecasting except to help decision and that one cannot rationally decide without forecasts. But the two things are different in nature, and they should be, and are, done by different people. Only rulers may take decisions about the future of society, and in democracies only elected politicians may rule. The distinction is obvious, and so is the reason why we labour it.

Gen.44. What sort of forecasting, then, will be useful to those we elect to rule us, in their decisions ? One may deploy in one's mind an image of the future as a cone. The further we look ahead, the wider is the range of possibilities open to us, the more numerous the futuribles. Tomorrow will probably be pretty like today, the day after tomorrow less like.

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(1) This discussion only holds good for English, French, and Italian, which have the words future, futur, futuro. The German and Dutch Zukunft and Toekomst simply mean that which is coming towards us. The Danish word Fremtid means "forward-time".

Outside our "cone" lies the impossible: (for instance, short-term reduction in world population without war or famine). Inside it, lies the range of the possible.

Gen.45. Now let us consider the plane which can be thought of as lying across the base of the cone , say thirty years hence. It strikes us as very broad: so many future states of world and European society may rationally be imagined. But we would like Europe Plus Thirty (if it comes into existence) to be able to present to the Communities' decision-makers a number of conceivable future conditions of European society, including its relations with the rest of the world, states of things which could, without flying in the face of reason, be provisionally adopted as long-term goals; states which do lie on the plane across the base of the cone of possibility thirty years ahead, or at whatever shorter term may be adopted for a particular purpose. Inconceivable states of affairs which could not, for whatever reason, be rationally adopted as goals, lie outside the cone altogether.

Gen.46. Let us now suppose that the decision-makers adopt one of the described states of affairs as their goal. The choice of a particular goal thirty years ahead implies the adoption, at the right time or times, of the means or policies to reach it. But there are usually many alternative combinations of means to a given end. If we want to have a tree twelve feet high in thirty years' time, there are many things we can do tomorrow. We can plant an acorn. We can plant a six-foot tree and cut it back so that it grows regularly over the thirty-year period; we can plant a six-foot tree, let it grow uncut to twelve feet, and then prune it so that it keeps to that size, and so on and so on. But if we do nothing for twenty-nine years, so that our will for a twelve-foot tree in thirty years becomes a will for a twelve-foot tree next year, we can do nothing but buy a twelve-foot tree.

Gen.47. There are many things we can do now to get our tree the size we want at the time we want, but as time goes by there are fewer and fewer. The cone running from the small definite now of actuality to the wide plane of possibility X years ahead must be echoed in our imagination by an inverse cone running from the wide now of means-choice to the small

definite then, X years hence, of our chosen goal. These two interpenetrating cones, the end-choice cone with its apex now and its base in the future, and the means-choice cone with its base now and its apex in the future, seem to us a useful image of what really happens in forecasting and planning.

Gen.48. One of the main products of Europe Plus Thirty could be the description of an appropriate number of alternative states of European society and of its relations with the rest of the world. any one of which could, without requiring the impossible, be adopted (provisionally but usefully) as the goal to be reached in, say, thirty years' time. The plane could be placed not at thirty years, but at any shorter date, where the cone will be narrower. The incompatibilities between these possible goals would be set out, and the costs and benefits of each described. The benefits would be in terms of social goods apparent to all at the time, as now justice, harmony, real wealth, "quality of life", etc. - none of them, it is worth noting, strictly quantifiable. The costs would be opportunity costs. Each alternative goal could be structured to give pre-eminence to one social good, and the costs of choosing it would be the rejection of the other goals, which gave pre-eminence to other goods. We would like to give this way of setting things out the name of teleonomy, the arranging of goals, as in agronomy, the arranging of land. Europe Plus Thirty would from time to time present revised teleonomies, as the general perception of what is desirable or possible or unavoidable changes, as forecasting techniques develop, and as time itself unfolds.

Gen.49. This description is highly schematic, not to say ideal. At least until forecasting reaches a stage of development which is now only imaginable, the reality will no doubt be much more muddled. But one thing which we do believe could already be done with some confidence is the separation of the possible from the impossible. The cone itself can be drawn, and probably drawn rather clearly. Inside, uncertainty will prevail, but outside will be a "no-go area", and this awareness in itself could save us and our descendants from a multitude of woes.

THE "TELEONOMY" CONCEPT

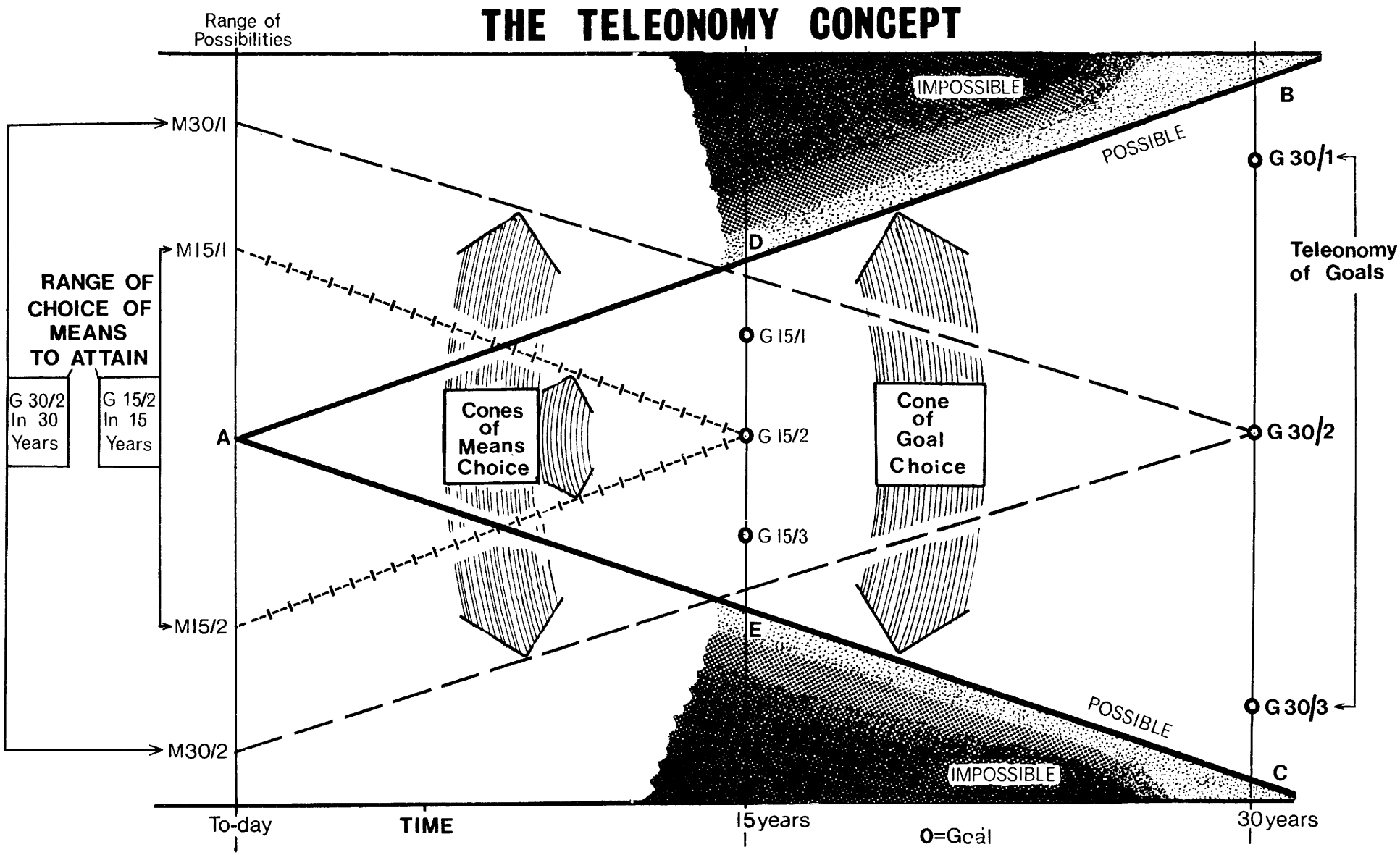
(See Figure)

The future is regarded as an ever widening Cone of possible situations. (Cone of Goal Choice). Everything inside the Cone ABC is considered to be possible and everything outside impossible. The straight lines indicating the surfaces of the (three-dimensional) cones are not, of course, trend projections or anything of that nature; they are simply a schematic representation of the frontier between possible futures and impossible futures.

The points G30/1, G30/2 and G30/3 lie within the bounds of possibility. The distinction and description of these points constitutes a teleonomy, i.e. the arranging of alternative goals, as in agronomy, the arranging of land. Suppose that point, or situation, G30/2 is chosen as a goal for the Community. Then the Cone of Means Choice (dotted cone M30/1 - G30/2 - M30/2) with its apex at Goal G30/2, will widen as it is projected back to the situation today, showing the range of possible means open to our choice now, and also the narrowing of the Cone as time advances.

If a 15 year goal (G15/2) is selected, the range of means to attain it is smaller than in the case of the more distant goal - G30/2 (Cone M15/1 - G15/2 - M15/2).

As emphasised in the text, this concept is just that: a concept, a way of imagining things. In real life the business of choosing ends and means is, as everyone knows, much less tidy.


THE TELEONOMY CONCEPT
Range of Possibilities
IMPOSSIBLE
POSSIBLE
B
M30/1
G 30/1
M15/1
D
Teleonomy of Goals
RANGE OF CHOICE OF MEANS TO ATTAIN
G 30/2 In 30 Years
G 15/2 In 15 Years
G 15/1
Cones of Means Choice
Cone of Goal Choice
A
G 15/2
G 30/2
G 15/3
M15/2
E
POSSIBLE
G 30/3
M30/2
IMPOSSIBLE
C
To-day
TIME
15years
30years
0=Goal

Gen.50. Throughout this report we hope the reader will remember our general purpose: to devise a new instrument which will help the power centres of the European Communities to make wise decisions in a largely, but not wholly, uncontrollable world.

Gen.51. What that instrument should look like, we recommend in Part IV below. A meaningful instrument will cost an annual sum which, while negligibly small in the normal scale of research costs, yet runs to a few million units of account, and the institutions of the Community will very properly look critically at the figures. Hardheaded people will think of the economic crisis which began in 1974, of inflation, of "runaway public expenditure", of the undesirability of allowing new Community instruments to proliferate, of the uncertain economic future. But they should remember it is precisely to reduce the likelihood of these things continuing or recurring in the future that Europe Plus Thirty would exist. It would exist (among other things) to foresee crises, to forecast about the underlying causes of inflation, and to reduce the uncertainty of the future. The troubles which Europe Plus Thirty could help to remove are the very same troubles which might persuade short-sighted people to refuse to set it up at all. It is a vicious circle. It would be paradoxical - it might even be tragic - if the Community were to think it was already too ill to reach for the medicine.

The shape of this report

Gen.52. Our report is necessarily complicated, and at this point we shall pause to outline its structure. In Part I, we describe first the forecasting which is already done by the European Communities and in their member countries (Chapters I.1 and I.2.). We look at the scene, and answer the questions: what is done now ? Should more be done ? If so, does the capacity to do it exist ? Next,in Chapter I.3., we come to the actual business of forecasting under three headings: the inputs you need, the methods you can use, and the way to put the outputs, or results, to the best use. In that chapter we look at forecasting in general, with only passing reference to the particular needs of the European Communities. But in Chapter I.4. we suggest some purposes and principles in the light of which

long-term forecasting should be done by and for the European Communities themselves, in the particular instrument called Europe Plus Thirty, which we recommend should be created. In the whole of Part I, we insist on the need for integrated "cross-sectoral" forecasting, but we say little or nothing about the sectors themselves, which must go to make it up. Part I is general; it treats, especially in Chapter I.3., of general methodology, and in Chapter I.4. of a methodology for the European Communities.

Gen.53. Part II becomes particular. Chapter II.1. introduces the Part as a whole, and gives in passing three examples of the way integrated problem-oriented forecasting is and could be carried out, as opposed to the teleonomy we have already described in this Chapter. The remainder of Part II (Chapters 2 to 17) discusses sixteen separate fields or sectors, in each of which we consider the possibility and desirability of long-term forecasting being undertaken a) at all, and b) by Europe Plus Thirty. We conclude that in most of them Europe Plus Thirty should be, to a greater or less extent, actively engaged, but in some that it should not, since the necessary work is already done elsewhere. Part I gives the bones, Part II puts the flesh on them. We are by no means certain that it is better to consider the general aspects first and the sectoral aspects later (as we do) than to do it the other way round. If he had to read about the sectors first, the reader would ask: "yes, but can all these things be related ?" Reading about the general aspects first will no doubt leave him feeling; "yes, but where is the substance of all this ? What is all this actually about ?" There are disadvantages both ways; but we ask the reader to be patient for specifics while we go into the generalities. Part I and II together answer the greater part of the first question put to us by the Council of Ministers. (See Letter of Transmission above).

Gen.54. In Part III we consider Technology Assessment, on which the Council of Ministers asked us to report in its second question. We attempt a definition, and point out the overlap between this work and forecasting about, especially, technology, industry, society, and the environment, which we have already treated in Part II. We suggest some ways in which the technology assessment work of Europe Plus Thirty could be related to the existing powers and functions of the European Communities.

Gen.55. In Part IV we turn finally to the constitution and working of the new Community instrument Europe Plus Thirty, and to the way it should be related to the Communities' existing institutions.

Gen.56. The Annexes are self-explanatory. They contain matter which, though necessary to our purpose, is too detailed to find a proper place in the main text. Annex 1 supplements Chapter I.2., and Annex 3 supplements Part III.

CAPACITY AND PROCESS

1. EXISTING FORECASTING AT THE LEVEL OF THE EUROPEAN COMMUNITIES

I.1.1. The Commission of the European Communities has for years been using various instruments of forecasting, in order to develop policies which are relevant not only to the problems of today, but also to those of tomorrow.

I.1.2. We are asked to make recommendations about a possible new instrument, and that instrument, if it is created, will have to fit with what already exists. It will have to fit institutionally, and also as regards its purposes. One cannot design a fit without examining the intended interface. Our own terms of reference express a need which is felt by the Commission and the Council. What is the origin of that need ? Only when this question is answered, however summarily, would it be justifiable to suggest how to meet it. In this chapter, therefore, we ask:

a) What are the forecasting needs of the European Communities ?

b) How have they been satisfied up to now, and what needs in particular have or have not been satisfied ?

c) What problems have to be considered which could prejudice the effectiveness of Europe Plus Thirty ?

From these considerations conclusions can be drawn about the contribution that Europe Plus Thirty could make to the future of the European Community, and how it should be constructed. The corresponding ideas are laid out in Part IV of this report.

The Forecasting Needs of the European Communities

I.1.3. To anticipate the conclusion, we start from the assertion that:

a) It follows from the nature of the European Communities that they are, to an even higher degree than nation states, dependent upon long-term forecasts; and

b) That for the formation of national as well as European policies long-term forecasting with a European dimension is increasingly necessary.

a) The European Communities came into being by a gradual process of integration, stretching from the ECSC to Euratom and the EEC, which may continue into the planned economic and monetary union, and more and more other areas. The development of the European Communities was a response to the changed requirements of the member countries, which agreed to share sovereignty in certain areas. Accordingly, the further development of the European Communities - that is, the strengthening of their competence and the extension of their radius of action - depends upon whether the members believe that, for instance, the problems of environmental protection or external monetary policy can in future be better dealt with on a European rather than national level. This presupposes a forecast not only of future problems but also of the development of national and European policy-making capacities and of good strategies for solving these problems.

b) Long-term forecasting is increasingly gaining in importance, because political decisions increasingly have long-term effects which cannot - or cannot easily - be changed. Equally the mastering of future problems depends on technical and social systems whose own process of maturation is becoming longer and longer.

I.1.4. The increased interweaving of the economies of the member states of the European Communities, and consequently the mutual influence of social and political processes upon each other, means that even short-term policy planning on the national level cannot be done without regard to developments in other countries of the Community. The longer the time horizons for planning are, the stronger are these interdependencies. For instance, we cannot make statements about the long-term industrialisation of a certain region without at the same time forecasting developments in prices, demand and employment. The individual member states of the Community, and the Community as a whole, are therefore dependent to a comparable degree upon long-term forecasts with a European dimension.

I.1.5. There are thus two different tasks for Community-wide research on the future; first to contribute to goal-seeking for the further development of European integration (if that is desired), and second to help set out options in various fields of European policy, and to help select the means of realising the options chosen.

Forecasting on the level of the European Communities

I.1.6. One can probably infer that, in forecasting, demand determines supply; so in order to assess past forecasting activities and to describe the way in which Europe Plus Thirty would operate, we should ask who, and in what way, sets the goals of integration, and who is entrusted with the implementation of Community policy ?

The goal-seeking process in the European Communities

I.1.7. In contrast to the nation states, the centres of political decision in the European Communities cannot freely decide upon their goals; they are bound by the limits of the founding Treaties. These limits are much narrower than those of a national constitution; the parties to the Treaties not only limited the competence of the European Communities to certain functions of government, but at the same time laid down certain goals, which are embodied in the Treaties. Thus the Treaty of Rome determines the general economic and socio-political goals of the EEC, and lays down the manner of their realisation, namely by the construction of a common market according to certain principles. The Treaty itself can be seen as a programme of long-term policy planning, concerned only with achieving the Community goal, and not with setting any new goals.

I.1.8. From the prehistory of the founding Treaties one can learn little about the use of forecasting. More instructive are the proposals for a European economic and monetary union. In the late 1960's, after the creation of the customs union, and the virtual achievement of the provisions of the Treaty, the European Community was in a state of unstable balance. Every means of stabilising the situation implied political decisions as important as the Treaties themselves.

I.1.9. The Treaty of Rome, in spite of its forward-looking nature, was not based on forecasting in the strict sense of the word. Scientific policy consultation was commissioned by governments only after the basic political decisions had been taken. Equally with economic and monetary union; the decision of the 1969 Hague summit conference was a response to past and present problems. The "phased plan"

was not based on any analysis of long-term tendencies, but was merely an attempt to describe a static model of monetary union; it is perhaps not surprising that the decision was overtaken by events.

I.1.10. Corresponding tendencies are apparent if we consider the ongoing decision-making process. In decisions on European integration the governments of the member states have regarded it as their prerogative to lay down the common goals of a European economic and monetary union (Hague summit), and have secured for themselves direct participation in the working out of proposals and procedures (Werner Report). The detailed follow-up of these decisions was, to be sure, handed over to the Commission, but it is in fact still carried out in close cooperation between the Commission and senior civil servants of the member states in various committees.

I.1.11. When it is a question of <u>setting</u> new goals for the Communities, the Commission clearly plays a subordinate role, but this fact says nothing about its significance in the European goal-<u>seeking</u> process, or teleonomy, as we called it earlier.

I.1.12. It is well known that the Commission very early on put forward proposals and preliminary studies for the further development of the Common Market towards an economic and monetary union. But comparable ideas were also developed by independent experts and in various national ministries, and the continuous and close cooperation between the Commission and member states makes it nearly impossible to trace ideas and political initiatives back to their origins. Still, it is precisely the position of the Commission as the turntable around which the European Communities network of communications is disposed which would enable it to make a special contribution to conceiving future developments. It is in a good position to solve problems in a way appropriate not only to the state of affairs at Community level, but also to the balancing out of diverging national interests. It already fulfils this task within the scope of the Treaty: the right to initiative was given to the Commission for these very reasons.

I.1.13. Even if the Commission, from the viewpoint of its critics, has lost its political impetus, it is still the organ of the European Communities which is most capable of policy planning. We cannot expect continuous conceptual work either from the Council or from the Committee of Permanent Representatives. Political initiatives by the Council, or rather by individual Council members, are generally the result of domestic perceptions and processes. The permanent representatives differ from the Council in that they work continuously, but the tasks they are charged with and the structure of their organisation makes them more akin to an international administration, from which one cannot expect planning. Their working programme is determined by the preliminary work of the Commission, and by the decisions of the Council itself. It is highly fragmented; many and changing experts, according to the subject area, are brought into consultation.

I.1.14. The European Parliament is even less able than national parliaments to undertake policy planning, because of its structure and its limited powers. The Economic and Social Committee, made up of the representatives of various social and economic interests, not only lacks political legitimacy and continuity in its work, but the Treaties confine it to an advisory capacity. For these reasons the Commission of the European Communities is the appropriate patron for a European forecasting instrument. It not only disposes of comprehensive factual and political information, but it is already the institution that receives forecasts and bases proposals on them for future Community policies. Nevertheless, it still cannot be the sole addressee of forecasts, because policy decisions are made in the Council of Ministers and are based not only on Commission inputs but also, and perhaps mainly, on opinions formed nationally. The effectiveness of forecasts, (that is, whether their results are taken into account in policy decisions) depends in part upon whether they can influence political discussion in the member states.

I.1.15. The general situation, as we see it, is this: the European Economic Community have now achieved almost all its original goals, and this naturally brings on a certain lack of impetus and direction. It wishes now to set new ones, and for this reason stands in need of the long-term integrated forecasting which can help it to do so.

Existing Forecasting in and for the European Communities

I.1.16. Forecasts have been prepared by the European Communities since their establi shment. With few exceptions, they are short or medium-term forecasts of development in particular sectors: for instance, the trends in demand for and supply of coal, steel, farm produce etc. They are restricted to single sectors because they are regarded as instruments to help formulate and implement the policies embodied in the Treaties. The European Communities themselves were built up according to the principle of sectoral integration, and the structure of the Commission, as the central administrative body, is geared to the individual tasks laid down in the Treaties. Each Directorate-General is responsible for a particular policy area, has its own need for forecasting and, at least until recently, has had the untrammelled right to commission the studies it wanted. We shall therefore base our account of the forecasting now carried out on the areas of activity of the Commission's individual Directorates-General.

I.1.17. Various departments of the Commission of the European Communities such as the Legal Service, Spokesman's Group, and the Directorate-General for Financial Control, can be ignored here, since their responsibilities do not require forecasting. There are also a number of Directorates-General which, in the past, have been concerned with devising only qualitative guidelines for a forward policy programme; one example is External Relations. Forecasts in the strict sense of the word have in the past been restricted to rather few fields: energy, industrial affairs, particularly where they are governed by the ECSC Treaty, economic and financial affairs, and agriculture. The use of forecasting became more widespread as new fields of activity opened up for the Communities (for example regional policy and environmental protection), and as the existing Directorates-General attempted to use forecasts as an instrument for promoting a European policy in certain areas such as transport.

I.1.18. Here is an account, based on the Commission's present division into Directorates-General, of the European Communities' forecasting activities. Ten Directorates-General undertake or obtain forecasts or futures studies of one sort or another.

External Relations
Directorate-General I

I.1.19. Only limited forecasts are drawn up, for instance of the trends in world trade in the three years ahead, but no quantified forward studies are available to underpin notions such as that of a European Mediterranean Policy.

Economic and Financial Affairs
Directorate-General II

Short-Term

I.1.20. Preliminary economic budgets for the next year are prepared by the Member States; the appropriate Commission departments, and the Short-Term Economic Policy Group of the Economic Policy Committee (formerly the Short-Term Economic Policy Committee) summarise these preliminary economic budgets, check them for compatibility, and compare them with the Commission's annual forecasts. The procedure is completed by the adoption of the economic budgets.

Annual reports are drawn up on the economic situation in the Community and on the outlook for the coming year, which serve as a basis for formulating the economic policy guidelines to be followed by the Member States in the following year.

DG II also prepares short-term economic forecasts on the basis of information supplied by the individual Member States.

Medium-Term

I.1.21. The Study Group on Medium-Term Economic Assessments is responsible for drawing up reports on the economic outlook in the European Community, covering a period of five years. The members of the Study Group are appointed by the Commission. The forecasts are used as a basis for medium-term economic policy programmes. Forecasts made before 1973 have been re-examined following the enlargement of the Community and in response to the raw materials crisis, and have been presented, with revised figures, as projections for the period 1974-78 in the form of a report to the Council and the Commission in preparation for the Fourth Medium-Term Economic Policy Programme, which will probably cover the period 1976-80. In accordance with the Directive on stability adopted in early 1974, the Member States of the Community are

also obliged to prepare medium-term forecasts covering a five-year period. The same Directive also laid down new provisions governing the Community's medium-term programmes.

There are also occasional future-oriented studies; recent examples are "Le profil de l'évolution économique sur longue période du Royaume-Uni" and"L'influence de la situation conjoncturelle présente sur l'évolution probable de l'Italie au cours des cinq prochaines années, 1973-1977". Other studies are designed more as qualitative guidelines for a medium-term Community policy, e.g. the report of the Working Party on Economic and Monetary Union 1980, or the report of the Economic Policy Committee on the medium-term problems raised by progress on the road to economic and monetary union (1973-1978).

Methodological studies dealing not only with short-term but also with medium-term and long-term economic forecasting have also been undertaken. For instance, the Central Planning Bureau of the Netherlands Government in collaboration with DG II, has constructed a model to explain and forecast the relationship between trade cycles in the national economies in Europe, which was to help guide short-term economic policy decisions at European level; the METEOR Project: "European Model for Economic Transmission Effects and Balancing Operations". Another model is to be used to forecast economic developments in Europe over the next six to seven years. Its construction was entrusted by the Study Group on Medium-Term Economic Assessments to the University of Louvain (COMET Project - Community Medium-Term Model). A third study deals with the methods of breaking down overall final demand by main functions, taking account of the problems raised by the analysis of long-term economic prospects.

Industrial and Technological Affairs
Directorate-General III

I.1.22. The ECSC and EURATOM treaties are the basis on which forecasts are made for steel and the nuclear field. The short-term forecasts have a time horizon of one year, the medium-term ones generally five years, and the long-term forecasts 15 years. The forecasts are made by the services of the Commission itself, since qualified personnel from the earlier ECSC and EURATOM Commissions have been absorbed into DG III.

Studies of individual industrial sectors carried out by DG III (textiles, paper, shipbuilding, aviation, etc.) are based on the short and medium-term estimates of the trends for each sector. They arethe basis on which guidelines for action are proposed for each sector.

Individual medium-term and long-term forward studies (for example, shipbuilding 1971-80) are carried out on behalf of the Commission, sometimes at the suggestion of the industrial associations concerned, by ad hoc committees which largely base their work on existing projections.

The services of DG III are also trying to develop medium and long-term activities, into which they can feed sectoral information for a forward looking input-output model. This model is being developed by an outside research institute and is intended to reveal the interdependencies of sectoral industrial development.

Social Affairs
Directorate-General V

I.1.23. As to planning in the field of social policy as a whole, a medium-term group under the chairmanship of the Director General is preparing a forecast for the period 1977-80 and plans for the Commission's work in that period. Discussions are proceeding about a similar exercise for the decade beginning 1980.

Forecasting in the field of employment has recently received more attention. Firstly, short-term forecasts of employment prospects are monitored, including those produced by national governments or their agencies, and by the Directorate-General for Economic and Social Affairs. This information is used as the basis for internal documents on short-run employment prospects. Secondly, work on medium-term employment prospects is carried out in conjunction with a group of experts from Member States. This group is identifying the likely trends in employment in the major economic sectors of the Member States up to 1980, and putting the results of various national forecasts onto a comparable basis. Original research work is also commissioned in order to establish alternative empirical forecasts on the basis of a standard methodology.

In the field of social budgets work is currently in hand on the development of common methods of forecasting by the Member States.

Article 7 of the regulations of the European Social Fund provides for preparatory studies and pilot schemes. They are important in testing possible future orientations for the Fund, but they contain at the most incidental forecasts, generally taken from national statistics.

Agriculture
Directorate-General VI

I.1.24. Medium-term forecasting for the common market in agricultural products dates back to the early 1960's. The most recent projections of the production and consumption of agricutural products only cover the period until 1977. They concern about 50 agricultural products and were drawn up for what were, when the study was commissioned, the six founder Member States and the four candidates for membership. The calculations are based on statistical series produced by the Statistical Office of the Community of Six, and on national statistics for the candidate countries. The national studies were prepared by research institutes in the various Member States under the direction of the Commission and a summary was produced by the latter.

The next forecasts will not only be drawn up according to a somewhat different procedure but will also cover a longer period (the years 1980 and 1985 are envisaged as time horizons); there are also plans to roll them forward each year.

Methodological studies were commissioned by the Community in the early 1960s. A comprehensive description and review of the technical methods and models for forward analysis in agriculture was obtained under contract as part of a study called "Agricultural Forecasts: I. Methods, Techniques and Models, II. Possible Applications of Certain Models, Methods and Techniques in the Community". The report of this study concluded that there was as yet no statistical information adequate for refined methods, and that even the methods examined were not suitably tailored to making long-term supply forecasts.

Forecasts for particular sectors of the agricultural market have also been prepared, some of which use models. Examples include a paper on the sensitivity of the parameters of a model for estimating pigmeat production.

There has also been forecasting about the agricultural workforce.

Transport
Directorate-General VII

I.1.25. Indicators for short-term transport forecasts are currently being developed. In addition to general economic trends they are to cover important features of the transport market, and are to be linked to a medium-term forecasting model. A permanent information service on the situation and trend of the freight transport market, which will have a time horizon of two or three years, is also planned.

The necessary statistical material is to be supplied by national authorities and undertakings, and collated and evaluated at Community level.

Long-Term

I.1.26. Long-term forward studies of passenger and freight transport are to serve as a guide for infrastructure investment in the Community. The European Commission is taking part with OECD in a programme called COST 33, forecasting the demand for passenger transport between major urban agglomerations. The time horizons of this study are 1985 and 2000; a report will probably be made in 1976. We refer to it again, particularly in Chapter II.1.

A report called "Preliminary Research with Reference to the Development of a Forecasting Model for Freight Transport in the EEC" was submitted at the end of 1974 by a contractor. It recommended that the proposed freight study should be closely aligned on the COST 33 passenger study as regards the time horizon involved, the breakdown by geographical region, the socio-economic definition of a region, the comparability of the socio-economic data on which both studies are based, and the transport systems to be covered. The project would use a model.

Research, Science and Education
Directorate-General XII

I.1.27. Two studies in the methodology of forecasting have been commissioned or supported financially: "A Feasibility Study of Socio-Economic Models of Europe" and "The physical sub-system - Definitions and Relationships". Both studies were carried out by university research groups. These introductory studies could be considered as a modest contribution by the Commission to the possible development of a major socio-economic simulation model for Europe. Our own study, "Europe Plus Thirty", which was set up by a decision of the Council of Ministers, is attached to DG XII.

Regional Policy
Directorate-General XVI

I.1.28. As yet no coherent forecasts exist of the regional development of the European Community as a whole. However, within the framework of the FLEUR study (factors of location in Europe), which is being carried out under contract to the Commission, forecasts with homogeneous data might become possible. A feasibility study on forecasting the balance between regional labour supply and demand in the Community has also been undertaken on behalf of the Commission.

At the request of a number of Member States, the Commission has also sponsored studies on the development of certain particular regions. Any short-term or medium-term forecasts contained in these studies were, however, taken from forecasts for the country in question.

Energy
Directorate-General XVII

Short-Term

I.1.29. The Commission prepares an annual report on the short-term energy situation in the Community, which contains forecasts for the following year. For the coal sector, a separate one year market forecast is drawn up.

Medium-Term

I.1.30. Medium-term forecasts and guidelines for individual sources of energy such as gas, coal or oil are prepared at irregular intervals.

Long-Term

I.1.31. The European Commission's long-term energy forecasts cover 15-year periods and are rolled forward every 5 years. In preparing the forecasts, the Commission's departments draw on statistical material available in the Member States, bearing in mind the medium-term economic forecasts for the Community. The statistical sources and forecasting methods have been continually improved over the past years, but the energy crisis has meant that the "Prospects for the development of primary energy requirements in the Community 1975 - 1980 - 1985" and the "Outlook for the Community's Long-Term Energy Supplies 1975 - 1980 - 1985" require revision, and has also made it doubtful whether it is possible to go on using the existing forecasting methods.

In mid-1974, the Commission submitted to the Council a comprehensive research and development programme for the energy sector which is intended to contribute a long-term improvement in the energy situation in Europe. In this report the Commission sees systems modelling as a suitable instrument for developing alternative options for a common R & D strategy, but considers that the techniques require further improvement, with the Community undertaking the necessary work.

Systems modelling is also to be used in the near future for two other studies: one concerns the socio-economic consequences of different energy supply breakdowns, and the other consists of an economic appraisal of different energy supply and demand patterns, mainly in the investment field.

Credit and Investments
Directorate-General XVIII

I.1.32. Surveys among undertakings and trade associations indicate what the probable supply situation in the coal and steel sectors will be and, on this basis, the Directorate-General for Credit and Investments prepares annual supply forecasts for the following four years. These forecasts serve as a basis for decisions on the granting of industrial and reconversion loans under Articles 54 and 56 of the ECSC Treaty. In order to prepare the "general objectives" for the steel market, which at present are being laid down for the years 1980 and 1985, the Directorate-General uses a similar

procedure for gathering information on new business investment and investment plans to estimate the supply situation in the steel market. Forecasts of demand trends are prepared by Directorate-General III (Industrial and Technological Affairs). The "general objectives" are revised every five years.

Budgets
Directorate-General XIX

I.1.33. In cooperation with national government departments and in the light of the estimates of the Medium-Term Economic Policy Programmes, this Directorate-General prepares financial forecasts which cover three years and are rolled forward annually.

Methodological studies are being carried out at the moment to improve the forecasts.

Others

I.1.34. Besides work done in and for the various Directorates-General, some forecasting may be expected to be carried out in or for two new dependent organs of the European Communities, one of which has been decided upon by the Council, and the other of which is to be proposed to it by the Commission.

The European Foundation for the Improvement of Working & Living Conditions.

I.1.35. This Foundation, which has been decided upon by the Council and is to be in Dublin, will undertake research into working and living conditions, including the environment, and their improvement. Long-term studies, such as that on water supply prospects in Europe in the next thirty years, which at present are done under contract for the Commission's Environment and Consumer Protection Service, may then become the responsibility of the Foundation.

European Communities Institute for Economic Analysis and Research

I.1.36. This Institute, which is to be proposed to the Council by the Commission, springs from the desire to place policy measures for the further economic integration of the European Communities on a more

scientific footing. The Institute would carry out both economic research and medium-term forecasting, and would deal with the methodological problems of economic forecasting.

Problems and difficulties of forecasting at Community level.

General tendencies and experience

I.1.37. The rather numerous forward studies carried out for the European Communities concentrate on short and medium-term forecasting. The Commission is, however, increasingly aware that it must also have at its disposal longer-term forecasts if it is to be in a position to develop a coherent system of goals and strategies into which to fit its short and medium-term policies. Similarly, there has been more and more evidence of the limitations of sectoral forecasts, and attempts are at present being made to overcome them through closer cooperation between the Directorates-General concerned and at Commission level, and also by contracting out work on integrated forecasting models.

I.1.38. Under the present arrangements the responsibility for deciding whether or not forward studies are to be carried out lies with the individual Directorates-General unless, that is, such studies are mandatory under one of the Treaties or under a Council decision. Only recently have attempts been made to achieve inter-departmental coordination: in early 1974, a study group was set up to coordinate proposed studies internally; it began its work only at the beginning of 1975.

I.1.39. A number of problems and trends have appeared in the preparation of Community forecasts.

Since they have no lower-tier administrations, the European Communities are dependent on statistical material and forecasts provided by the Member States. The insufficient comparability of national statistical data and forecasting procedures is thus the first obstacle to be overcome. The Statistical Office of the European Communities makes a major contribution towards overcoming it. Once standardisation is achieved, the next problem to arise is the inadequacy of traditional forecasting methods. Accordingly, various Directorates-General have commissioned the construction of forecasting models within their own fields, which have revealed that

computer science does indeed offer almost unlimited possibilities but that the present state of economics and social science, and also the existing level of information, impose considerable constraints. Because of their high degree of aggregation and above all their necessarily narrow assumptions, these studies have so far been of only limited use in policy-making. The small size of the Commission's staff means that most forecasting work has to be contracted out. However, preparatory work in the Commission must be carried a certain distance before outside experts can be asked to draw up forecasts.

The contribution of forecasting to policy planning at European level.

I.1.40. As the party commissioning forward studies has so far been identical with the party for which they are intended, the forecasts have in a sense met the Commission's information needs. But this does not yet mean that they are appropriately assessed or used for the formulation of policy proposals.

I.1.41. The inadequacy of many forecasts has given rise to some reticence, because their statistical base is too narrow, or their theoretical premises are disputed, or the results are too general, or fundamentally interdependent relationships have been disregarded. Other difficulties in exploiting the results for policy-making have been due to a lack of planning at the receiving end.

I.1.42. In a number of areas, such as medium-term economic programming, forecasts are an integral part of programme planning, of which Council decisions or Treaty provisions are the basis. Not only is there thus a guarantee that the results of the forward studies are taken into account when programmes are being drawn up, but there is also permanent and close cooperation between outside experts, Commission officials, and officials of the Member States. In other contexts, the decision whether or not to use forecasts for formulating Community policy in a specific field depends on how relevant the information provided is to the work of the Directorate-General concerned. This raises the problem of interdepartmental coordination. Programme planning within the individual Directorates-General is still in its infancy. Consequently, there has been no assurance that forward studies are always commissioned in consultation with other departments or in accordance with criteria previously agreed.

This problem exists regardless of the formal allocation of responsibilities for studies, which varies from one Directorate-General to another.

I.1.43. Nevertheless, as a general rule, the Directorates-General have been provided - to the extent this has been financially, statistically and methodologically possible - with the short and medium-term forward information necessary for the limited policy sectors covered. One generally noted shortcoming has been the lack of wider-ranging forecasts as a prerequisite for and adjunct to forecasts in individual sectors; the desire to obtain forward studies of immediate practical relevance has meant that interest has focused on short-term and medium-term sectoral forecasts. In addition, the Commission's internal organisation makes for a rigid division between the sectors covered, so that it is difficult to identify and successfully pursue any interest that extends beyond a single department.

I.1.44. But the European Communities need precisely these long-term integrated forecasts of economic, political and social trends in order to steer their own course. This requires political planning at Community level, it requires the coordination of the proposals and programmes of the individual Directorates-General so that they form a comprehensive concept of Community policy. Only through such a planning process can the feasibility of, and possible alternatives to, specific policy choices be considered.

I.1.45. The Commission of the European Communities finds it just as difficult as other big administrations to plan its tasks and programmes coherently. As an international organisation, it has to cope with additional problems. And as the first international, multilingual administration in all history (as far as we know) to have some direct power over the lives of actual people, it also has to cope with completely unprecedented ones as well.

I.1.46. Policy planning requires the collation and processing of complex information and the goal-oriented coordination of possible courses of action. The ability to achieve this coordination depends on whether the body directing policy is capable of arriving at a consensus and of taking political action. The thirteen Commissioners, acting together, constitute the Commission's controlling body. Their unity is in practice impaired by the way they are

appointed and by the lack of direct political legitimation. The Commission is, it is true, designed as a collegiate body, but functions de facto on strict departmental principles. An excessive workload, the continued existence of separate Treaties, and the working methods of the Committee of Permanent Representatives are further reasons for this state of affairs. To this extent, it is clear why the Commissioners, acting as a body, do not carry out their programming and coordinating tasks in an optimum way.

I.1.47. The responsibility for coordination cannot, however, be taken over by the Commission's departments. They possess neither the political legitimation nor the necessary power; the result is that they can play only an auxiliary role by helping either to cut down the surfeit of information or to coordinate implementation of the various departments' separate tasks. The Commissioners' cabinets, the Secretariat-General, and the Legal Service could be particularly important here; they are the points on which the flow of information converges.

I.1.48. The scope for "autonomous self-coordination" at the level of the Directorates-General is limited; it is largely restricted to an exchange of information and the formal delimitation of spheres of work. It is still too early to judge more recent tentative coordinating efforts, for instance in the contracting out of research by the Commission. These and other attempts are an indication that a shortcoming has been recognised and has to be remedied.

It would not be right for us to pursue these points further, but we will return in Chapters I.3. and I.4. below to the general question of how forecasts may best be turned to account in policy-making.

I.1.49. In the meantime we note with encouragement a speech made by President Ortoli to the European Parliament in February 1975; in it he propounded that the action programme of the Commission should be seen as a comprehensive programme, so that the Commission "could do justice to its regained vocation as a political organ", and so as "to give the work of European unity a different dynamic and a different dimension."

Conclusion.

I.1.50. We began this chapter by mentioning the need to attend to the relationship between the proposed new continuing instrument of long-term integrated forecasting and the short and medium-term sectoral forecasting which already exists; we have now briefly reviewed the latter and found that quite a lot has been done, is being done, and is proposed, and that it is, in general, not very well coordinated. Clearly the amount and variety of the work is such that some general principle will have to be adopted to govern the interfaces with Europe Plus Thirty, if it comes into being. A series of one-to-one arrangements would not be good enough.

I.1.51. We think this principle can be found in the time-horizon of the work concerned. If the existing sectoral forecasting is really short-term, a year or less, we do not foresee any problem. The short-term enterprises and Europe Plus Thirty can be useful to each other, but no coordination is required between them beyond the assuring of a mutual flow of information. If the sectoral work is what one could conveniently call medium-term, say between one and four years in time-horizon, the coordination will have to be more thorough. A certain harmonisation of methods, and a certain community of assumptions, would be extremely useful. If Europe Plus Thirty can be instrumental in bringing about that harmonisation and that community of assumptions, not only between itself and each of the existing medium-term sectoral projects, but also among the latter, that would be in itself a minor justification for its existence. We recommend that the laborious work entailed should be promptly undertaken, if Europe Plus Thirty comes into being.

I.1.52. Where the sectoral forecasting looks to a term longer than four years, and where the longer time-horizon must (or should) tend to make it multi-sectoral or integrated, there will be severe dangers of overlap, waste, and confusion. We strongly recommend that these dangers should be faced immediately. If Europe Plus Thirty is to have any purpose, it must be a truly integrated project, which means that it must work in all fields where long-term forecasting makes sense. (We identify these fields in Part II below.) It will be necessary immediately to consider and decide whether, if long-term forecasting is being done in the integrated project, it is also a good idea to do it in a series of separate sectoral

projects. We are convinced it is not. If our view were accepted, it would lead to the absorption of some projects and studies into Europe Plus Thirty, those with a time-horizon of more than four years. There is no reason why this should be any loss either to the Commission of the European Communities or to those whose livelihood depends upon it. Much good work is already being done; it will be better done, and very probably by the same people, even in the same place, if it is done as part of an integrated network project such as we describe and commend in Part IV of our report. To avoid misunderstanding, we emphasise that in the case of instruments where long-term forecasting is likely to be only a small part of their work (such, for instance, as the Foundation for the Improvement of Living and Working Conditions, the proposed European Communities Institute for Economic Analysis and Research, and the Energy Research Programme) we are <u>not</u> proposing that the instrument should be absorbed into Europe Plus Thirty; our proposal concerns only long-term forecasting.

2. FORECASTING CAPACITY IN MEMBER COUNTRIES OF THE EUROPEAN COMMUNITIES

General

I.2.1. In the present chapter, we look at what sort of forecasting is already being done in the countries of the European Communities, because whatever instrument is created for the Community itself, that instrument should be carefully related to the existing capacity, and should of course use it where appropriate.

I.2.2. In the last ten years several investigations of the scope of forecasting have been carried out in Europe and elsewhere.(1) The results tend to show that forecasting as a formal activity is increasing. The range of techniques employed has also increased, and so has sophistication in general.

I.2.3. There is considerable variety in the pattern of forecasting in different countries, and in the methods used. It depends on the issue under consideration, cultural outlook, personalities, the organisation (including organisation of government), and previous experience. To understand precisely why forecasts are made and why particular methods are used today would involve extensive historical analysis. This chapter contains general observations, and is supplemented by Annex I, which discusses in more detail the fields, organisation, methods, scale, purposes, sponsors and end-users of forecasting, both governmental and non-governmental, in each EEC country, in international organisations, the rest of Western Europe, Eastern Europe, North America and Japan. We have looked outside the Community at this point, because we think that can only broaden our understanding of what goes on within it, and because Europe Plus Thirty will have to forecast about the Community's position in the world, and will therefore need data from outside.

I.2.4. Our terms of reference bind us to look closely at existing forecasting capacity, and this we have done. But we would caution against any attempt to concoct an "analytical table" of it. It changes. Good individuals move. Ventures fail. Other ventures, sometimes of high quality, go unperceived from modesty or poverty. As well as the general indicators contained in Annex I, we are transmitting to the

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(1) For example, N. Sombart: Long-term Planning and Forecasting in Europe. Long Range Planning Vol. 5, No. 2.

Commission privately, that is, separately from this report, a list of names and addresses of forecasting institutions. It is the best we have been able to compile at a given moment in time. It is not complete; still less is it an indication of merit. We recommend that it be among the functions of a continuing Europe Plus Thirty to maintain such a list as this up to date, and to make it fuller and more informative.

Forecasting in Europe

I.2.5. European forecasting lies between two polar stereotypes: the Soviet Union (highly centralised preparation of rigid five-year plans based on estimates of economic, social and technological possibilities at a national, sectoral and regional level) and the United States (largely decentralised forecasts, with an emphasis on short-term issues, by departments and agencies at all levels of government, and by industries and universities, with minimum coordination).

I.2.6. In the Netherlands, the Federal Republic of Germany, the United Kingdom, and Belgium, government has a strong regional element, and much planning is decentralised. In France the reverse is the case. In the United Kingdom power lies largely with individual ministers, and long-range planning tends to take place on a departmental basis. France and the Eastern European countries have for some time produced comprehensive medium-term plans. In the Federal Republic of Germany, like the United States, there has been no planning of this kind. The Netherlands, Italy and Sweden have produced long-term, macro-economic projections on a less comprehensive basis, and have tended to focus on a particular issue such as regional sectoral disparities in Italy, or industrial production in the Netherlands. In the main, it has been undertaken to help tackle a particular problem, or even to generate a sense of purpose. Plans usually cover a five-year period and are either regular, as in France, or occasional, like the ill-fated British National Plan of 1965.

I.2.7. All European nations, within their Ministries of Finance, have for many years carried out annual budgetary forecasts, usually based on econometric models. Most engage in mid-term forecasting up to five to ten years. In industry and government budgetary planning, much shorter

planning horizons operate; they are dictated largely by the prevailing discount rate and (it is commonly believed) by the lifetime of democratically elected parliaments, but there is a consensus that the amount of long-term thinking has increased. The annual budget is what affects people's lives, and the very great difficulty of translating long-term strategies into short-term tactics has meant that National Plans, even where they have been coordinated by the finance ministry, have tended to have less effect. If we want to identify the kinds of forecasting which really do assist policy-making, we shall have to remember this.

I.2.8. As well as finance ministries, most government departments carry out forward planning and have at least a nominal forecasting capability. At this level studies are intended to provide background information for policy formation (beforehand) and assessment (afterwards). Sometimes it is done for specific policies but often, for example with demographic forecasts, for a wide range of policies.

I.2.9. Overall plans sometimes originate within the finance ministry, but more often in departments set up for the purpose. The aims of overall plans vary. Often they have been initiated (as in France, the United Kingdom and Ireland) to relieve economic troubles. But they are also intended to provide strategic guidelines within which sectoral and regional policies may be devised. The need for such guidelines has become accepted for many reasons, particularly perhaps because of the increase in public involvement in industry.

I.2.10. Where the preparation of an overall plan is not the intention, the need to coordinate plans and forecasts between ministries is increasingly recognised. In Eastern Europe, and to a lesser degree in France, formal coordination has existed for several decades. In the United Kingdom and the Netherlands it is more recent, and inter-ministerial activity is obtained more often through committees than through joint analyses. Most countries suffer from lack of inter-departmental communication. Traditionally powerful finance ministries are loth to concede power to national planning agencies. In the United Kingdom, coordination was significantly improved when a number of spending departments were grouped into new and larger 'super-departments' (e.g. Department of the Environment).

I.2.11. Typically the time scale for ministerial forecasts is five to ten years, but 1985 and the end of the century have been common horizons for about a decade. There is at least some recognition of the physical, technological, social or economic time scales characteristic of each policy area. Land use planning, for example, is recognised as having physical implications up to and beyond sixty years (the theoretical physical lifetime of dwellings). Energy requirements are considered on a scale of several decades, corresponding to the lead time for new technologies, the economic life of power stations, and physical limitations (fossil fuel reserves, environment). Some aspects of social policy (for example, planning for retirement pensions) also require forecasts of at least thirty years.

I.2.12. Although the time horizon and scope of forecasting do seem to be extending, several countries which have experimented with forecasts and plans of long time span or great detail are now redirecting their efforts towards less ambitious projects. The attempts during the 1960's to produce long-term, very detailed forecasts of wide scope were not entirely successful. In Hungary, in France and in Ireland, for example, the time horizons of government forecasts have shortened, and the level of detail in long-term forecasts has been reduced significantly.

I.2.13. Social factors are becoming increasingly prominent in governmental and other forecasts: in some cases this means attempting to display social and environmental costs in economic terms, in others it involves merely indicating the social implications of economic and other policies. Problems arising from increasing urbanisation and industrialisation, the ecological aspects of environment, and most recently the energy crisis, have all contributed to this widening of perspectives. In several countries new government departments which focus on these issues have been established. A need for 'social indicators' with which to monitor the effects of social policies is recognised; we return to this (1) fascinating subject later. The Netherlands and Sweden have set up agencies to examine the assumptions and goals implicit in government policy.

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(1) See I.4., pages 8 - 10.

I.2.14. But the purpose of 'forecasting' is seen differently in different European countries, and in each country the perception and emphasis has changed continuously. In Eastern Europe, France, Italy, Belgium and Norway, forecasting has been closely intermeshed with planning, and has thus been more "political". In the Netherlands, the United Kingdom and West Germany, it has been more removed from the hurly-burly.

I.2.15. There are also differences in the overall approach to forecasting. Some countries, such as the United Kingdom and Norway, emphasise the formulation of alternative hypotheses concerning future trends. By contrast, in France the approach to mid-term planning has been to specify by systematic (iterative) trial and error the policies which - taken together with estimates of social and technological changes - will lead as close as possible to a specified set of objectives. In some countries (e.g. Hungary) attempts have been made to arrive at such 'solutions' by using programmed optimisation methods. (It is worth mentioning here that world-wide the only body known to us practising anything like teleonomy is the Economic Council in Japan.)

I.2.16. An important factor determining governmental planning activity is the level of public ownership in a country; whether, for example, forecasts are oriented toward revenue or production. Even in East European countries, as experience in Hungary shows, there is a conflict between perceived industrial and governmental forecasting needs, industry in general preferring a shorter planning horizon. In the West, different perceptions with regard to, say, the question of taxes, makes full cooperation between companies and governments quite difficult. Nevertheless, the expectations of businessmen concerning levels of investment and of technologists concerning the lead time for new technologies are relied upon by most government agencies in making detailed sectoral forecasts. On the other side although most industrial forecasts are narrowly product-oriented, some industries (e.g. oil and transport) find it essential to consider a wide range of social and environmental issues.

I.2.17. This applies particularly to large firms and public ventures (including nationalised industries) many of which have their own long-range forecasting groups. The size of a firm and the character of its products naturally have a greater impact on its planning effort than does the pattern of national economic planning. Where interests do not clash directly, several companies cooperate to sponsor research associations or

conferences. There are, in fact, several fora, both governmental and non-governmental (such as the ECE seminars for senior economic advisors or the Institute of Administrative Science Congress), for exchanging ideas about forecasting methods and applications.

I.2.18. It is difficult to make generalisations about forecasting research in universities, private organisations and consultancies. If anything, interest in forecasting among them exceeds that in government departments or industry. Some universities conduct programmes of research into forecasting in general and in relation to specific topics. Attitudes to work by universities and consultants vary between countries; in Europe (compared with the United States) university research tends to be viewed as 'too academic' or irrelevant. However, most non-governmental research contributes to a widening of perspective which is lacking in narrowly defined governmental forecasts, and points to neglected issues which are often not viewed as central problems by the governments of advanced nations. In some countries (for example, the United Kingdom) it has been stated as a deliberate policy that speculative long-term issues should be aired publicly via non-governmental sources.

I.2.19. There is considerable variation in the level of interdependence and cooperation between government and non-government research teams. This also includes groups not engaged specifically in forecasting, such as government statistical offices and many university departments which collect and monitor data. Although they are not mentioned here in any detail, such groups are clearly vital to the overall forecasting activity.

I.2.20. The pattern of international association and cooperation between governments in forecasting seems to be geographically, economically, and politically determined; probably in that order. In Europe, France has greater cooperation with Italy and Belgium (and Eastern Europe) than with other nations. Dutch links tend to be with the Federal Republic of Germany, the United Kingdom and United States. The Scandinavian countries are close to each other; Germany to the U.S.A., etc. Language and culture place greater barriers on joint projects than differences in method or approach. There is rarely a complete correspondence between the activities of a government department in one country and its (nominal) opposite number in another.

I.2.21. The work of inter-governmental agencies, such as the United Nations and OECD, especially the latter, is often well thought out and executed. Although OECD is not strictly a European organisation, all the Western European countries are members. It is certainly one of the main sources of comparative data, not only in the field of conjunctural economics, but across a wide span of sectoral activities such as agriculture, energy, science and technology, environment, education, social policy and development aid. Furthermore, its work is, in general, rather more concerned with the longer-term trends than that of other international organisations. However, OECD has made little attempt to initiate an integrated forecasting approach of the type which we advocate in our report. Its work is essentially on a sector by sector basis with little consideration of the significance of inter-sectoral influences and impacts. We consider that its work cannot be regarded as an alternative to the creation of a sound and integrated forecasting capacity within the Community, where such forecasts, to be effective, must necessarily be close to the points of analysis and decision. The European Commission and Council are to some extent an executive, having powers of their own, and forecasting done by them or for them should therefore be more policy-oriented than can, or need, be the case in OECD.

The Methods Employed

I.2.22. We describe and consider the methods of forecasting as such in Chapter I.3.

The range of techniques used in forecasting has increased in the last twenty years, and greater sophistication is evident in many forecasting exercises. There are several reasons for the increase in the use of sophisticated (usually mathematical) methods. First, techniques, technology and expertise have been carried over from military, engineering and scientific endeavours. The operations research and 'systems' approaches had their origins in the Second World War. Second, there has been a tendency since the War, in government economic planning particularly, to define a relatively small set of objectives (economic growth, full employment, etc.) and to adopt a managerial approach to achieving these objectives which in itself helped to promote the use of more formal techniques. Finally, there has been a demand for methods which can cope with issues which are realised to be increasingly complex.

I.2.23. For the resolution of issues which have recently become political eye-catchers (energy, and ecological aspects of the environment) systems analysis and sophisticated modelling methods are often used. International agencies and international non-governmental projects are sometimes front runners in experimenting with and supporting studies based on new techniques such as dynamic modelling. In long-term economic studies, both formal mathematical methods and informal discursive methods are generally used. All countries carrying out long-term exercises make use of non-formal methods such as qualitative analysis (including scenario writing), international comparisons, and of course the simple extrapolation of past trends. The degree of emphasis depends on the overall approach used. Although econometric methods have often given reasonable forecasts, they have proved insufficiently responsive to unusual circumstances. In general the more detailed an analysis, the more expert judgement as opposed to econometric or other models is relied upon. Even with short-term forecasts there are considerable variations in approach and in the assumptions underlying the models constructed in different countries, which will be a problem in itself for any integrated forecasting instrument set up by the Community.

I.2.24. In France, Italy, the Netherlands and the United Kingdom experience with the use of aggregated economic models is generally considered to have been satisfactory. Although the Czechs, Italians and Dutch have all experimented with non-linear versions of their aggregate macro-economic models, there is a tendency for models actually employed in the management of economies, and particularly trade models, to be mathematically relatively simple. They consist for the most part of linear relationships. Optimization methods and dynamic programming are used less often. One reason for this is the low quality of data, which makes estimation of relationships difficult and the use of more sophisticated methods of dubious value. This situation is improving, although Europe as a whole still lags behind the United States. We return to the question of inputs later in Chapter I.3.

I.2.25. There have been failures, from all of which we must learn. It has proved difficult to produce consistent long-term demographic forecasts as, for example, the experiences of both the Netherlands and the United Kingdom show. Attempts are being made to extend the extrapolative methods based on fertility rates and cohort analysis to include other

non-demographic variables. Similarly, models of technological change have tended to be too primitive. In an industry such as electronics, a new generation of components may appear in commercial application less than five years after the discovery of the basic physical phenomenon. In other industries, such as nuclear power, forecasts of lead times are hazardous. For this reason estimates of expected technical changes and costs tend to be based upon the opinions of large numbers of industrial and scientific researchers. This seems to be especially true of Japan and the Soviet Union. The PPBS (Planning, Programming and Budgeting System) has had mixed fortunes in several of the countries in which it has been introduced, particularly in the United States, and has largely been replaced by the less complicated 'management by objectives' approach. One of the more commonly advanced and charitable reasons for this failure in the United States is that its introduction across a wide range of government departments more or less simultaneously overstrained the supply of policy analysts.

I.2.26. But difficulties which might be viewed as teething troubles are to be distinguished from inherent limitations in forecasting methods. Input-output methods, for example, were strongly criticised by many other economists when first introduced by Leontief. Today input-output tables are an invaluable part of the government economist's armoury.

Conclusion

I.2.27. The information contained in Annex I suggests that there is an increased awareness of the need for forecasting both inside and outside government, in all countries. In particular there appears to have been a continuing, and in many cases increasing, interest in longer-term forecasts. The scope of forecasts is also broadening, as is the range of techniques employed.

There are considerable differences between patterns of activity, even among countries of the European Community. The trends have certainly not all been in the same direction.

I.2.28. In Europe and elsewhere forecasting is part of a continuous process of experimentation in methods and organisation. The aim of this activity should be to contribute to the formulation and implementation of worthwhile policies. This increasingly involves a questioning of basic values and assumptions which cut right across sectoral and national interests. Satisfactory procedures for reconciling the resulting broad objectives with short-range policies, and bringing together the research, forecasting, and planning functions, have yet to be devised. We think that if a Europe Plus Thirty is set up, it should be not only because the Community (as opposed to its member countries downhill, and the OECD uphill) needs it, but also because it should, and can, contribute to the devising of those procedures.

3. THE FORECASTING PROCESS

I.3.1. We have now considered the following questions: Should the European Communities do anything new in order to come to grips with the increasing complexity of their public life? What is Europe that it should need forecasting, and what is forecasting that Europe should need it? (General Introduction.) How does the Community at present use forecasting in choosing its goals and formulating its policies? (I.1.) And what sort of forecasting capacity at present exists within the European Communities? (I.2., and Annex I.) We have suggested that the Community does indeed stand in need of a long-term forecasting capacity, and we must now begin to review the methodological elements out of which such a capacity could be constructed.

I.3.2. In this chapter, we discuss:

a) the inputs needed for long-term forecasting;

b) the available methods of forecasting; and

c) what can be done to ensure that the results of forecasting do in fact contribute to decision-making and planning.

We discuss forecasting in general, with only passing reference to the particular needs of the European Communities. Only in the next chapter, I.4., do we consider the principles which should govern the putting together of all these elements into a particular continuing operation: integrated forecasting for the European Communities. After that, in Part II, we briefly review the experience and the difficulties, the possibilities and impossibilities, which pertain to attempts at forecasting in each of a number of different sectors.

I.3.3. This chapter, on "the forecasting process", falls into three parts: inputs, methods, and outputs. Forecasting is a process and like most processes it requires raw materials: the inputs of forecasting are in the form of information about the past and present. Like all human processes, it uses methods; sometimes alternatively, sometimes sequentially, sometimes in combination. The methods of forecasting are described in the second part of this chapter, and are grouped to show what part of the forecasting process they are most use for. Like all processes, again,

forecasting gives rise to an output, a product or results, and, if it is to serve its purpose, this output has to be brought to the right person in the right form. The relationship between forecasting on the one hand, and planning and decision making on the other, is treated in the third part of this chapter.

I.3.4. We use the analogy of food. If forecasting is a meal, then the inputs are the raw foodstuffs, and statisticians the farmers. The methods are the pots and pans in the kitchen. The outputs are the meal itself, and policy-makers are the guests. The forecaster, the central figure in the chain, is the cook. This chapter treats first of farming and harvesting (inputs) second of cooking (methods) and third of laying the table and serving (outputs).

Input: the raw materials

Introduction

If we want to forecast about something, we must know what it is, and to know what it is we must know its history, however slightly. This is true even if a forecast is mainly based on guesswork, since guessing itself can only be based on some kind of knowledge about past developments. Thus, forecasting requires a certain awareness of the present and its history: it needs input.

In this chapter we shall discuss first its main component: information, i.e. statements about perceived facts, about whether something does or does not exist, numerical statements about its existence, and qualitative statements of all sorts. The quality of forecasts depends critically but not exclusively on the quality of the input, whether we use conceptual models in our minds, or the computer models which reflect them. The existence or non-existence of time series of accurate and consistent data greatly affects the possibility of forecasting. But knowledge about the past is not sufficient, as the following example will illustrate.

Example

I.3.5. Input requirements for national forecasts of consumption patterns several years ahead may illustrate the different types of input needed

in the forecasting process. This type of forecasting is done in several countries either by government authorities for national economic forecasts, or by private organisations or firms to help plan future production of goods.

I.3.6. The first step in this particular process - as in most forecasting - consists of choosing a "model" - whether conceptual, mathematical, or other - that can "explain" past and present consumption trends, in the hope that it will hold true also for future trends. To choose and to test models, you need all kinds of historical inputs, qualitative as well as quantitative. You have to be able to "explain" slow, systematic changes in the composition of household consumption (e.g. the declining percentage of food in the daily budget), and, if possible, also more sudden shifts in consumer behaviour such as those caused by the introduction of the automobile.

A good forecasting model is one that displays identifiable and stable relationships between the variable you want to forecast and a set of "explanatory variables" which can be accepted with confidence, or can be controlled by the forecaster or his boss (by policy, say, or by sales promotion). Experience in many countries shows that fairly realistic "models" of consumption patterns can be constructed, provided variables such as income, household composition, and trends in relative prices are at hand.

I.3.7. Careful studies of changes in relative prices have shown some fairly stable long-term trends (e.g. labour-intensive goods and services becoming more and more expensive). Similarly, studies of demographic and sociological data reveal that the household composition in Europe has so far changed fairly systematically over time towards smaller households, the number of children per family decreasing and the span of years without small children in the average family increasing, largely independently of short-run economic and social changes. All these are useful in assessing the future. As regards the remaining explanatory variable, future trends in income (distribution), the forecaster will have to rely on the results of other forecasts, (e.g. of the levels of employment and economic activity). Frequently, then, the forecaster will have to use several assumed future income trends themselves based on historical evidence of past developments.

I.3.8. It will be obvious that no fool-proof long-term model can be made to explain all the changes in consumption patterns. Even if careful studies of past experience confirm relationships which seem to withstand short-term disturbances, this stability may not endure. Therefore the forecaster must go on collecting new inputs to confront his forecasts with developments in the real world. Are new family structures or new life-styles emerging which may radically change consumption patterns ? Will the consumer behaviour of young families in the late 70's or 80's begin to level off (saturate), in a reaction to the "economic growth era" of the 50's and 60's ? These are questions of great importance in forecasting long-term consumption patterns; but many of the necessary inputs are themselves forecasts, and thus only verifiable with the passage of time.

More about Inputs

I.3.9. Different types of forecasting require different types of input. Very often, the main input has to be knowledge of the past as it led up to the present: historical data series, or time series data, to use the statistical terms. Sometimes, knowledge of the present situation may suffice, but only when other "outside information" is at hand as a substitute for history. That outside information may be in the form of technical "laws", for instance concerning the energy requirements of alternative patterns of production. (For instance, the production of steel and of most fertilizers requires much energy, while textile industries mostly consume relatively little.) "Outside information" may also come in the form of accepted political plans, for instance plans for the regulation of agricultural production and trade in the Community. In the latter case the forecaster may say: "Since you are determined things in this field shall be done thus, I assume they will be done thus. Let us now see what effect that might have on things in other fields". Of course, if they are not, or not for long, "done thus", then the forecaster's work may turn out to be less relevant - unless indeed things were no longer "done thus" precisely because his forecast showed that would have been a bad idea.

I.3.10. The data problems in forecasting are formidable. Most of the historical data which would be most useful to a forecaster do not exist. Those that do exist tend not to be mutually compatible (even when officially pre-digested), and many of them cover only a few decades with relatively coarse (yearly) time-intervals, displaying undesirable traits like collinearity, and not being law-abiding at all (e.g. not converging towards stable probability distributions). And perhaps worst of all are data which are outdated. As the British economic forecaster, Professor R.J. Ball, pointed out at a recent International Conference on Dynamic Modelling and the Control of National Economies (Warwick, July 1973): "Forecasting ..... is often like trying to find out where you are going when you don't know where you have been."

In long-term economic forecasting, for instance, the data available may consist of time series ending 3 or 4 years ago. Some of the figures in the model, e.g. the so-called technical coefficients in the input-output tables, may date back even longer, perhaps 10 or 15 years. Luckily, these coefficients seem to change fairly slowly, but economic model-building might yield more reliable forecasts if more up-to-date values of, for example, these input-output coefficients were available. According to the present commitments of the statistical bureaus of the member countries, input-output tables, and hence those coefficients, will be updated more frequently in the future.

I.3.11. Even so, the existing systems of statistical data collection and handling in the European countries have been constructed primarily for evaluating past and present developments and policies, and not for forecasting. Changing them is a very slow and laborious process in a single country, not to speak of the difficulty of getting those processes in 9 countries to converge into full compatibility at the same time.

I.3.12. On the national level, major improvements of the statistical base are required to serve long-term forecasting. For instance, apart from the input-output coefficients mentioned above, we still lack data on other structural changes in some of our economies (as opposed to short-term cyclical or conjunctural changes) such as those in patterns of consumption, in composition of the labour force and in weekly hours of work, in growth patterns for the public sector, and so on and so forth.

I.3.13. Europe Plus Thirty must decide what data it needs, and ask for them. If they do not exist, it will have to negotiate for them to be procured with the Community Statistical Office in Luxembourg, with the national statistical services, and with anyone else who can procure them. Only as an exception would it collect primary data itself. For specific projects it might sometimes be useful to conduct, or contract out, specific sample surveys.

I.3.14. If the general economic development of the Community is to be analysed, compatible national accounts data and input-output tables have to become available. This will involve a further development of the application in the member countries - on the most detailed level - of common definitions and classifications within the field of national accounts data. Only when this is realised can Community-wide data series be constructed, and be analysed by such criteria as urban/rural, highly-developed/less-developed, etc., and by economic and other sectors for the Community as a whole, instead of by nations as at present. The pioneering work which has already started at the Statistical Office of the European Communities on a common input-output table is very promising.

I.3.15. In some cases data can be obtained by historical reconstruction. In fields without ready-made historical time series, the need for "hindcasting" is obvious. In many countries the need for macro-economic time series covering several decades has led economic historians to make impressive studies enabling them to put together comparative time series for key variables from circumstantial evidence. Europe Plus Thirty should, if necessary, stimulate this sort of work.

I.3.16. Few things are more important than the continuous checking of forecasts against what happens. If events seem to be writing a scenario which was not among those considered by the forecasters, the sooner that is detected the better. The data needed for this continuous validation may be different, though not very different, from those needed for the forecasting itself. Most forecasting models will contain a set of exogenous or independent variables (determined outside the model) and a set of endogenous or dependent variables, the values of which it is the task of the model to "determine". The values of the exogenous variables in forecasting have to be assumed in advance. In these cases it is very important,

as soon as preliminary estimates of the "true" values of these variables are available, to check the model values.

I.3.17. In the real world, and hence in realistic models of economic, social and technological developments, there is usually a certain sub-set of variables which is more significant in determining the results than others. Raw material prices, investment in key industrial sectors, demand for automobiles, are examples of such variables. These variables have great influence in many ways. In fact, quite substantial changes in many other variables have less effect on the total economy than do changes in these "influential variables" within the margin of error with which the latter can themselves be measured.

Non-Economic Input

I.3.18. Even for long-term economic forecasting, one needs inputs of a "non-economic" nature: information on social developments such as trends in married women working outside the home, and the effect of this on the birthrate, labour conditions, preferences for different types of work and for leisure time, trends in family patterns, and changes in "life style" more generally. Fortunately, this non-economic input is increasingly needed for shorter-term purposes as well. Many governments and political parties have started to question the social benefits of certain state activities in their present form (health services, education, etc.) because they are absorbing an ever-increasing part of their countries' resources. Until fairly recently, it was common to judge success in these fields by the resources allocated to them, but this is clearly unsatisfactory, indeed misleading; it is the effects of these allocations that have to be evaluated. If we want to know how healthy the people in a country are, we must look at its health statistics, not its health expenditures. Hence the growing interest in non-economic yardsticks over the past decade, particularly the so-called social indicators, which are now being developed in many countries, in the European Commission, and in the OECD. For if we want to plan expenditures aright, we must find means of establishing the relation between expenditure and the results of expenditure. We must make input-output tables for welfare.

I.3.19. This will not be easy, if only because there is not always agreement between the variations of the indicators which seek to represent people's "objective" conditions, and the way the latter are perceived subjectively. For instance, a recent survey about levels of satisfaction carried out for the Commission (see Trente Jours d'Europe, January 1974[1]) showed that the average standard of living in the EEC rose by about 20% between 1968 and 1973, while 25% of the respondents thought they were worse off than five years ago, and 33% declared that they had noticed no change in their situation. Two alternative interpretations are possible: 1) that the 58% who declared "worse off" or "no change" did enjoy an actual increase in their standard of living, which was offset by some hidden deterioration in other components of their welfare; and 2) that at least part of the discrepancy between perception and reality is explainable in terms of the uneven character of the progress of the standard of living; namely that the rich got richer and the poor did not. In either case, this is an important example of the sort of social information which should be available to policy-makers, since it provides an argument against taking the 'output' of public policies too literally, and neglecting their socio-psychological aspects.

I.3.20. The concept of social indicators must be handled with care. It grew up because researchers and social planners recognised that, on the one hand, direct measurements of social policy effects were very often impossible, and that, on the other, the available measures of total income, production and resource allocation were insufficient or even misleading. As indicators of the success of policies, in the present state of the art, a social indicator can only give an indirect measure of the social wellbeing of a population. For example, recognising on the one hand the impossibility of measuring "the health" of a population, and on the other the limited relevance of measuring health services expenditures, attempts are being made to construct indicators based on average lifetime/mortality, numbers of visits to doctors, days spent in hospital, and so on.

So far, there is no generally accepted idea about what social indicators are, and it is interesting that one publication which at present holds international attention, the OECD's "Social Indicators", is subtitled, more correctly, "List of Social Concerns Common to Most

(1) Published by the Paris Information Office of the Commission of the European Communities.

Member Countries".[1] But social indicators are conceivable, and Europe Plus Thirty should certainly play its part in identifying them and developing their use.

I.3.21. In the very difficult forecasting that concerns non-economic aspects of society, experimental social innovation deserves special consideration. Controlled social innovation programmes, set up according to the rules of experiment design known from the physical and biological sciences, are rare, some would say impossible. During the sixties a few experimental social programmes, or something very near, were conducted in the U.S. on negative income tax, family planning, different types of housing subsidies, etc. In Europe the OECD has started a programme concerning "innovation in the service sector" which comes close to experimental innovation.

I.3.22. Just as nature often sets up different situations which natural scientists can observe and compare ("de facto experiments"), so political events, or history, often set up different social situations which can be studied in the same way. For instance: in Britain the telephone service is state-owned, the pubs are owned by the brewers, and domestic water is paid for by a fixed local property tax. But there is one town where the telephone system is privately owned, one town where the pubs belonged for decades to the state, and one town where domestic water is metered. If anybody wanted to investigate the social or economic effects of those alternative innovations in that country, historical accident gives him his "de facto experiment". And there are hundreds of such situations throughout the Community, waiting to be identified and examined.

I.3.23. The countries of the Community which have different systems for this or that, themselves constitute a web of de facto social innovation: each has evolved its own pattern of social service, health service, education, even foreign policy. In the 1950's the advantages of early intervention in psychiatry were demonstrated in the Netherlands at the same time as some mental hospitals in Britain were experimenting with "open" (unlocked) wards. Both experiments yielded results, and the policies have been adopted elsewhere. In the 1960's Denmark made an intensive effort to provide better and more decentralised services (including social and occupational training) for the

(1) OECD, Paris 1973.

mentally handicapped. Others watched, it worked, lessons were learned. The Community itself is, after all, one vast and unprecedented social experiment.

External Relations

I.3.24. Europe Plus Thirty will have to operate in the greatest possible knowledge of global trends. At present much data is lacking, or too unsystematic and unreliable for forecasting.

Europe Plus Thirty will have to enter into working arrangements with the most relevant institutions to get the world perspective indispensable for assessing European prospects. The institutions are listed at Annex 1, pp 31-35. It is clear that forecasts concerning the Community have to contain assumptions about what will happen, or may happen, or cannot happen, in the rest of the world. These assumptions must be explicit.

The question will arise again and again how these assumptions are to be made. Other people's figures and forecasts should be used where possible. Where not, Europe Plus Thirty will have to obtain what figures it can and make its own forecasts for other parts of the world as well. The work of judging what to use will itself be considerable. For most continents, it will be a financial and man-year problem, but as regards Eastern Europe a diplomatic problem may exist as well, since the Soviet attitude to the European Community is still uncertain. If that is so, we recommend that every effort be made to solve it; forecasts about our part of Europe have to be related to the best available forecasts about the other part. In many things Western Europe does, it is as strongly conditioned by the giant beyond the rivers as it is by the giant beyond the sea, and in some, more.

I.3.25. Many of the Community countries are now, even in the higher reaches of politics and administration, extremely poorly informed about the rest of the world. This is a general fact, not specially related to forecasting. But in order to avoid suffering from the general insularity it will be necessary for Europe Plus Thirty to scan one of the major world monitoring reports, perhaps the Summary of World Broadcasts produced, about 100 pages a day, by the BBC.

Methodology

Available Methods

I.3.26. If inputs are to forecasting as a farm is to a hot dinner, methods are as kitchen utensils: indispensable, but largely interchangeable. Good cooks and good forecasters can do great things with simple tools provided the right ingredients are available, whereas even the most sophisticated tools are of little use in the hands of the inexperienced, or in the absence of edible materials. In short, it is the way in which the available methods are used that counts. In both cases seemingly minor mistakes are sufficient to make the end results unpalatable. But here the analogy ends, since errors in a kitchen result at worst in indigestion while errors in forecasting may be more serious. And whereas cooking confidently aims at eliminating our hunger, no amount of forecasting will ever eliminate our uncertainty about the future. It can only help us to anticipate future developments, and to reduce our uncertainty about them.

I.3.27. However sophisticated forecasting methods may appear, underlying them are certain simple heuristic notions, such as that processes can be explained in terms of simplified structures, that there may be causal mechanisms acting between different parts of the structure, and that all these have a certain continuity of time and space. The use of these notions permits generalisations and theories to be made. Knowing this, one can cut away much of the confusion and mystique surrounding forecasting methods, and more readily judge their merits and limitations.

I.3.28. Most of the methods described in this chapter have been developed for industrial or commercial short or medium-term forecasting, and were derived from the methods of the natural and engineering sciences, where the characteristics of the systems under observation naturally make a systematic quantitative approach most likely to be successful. Long-term forecasting has tended until recently to be more visionary, consisting mainly of literary images of utopian or catastrophic futures; many kinds of professionals are now searching for better ways of probing the distant future and of improving the discussion about it. Most long-term forecasting is concerned with the identification

and clarification of broad trends and options, since the constraints upon long-term choices are less sharply defined and understood than those on short-term ones. Long-term trends conversely are more open to our influence. Although this implies a greater freedom of choice, the ramifications of any major long-term decisions are likely to be more widely felt, and to have implications for a far greater number of policy areas. A worthwhile long-term forecast has therefore to be wide-ranging and complex, and to involve the joint expertise of many different disciplines; long-term forecasting of a single trend, or within a single sector or nation, is of little value.

I.3.29. The various forecasting techniques can be usefully categorised by the following three purposes they serve:

(a) to combine and to carry forward quantitatively or quasi-quantitatively expressed knowledge of the past and the present;

(b) to help to imagine the future, or a future, or futures, by developing hypotheses;

(c) to help determine what might or must be done, now and later, to make things go the way we want.

In what follows we use the portmanteau words (a) projection, (b) image creation, and (c) policy analysis. All three can and should be used in defining both cones described in the General Introduction, though projection serves more for the definition of the goal-choice cone, and policy analysis for the definition of the means-choice cone.

I.3.30. In the pages which follow (see boxes), we describe a number of methods which have proved or which promise to be of use in forecasting and related activities. Their theoretical legitimacy and their practical utility vary greatly. This is one reason why we present these descriptions with considerable hesitation: there is no correlation between the "value" of any method and the amount of paper we use to describe it. Our second reason to be hesitant is that the very idea of long-term forecasting has met with rather strongly polarised responses, even in the scientific world. In our opinion, long-term forecasting has been either rejected too flatly or swallowed too whole, by too many people. Therefore, our description of forecasting methods faces - like forecasting itself - a Scylla and Charybdis situation: on the one hand, it may over-impress people and make them

expect too much from forecasting; on the other hand, because of the extreme briefness of most of our descriptions, it is all too easy to find fault with them. We are not even certain that all can be regarded as forecasting methods; that is why we called them "of use in forecasting and related activities".

With these reservations, then, let us turn to the description of these "kitchen utensils". It will, after all, give an idea of the variety of approaches, and if it removes the false impression that gaming with a complex computer model is the very essence of forecasting, it will serve one purpose. As we see it, and describe it later on, forecasting is an interdisciplinary team effort making a flexible use of the great variety of "utensils" available.

The presentation here roughly corresponds to an increasing level of sophistication, moving from straightforward graphical and intuitive methods to those which require more data input and more complex manipulation. The kind of forecasting each serves best (i.e. projection, image creation, or policy analysis, as we described them above) is mentioned in each case.

'SIMPLE METHODS'

Single-Variable Extrapolation (Projection)

I.3.31. This consists of the extrapolation into the future of a particular variable from a table of historical data. The data are usually displayed graphically and the curve formed from the points is extended into the 'future'. This may be done by eye or with the aid of statistical techniques, which allow the best 'fit' to the historical data to be found, given the general shape of the curve (e.g. linear, logistic, exponential).

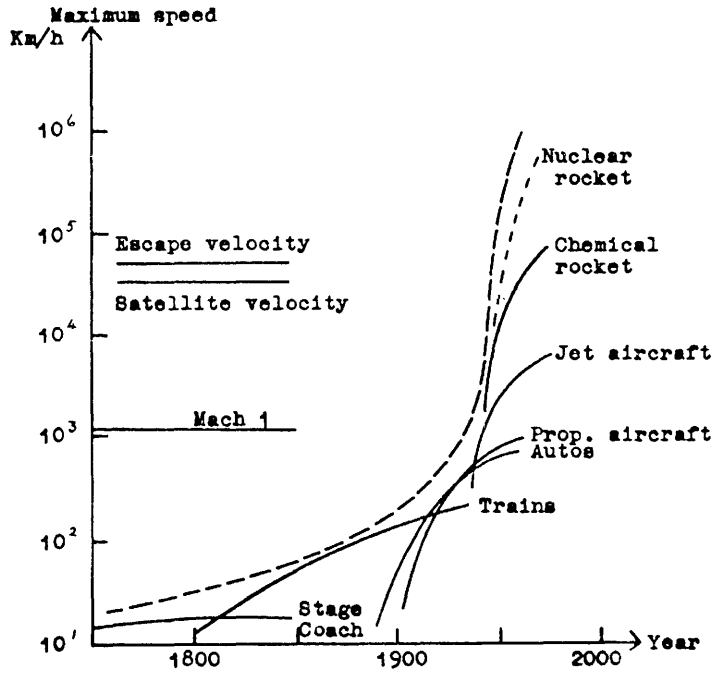
Extrapolation is widely used in many fields. Its use for prediction must assume that the mechanisms underlying observed historical trends will continue undisturbed. We discuss the naivete of this assumption in our General Introduction. It is of no direct use for long-term forecasting (where mechanisms are usually expected to change), but it can, and should, provide a preliminary basis for discussion.

Envelope Curves (Projection)

I.3.32. These are used to forecast possible future trends for a given variable (usually technological), from time series data. The method is based on the observation that a technology is often replaced by a 'superior' technology when the first begins to show diminishing returns for further improvement in some critical parameter, generally money. The data for each successive technology are plotted against time, giving a family of overlapping curves from which the 'envelope curve' - tangential to and connecting the family of curves - is drawn.

The usual example[1] is in forecasting transportation speeds; a set of curves is drawn representing the increase in maximum speed over time for horses, cars, trains, aircraft, etc., as shown, for illustrative purposes only.

(1) Erich Jantsch: Technological Forecasting in Perspective, OECD, 1967



Generally, however, one expects the envelope to be a logistic curve ('S' shaped), similar to those representing individual techniques. The method has been used to estimate the maximum performance from a given class of technologies.

Analysis by Precursive Events (Projection)

I.3.33. The idea here is to forecast a particular technological or social trend from time series data of past developments whose behaviour is thought to be analagous. The method has been used to forecast developments in racing cars and aircraft, and to forecast the saturation of markets for various goods. The maximum speed of transport aircraft has been found to increase in a way similar to that previously observed for military aircraft. Crime trends, strange as that may seem, have been forecast in a similar way, e.g. Europe following the United States. The assumption that two phenomena will follow 'parallel' paths of development, one following the other after a fixed time, may be justified if there is a causal relationship between them or if their progress has a common cause.

'INTUITIVE' METHODS

Scenarios (Image Creation and Projection)

I.3.34. Scenario writing describes, in words, possible future events and the forces giving rise to them.

It is in universal use wherever forecasting is attempted, and constitutes the main vehicle for the application of human intelligence to the problem of the future.

Delphi (Image Creation and Projection)

I.3.35. Unhappily named after the Delphic oracle, this is a technique for obtaining from a group of individuals a consensus on some topic or event, usually a forecast when an event will occur or (to help assess R & D priorities) when a scientific breakthrough will be realisable. A questionnaire is circulated to experts asking for estimates of when, for example, a given technological development will occur. The replies are analysed, the experts are informed of the "spread" of estimated dates and of the arguments put forward by the other participants, and are invited to revise their estimates. The process is repeated several times.

Originally developed at the Rand Corporation, Delphi has been extensively used by industrial bodies to forecast technical change. It is a very popular method in Japan. The advantages claimed over viva voce discussion are that social distortions arising from differences in status and personality are eliminated; that is to say, people are not cowed by a powerful person or talked down by a garrulous one. In practice it does produce some shift in people's estimates towards the middle, but this would only be valuable if it could be established that the truth commonly lay near the middle and, if it could, the second and subsequent rounds of a Delphi would be unnecessary in any case.

Brainstorming (Image Creation)

I.3.36. This is a way of obtaining new insights into a problem through intensive talking. Participants are asked to contribute ideas, even if they do not seem to be directly relevant: there is some evidence that more 'good' ideas are produced by this means than if only 'good' ideas are sought.(1) No attempt is made to criticise, discuss or explore the ideas which come up in the brainstorming session, since this might inhibit it, thus negating the purpose. Order can be introduced later.

Brainstorming has been used in industry and, to some extent, in military forecasting (NATO Long-Term Scientific Studies).

Morphology (Image Creation and Policy Analysis)

I.3.37. The word morphology ("study of forms") was first appropriated in 1942 to describe a particular way of exploring alternative strategies for achieving a given end. The issue to be explored is broken down into component elements, all possible states of each are identified, and finally all possible combinations of these states are listed and mapped and their relative performance estimated.

It has been used to study technological choices available in rocket construction. In one such study(2) eleven factors were identified, and between two and four alternatives were identified for each (e.g. gas, liquid or solid propellant: internal or external thrust generation) giving a total of over 25,000 possible combinations.

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(1) Jantsch E. op.cit.

(2) As above.

Morphology is mainly an attempt to structure thinking rather than a forecasting device. It is, for a system which can be broken down into quasi-independent components, a useful way of reducing the risk that viable alternatives will be overlooked.

SEMI-QUANTITATIVE ANALYTICAL METHODS

Relevance Tree (Policy Analysis)

I.3.38. This useful and important technique is best understood through an example. We quote here one devised by Beate Kohler and Renate Nagel.(1)

The tree (see figure) reads downwards. The purpose in this case is a large one: to find a good way to increase social welfare.

By a quantitative method outlined below, what might appear to be the optimum chain of alternatives from the present to the future goal can be determined. Our figure is incomplete in that (a) not all the possible alternatives are spelled out at each stage and (b) only the final chosen route in this hypothetical situation is indicated - the application of tax incentives to savings in order to encourage property formation as a basis for social welfare.

At each stage a quantitative value is worked out for each of the alternatives. This is done by means of a matrix in which the alternatives are matched against criteria. The criteria are given weightings (adding up to 1) and the alternatives 'significance numbers' (also adding up to 1). The criteria weightings relate to the long-term goal (i.e. they are 'vertical' with regard to the tree as a whole seen from a particular stage); the 'significance numbers' assess

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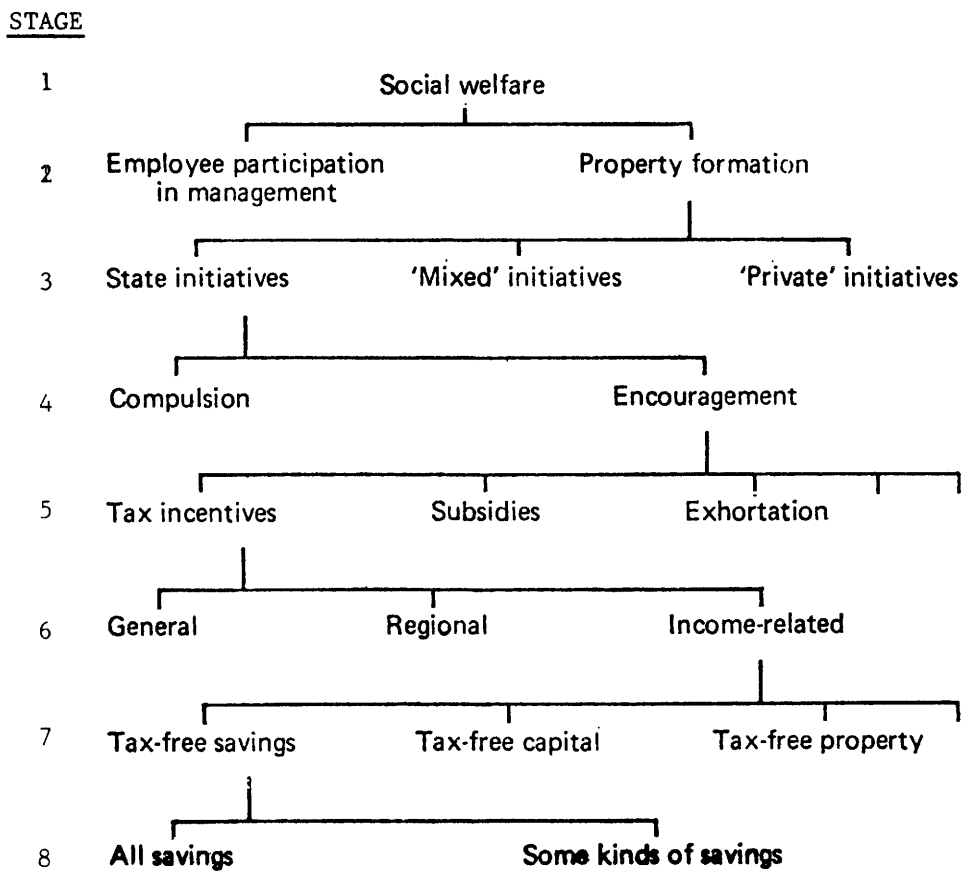
(1) (Die Zukunft Europas, Bildungswerk Europäische Politik, Cologne, 1968) as it is presented in And Now the Future, PEP, London, 1971.

the contribution of the alternatives to each criterion (i.e. they are 'horizontal' and refer only to one particular stage). The table gives a matrix for the seventh stage in the tree shown in the Figure. There is (not produced here) a corresponding matrix for each stage. The numerals in brackets are the products obtained by multiplying criteria weightings and significance numbers; the sum of these products gives the 'relevance number' of each alternative. In this example 'tax-free savings' wins easily.

If all the relevance numbers obtained at each stage in any chain of alternatives are multiplied together, the result is the 'relevance figure' for that chain. Comparisons of these figures allows conclusions to be drawn about which chain is best.

F I G U R E

An example of a relevance tree



Matrix for Stage 7 of Figure

Criteria	Criteria weighting	Alternatives: Tax-free savings	Tax-free capital	Tax-free property
Net property formation	0.4	0.7 (0.28)	0.2 (0.08	0.1 (0.04)
Social justice	0.3	0.6 (0.18)	0.2 (0.06)	0.2 (0.06)
Minimisation of loss of tax revenue	0.2	0.1 (0.02)	0.3 (0.06)	0.6 (0.12)
Minimisation of administrative costs	0.1	0.2 (0.02)	0.3 (0.03)	0.5 (0.05)
RELEVANCE NUMBER		0.50	0.23	0.27

Cost-Benefit Analysis (Policy Analysis)

I.3.39. The aim is to judge the desirability of a proposed project or policy. A time horizon is specified and all the consequences of the proposal that can be foreseen are listed. Costs and benefits are attached to each consequence, usually in monetary units, with discounting to present values, and total 'costs' and 'benefits' are compared.

This is of course the basic method used in private and public business to determine investments. It is also used by governments in assessing largescale technological projects. It permits systematic evaluation, although problems of subjectivity in excluding or including phenomena, and of weighting them properly, are formidable. In some studies using a simple checklist, no effort is made to weight phenomena. This avoids quantification problems, but provides no means of separating important and unimportant factors.

Planning, Programming and Budgeting System (PPBS) (Policy Analysis)

I 3.40. This is a large-scale planning system, evolved for the management and control of resource allocation. Like cost-benefit analysis, it is more correctly described as a planning technique than as a forecasting one, but it is closely allied. The planning phase of PPBS involves the definition of objectives and testing for incompatibilities. Various methods, such as trend extrapolation or mathematical modelling may be invoked here. Programming involves the sub-division of objectives and developments of strategies (programmes) for achieving these 'partial' objectives; these alternatives may each be subject to a cost-benefit analysis, and be represented by a relevance tree. Budgeting requires the allocation of resources according to the 'value' of each possible progamme.

PPBS was introduced in the USA in 1961 (and subsequently elsewhere) with a view to tying together all the work of the Department of Defence. The main result was intended to be a flexible five-year plan.

Empirical studies[1] on the effects of PPBS on Government planning are contradictory, but suggest that it may be useful in some areas of planning.

NETWORK METHODS (E.G. PERT: PROGRAMME EVALUATION AND REVIEW TECHNIQUE, AND CPM: CRITICAL PATH METHOD) (POLICY ANALYSIS)

I.3.41. Network techniques are used as a management tool for the control of complex projects, and provide yet another device for 'structured checking'. They are designed to facilitate the making and management of plans. A network of possible steps in all branches of a project or strategy is mapped to determine the critical 'path' on the basis of, e.g., lowest cost or least time. CPM involves the construction of 'flow charts' indicating alternative combinations of factors

(1) E. Jantsch op. cit.

required for the realisation of a project, and estimates are then made of the time required for these factors to be developed to the necessary degree. In this way possible bottle-necks are indicated and evidence is provided of where the greatest input of effort will be needed to complete the overall project. PERT is similar. It involves stochastic inputs, and is used to compute probabilities for the time or cost involved in a project. It was developed first for the Polaris missile system. Surveys of thirty-seven government financed R & D projects in the U.S. suggest that PERT offered no improvement in technical performance but reduced the probability of a cost or time overrun.(1)

Decision Theory (Policy Analysis)

I.3.42. Relevance trees, cost-benefit analysis, PPBS, PERT and CPM may all be considered as branches of 'decision theory'. Under this heading, however, we consider methods where explicit account is taken of external events. A set of policies is specified and the future events which are expected to influence the effectiveness of the choices, but over which the decision maker has no control, are listed and weighted by probability of occurrence. An 'optimum' (e.g. a least cost) solution which gives an acceptable probability of attaining the overall goal is sought. In Risk Analysis, probability distributions are used rather than 'absolute' probabilities to give guidelines for an optimum pattern of strategies.

Goal Setting and Goal Weighting (Policy Analysis)

I.3.43. Goal setting is sometimes used as part of a planning process. It makes the distinction between 'desirable' and 'achievable' goals. It may begin with a brainstorming session to collect elements for a goal hierarchy to be constructed with the help

(1) Analytical Methods in Government Science Policy Evaluation, OECD, 1972.

of cause-effect relationships. An alternative way of collecting meaningful goal elements is the "content analysis" of various programmatic documents. A "goal hierarchy"is evolved. The goals defined do not require information with respect to time or space, or magnitude: they are only "directional".

The weighting of the goals with respect to their relative importance within one level of the goal hierarchy can be carried out in a matrix by "pairwise comparison" or other suitable methods. If a goal system of higher order is available, to which the goal system considered belongs as a subsystem, then the goals of the superior system should be used for the weighting process. The relative importance of the goals is determined by a subjective value judgement and indicated with the help of a cardinal scale. Summing up these numerical values for any one line of the matrix leads to relevance figures which then are normalized and as such represent the percentage distribution of the overall weight among the goals at one level of the hierarchy. Methods are available to take into consideration the interdependence between the goals.

A goal system can be made operational by assigning suitable indicators to each goal element located on the highest level of the goal hierarchy. Their quality as measuring devices for determining the degree of goal achievement produced by alternative courses of action is taken into consideration by a separate weighting factor. (See note on Conflict Analysis, below).

Value Analysis (Policy Analysis)

I.3.44. Value Analysis has been developed out of decision theory. It is the most general case of a cost-benefit analysis, since it allows various cost criteria to be used during one specific valuation within one goal hierarchy.

It aims to allow one to add up the value of apples, trees and hospitals, since the measuring scale is "dimensionless". The "value" of the state of a system as judged by an individual is quantitatively weighted on a subjective basis. Full goal achievement is given a value of 1. The contribution of a project or course of action which aims to improve the state of a system is then measured on the value scale, and the sum total of all weighted arguments for or against it is derived. The derived value describes the degree of improvement of the system under consideration after the action has been completed. A goal hierarchy is needed to make a value determination. Indicators in time series are needed for the conversion of objective information to subjective value as seen by the person making the valuation. Utility functions are used to formalise this conversion and make it explicit. These utility functions are selected or constructed by the person undertaking the analysis. In this way the different values of interest groups in judging a certain action or situation may be made "explicit".

Value analysis allows one to determine the relative merits of alternative courses of action from the different view points of various interest groups or persons, and to measure the expected effects of a project on a system over longer time periods. (See note on Conflict Analysis below).

Conflict Analysis (Policy Analysis)

I.3.45. Conflicts existing or to be expected among individuals, interest groups, nations, etc., can be described, measured and ranked with the help of formal goal analysis. Conflicts arise when there are differences in goal structures and/or goal priorities, especially where the latter are strongly influenced by time. By measuring the degree of disharmony or incompatibility between any two goals (by "pairwise comparison") and multiplying this factor by the difference of their respective weights, one obtains a "conflict factor" indicating the magnitude of a potential conflict between the adherents of different goal systems. These conflicts can be ranked for any one point in time, provided that the weights

of the goals are given as functions of time.

Conflict analysis can also be extended to the indicator level and thus will produce detailed information on conflicts with respect to the target dates or sizes of individual goals.

If such an analysis is carried further, one can investigate the degree to which these conflicts might be reduced or eliminated by suitable courses of action.

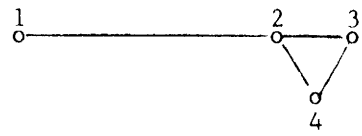
Note: the last three methods listed, Goal Setting and Weighting, Value Analysis, and Conflict Analysis, must obviously be used with extreme caution, since they all rest on assumptions about what other people think. This is at best a risky procedure, and at worst may lead to damaging delusions.

Graph Theory (Projection and Policy Analysis)

I.3.46. Graph theory is designed to improve understanding of the structure and mechanism of complex systems. It is really more of an element in many forecasting techniques than a forecasting technique in itself. A diagram is drawn indicating interactions between parts of a system; lines may be arrowed to indicate direction of interaction (directed graphs). The graph may be represented by a matrix which can reveal certain features of the system, e.g. the number of linkages, whether elements are related indirectly, and other general features and patterns.

In some respects, the advantages claimed are similar to those of computer models, i.e. that complex chains of interactions, unlike simple two-element interactions, cannot be grasped intuitively. However, quantification is not carried to the same extent, so only general features of the system are obtained as output. It has applications, for example, in sociology to communication networks and "cliques". A trivial example of the latter is shown below:(1)

(1) M.A. Beauchamp: Elements of Mathematical Sociology, New York, Random House, 1970.



People represented by points 2, 3 and 4 form a "clique", while 1 and 2 are friends but do not share a common friend. Here visual identification is easy, but in examples which may involve many people, Boolean matrix algebra provides a helpful aid.

Markov Chains (Projection)

I.3.47. A matrix is drawn up to represent the probability of transition of individual objects or persons from one class to another, usually on the basis of past data. For example, individual people are assigned to income groups, and data used to indicate how the number of individuals in each group has changed over time. This permits the calculation of the 'transition matrix' which shows the fraction of those individuals formerly in each income group which has moved to each of the other income groups. This matrix can then be applied to the latest data set to forecast future distributions, assuming that the forces historically governing changes in income distribution (which need not be specified) remain the same.

Game Theory (Projection and Policy Analysis)

I.3.48. Game theory is concerned with decision-making where alternatives are influenced by the actions of others. A set of possible strategies for the 'players' is devised, and the optimum strategy' for one player, given the alternatives available to the other, is calculated.

A simple (and well-known) example is the 'prisoners dilemma'.(1) Two prisoners are separated and told by their captors that they will get a 10 year sentence if they both confess and 5 if neither

(1) M.A. Beauchamp: op. cit.

confesses; if one confesses and the other does not, the former will get 5 years and the latter 20. What should each do ?

		No. 2	
		Confess	Not Confess
No. 1	Confess	(-10, -10	-5, -20)
	Not Confess	(-20, - 5	-5, - 5)

The first number in each pair refers to prisoner No.1, the second to prisoner No.2. According to game theory, each calculates his 'expected' or 'average' return from each strategy. For each prisoner confession means 10 or 5 years; non-confession means 20 or 5. Thus both reduce their 'expected' sentence by confessing, which represents the best strategy for each individually according to the theory, even though this means that each gets 10 years instead of the 5 which would result from neither confessing.

This is in fact a weak example, since trust is not incorporated. Moreover, numbers are often difficult to determine in more realistic examples, particularly where the object is to forecas behaviour rather than devise a strategy; it is not always clear what people want to maximise.

Game theory has been widely experimented with, notably, by the Rand Corporation in America , for military strategy and politics. Some hold that American military failures in the Vietnam War were partly due to excessive reliance on this method, and it was certainly much used in the 1960's in the unsuccessful attempt to devise ways of halting the arms race without seeking agreement with the Soviet Union. It is apparently no longer widely used by sociologists, mainly for the reasons given above, and its limitations are indeed obvious.

Cross-Impact (Projection and Policy Analysis)

I.3.49. Cross-Impact methods are designed to illustrate the effects of policies or future events on various related phenomena.

A matrix is constructed, with rows and columns labelled with variables related to a particular theme, e.g. transport. The matrix element shows the magnitude of the impact of each one variable on each other. The number will be positive, negative or zero according to whether the first variable increases, decreases or doesn't affect the other. A Delphi survey is often used to obtain values for the matrix elements representing the 'cross-impacts'.

The technique has been adapted to enable mathematical calculations to be carried out on a computer showing possible future developments of the variables selected. The effects of governmental or corporate policies can be included at the outset or during the computer run.

The technique has been applied to the 'Minuteman' missile.(1) It suggested a 73% probability of deployment, as opposed to the 20% probability obtained in a Delphi survey of the same experts who provided the cross-impact values. (Minuteman was, of course, deployed).

'QUANTITATIVE' METHODS

Input-Output (Projection)

I.3.50. This method is used to represent the dependence of different elements in a system on one another and to represent transfers between them. The form of representation is similar to that used in cross-impact; a matrix is set up whose elements represent (traditionally) the value of purchases of each industry or sector from each other, per unit value of output produced. This relates final demand

(1) T.J. Gordon & H. Hayward: Initial Experiments with the Cross-impact Matrix Method of forecasting Futures, Vol.I. no. 2. pp.100-116.

to final output of each industry or sector. The technique was originally static, but several attempts have been made to dynamise it. The matrix elements can be made time-dependent to permit representation of, for example, technical change.

The method is widely used in economics, not only as an accounting framework, but also to evaluate the consequences of changes in final demand (e.g. disarmament) or of bottlenecks in the economy. Successful attempts have also been made to let an input-output model be part of a more general macro-economic model.

Regression Analysis (Projection)

I.3.51. This is a statistical technique used to verify hypotheses about relations between variables which may be of any nature (economic, social, etc.) and to estimate the magnitude of the coefficients which appear in the specification of these relations. The statistical data required may be either time series or data referring to a set of persons, firms, etc., at a given moment or during a given period. Such relations often play a very important role in forecasting models.

Multivariate Analysis (Projection)

I.3.52. This is used to determine, from data, the best variables with which to represent a given system. The method involves the identification of mathematical quantities which may not correspond to real features of a system but provide a concise description of it; i.e. 'canonical factors' or 'principal components' from a set of data, enabling a system to be parameterised with the smallest number of 'orthogonal' variables or associations.

Multivariate techniques are used in ecology, sociology (particularly in the analysis of survey questionnaires) and economics.

ANALYTIC SOLUTIONS

Mathematical Models (Projection)

I.3.53. These aim to represent mathematically the interactions between factors in a system, usually with a view to exploring their future relationships. The essential difference between these methods and those described above is that they have a greater theoretical content.

A mathematical representation of certain relevant features of a system is sought which is simple enough to be tractable algebraically. 'Realism' is often sacrificed for this end, in the belief that manipulation of ideas is often more fruitful if they are simplified at a more abstract level. The value of this approach is that it permits the dependence of the solution on the different contributing factors to be easily seen, and so also permits concepts and theories to be extracted more easily.

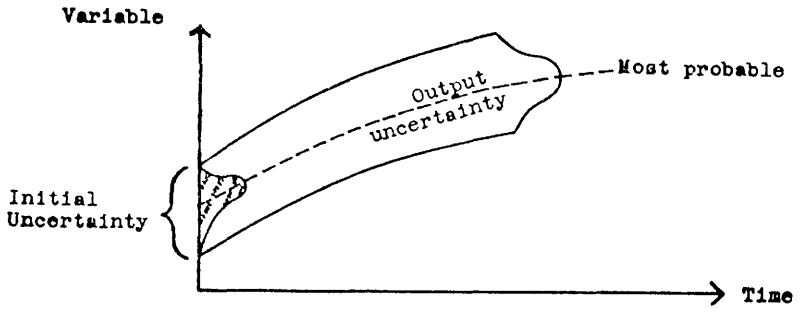
The method is used extensively in economics and ecology (e.g. predator-prey models). It enables ideas to be explored quickly, cheaply, and (if one understands the mathematics), clearly.

Computer Solutions (Projection)

I.3.54. Simulation models are usually constructed for exploratory purposes where the theories are rather weak or the calculations are highly complex, so that simple algebraic solutions cannot be obtained. Models may be deterministic, contain optimising or other control routines, or be stochastic. Relationships between variables are specified individually, either algebraically or directly into a computer simulation language, and the consequences of their interactions, which may have time delays, are projected.

Stochastic Methods (Projection)

I.3.55. Stochastic methods include Monte Carlo simulation, i.e. randomly selecting values for parameters from probability distributions. In this approach, explicit account is taken of uncertainty in the input data; the model may be run for several hundred combinations of values for input variables, a value for each such variable being selected at random within its range of uncertainty for each run. In this way a range of values for the output variables is obtained which provides a measure of their uncertainty.



Gaming Models (Project, Image Forming)

I.3.56. These models are computer simulations which contain an explicit recognition of the role of human choice. These models usually include a causal simulation model, in a game theory situation. They attempt to separate out 'intangible' factors which are given values in the course of the computer run by an operator (or operators who may have conflicting goals). Thus, 'policy decisions' can be directly inserted to influence the observed evolution of the model. This method is most useful in situations where the separation of subjective and objective features of a system is possible.

'Optimization'Techniques (Projection and Policy Analysis)

I.3.57. These include linear programming, non-linear programming, quadratic programming, calculus of variations, optimal control and many others.

These methods are employed in an effort to determine the best method of reaching an explicitly defined goal; they belong to the second cone described in I.1., the cone of means-choice, with its base now and its apex in the future, at the already selected goal.

A mathematical 'objective function' whose maximum or minimum value represents a desirable situation is formulated and, subject to specified constraints, the 'policy' needed to obtain the desired goal is calculated. An example is the Bariloche world model, where human life expectancy is the quantity to be maximised subject to various economic constraints. The model suggests how available resources should be allocated between various sectors of the economy to achieve this goal.

These methods were generally developed for operations research and widely used in an industrial context. They provide a useful method when model, objectives and constraints can be stated realistically.

A peripheral research proposal

I.3.58. We touched in our General Introduction on the long history of forecasting. We have still available to us thousands of forecasts made in the West over the last two thousand five hundred years, and in the East over the last four thousand years, about events that have long since either happened or failed to happen. That until the last hundred they were mainly qualitative and not quantitative should not worry us; they were still forecasts. But this wealth of historical material remains virtually unexamined. There

have been a few anecdotal anthologies of old forecasts; Yesterday's Tomorrows, by W.H.G. Armytage [1] is a notable one. In his L'Art de la Conjecture Bertrand de Jouvenel[2] analyses a few eighteenth and nineteenth century European forecasts, but only for example, not in the pursuit of general lessons. We think Europe Plus Thirty should do what it can to have these lessons pursued by stimulating certain historical research.

There might be one or more research programmes in which the writings of social philosophers, of statesmen, and of historians, were scanned to identify forecasts. They should seek to identify the method used in making each forecast, and should classify the forecasts into "good" and "bad", that is to say, whether the assertion identified as a forecast, with whatever qualification it carried, later turned out to be "the case". The lessons learned might be useful not only to Europe Plus Thirty, but to forecasters everywhere.

The State of the Art

I.3.59. Over the last two decades, as we have noted, increasing attention has been given to the problem of how to probe the future. Initially, this was attempted mainly by devising piecemeal a whole range of techniques, such as those we have described, some quantitative and others non-quantitative and not always strictly scientifically based, for the attack on specific problems. None of these has proved completely satisfactory or generally applicable. More recently, comprehensive but not always sophisticated attempts have been made through dynamic modelling, including methods which react with the policymaker.[3] It would be wrong to assume, however, that techniques are already in existence which could make Europe Plus Thirty immediately and universally effective. Nevertheless, the need for it is so overwhelmingly urgent that it would be wrong to wait until more adequate methods are perfected. We are certain, therefore, that Europe Plus Thirty should be established without delay, both to undertake long-term forecasts through the use of appropriate combinations of existing, admittedly imperfect techniques, and to develop and stimulate the development of larger dynamic models.

There is no royal route to the future for the Community. Incessant scouting and pathfinding remain indispensable.

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(1) Routledge, London 1968

(2) Paris 1958

(3) We describe one such reaction at Annex 2

I.3.60. Mathematical modelling has been most successful in the engineering sciences, for obvious reasons; with a man-made system more often than not the real system obeys the theory underlying the model. But, for instance, in the study of ecological processes, opportunities for satisfactory controlled experiment are rare, systems are often highly complicated and data difficult to gather. Ecological theories based on nutrient flows and on basic physical and chemical principles have been developed, and many field stations have been set up to examine, for instance, new crop strains or fertilisers. Nevertheless, ecological theory is mainly at an elementary level. Even in the physical sciences, many complex phenomena are only understood in an 'order of magnitude' approximation, even though the underlying elementary mechanisms are known to a high level of precision. For example, the critical temperature of a super-conductor, or the tensile properties of an alloy, are usually determined experimentally, not by calculation.

One would therefore expect the more quantitative forecasting methods to be more applicable to the physical or 'ponderable' component of any issue, and this is so; for example, computer simulation models are very useful in meteorological work, and probably also in certain aspects of forecasting in economics, resources (including energy), transport and communications.

I.3.61 Quantitative methods have a lesser use in other areas, but, for example, in agriculture and sociological studies, multivariate techniques (see p 29) are invaluable for data analysis. But otherwise, the scope of quantitative methods is limited in the social sciences. Fundamental questions such as how to define variables and scales and how to measure - and anticipate - changes in the complicated pattern of human preferences and relationships have not been solved, and may never be. Controlled experimentation is almost impossible. Different (and maybe contradictory) theories of society may be found equally valid to the extent that they can be tested, and may be equally widely advocated. Moreover, theories about society and society itself evolve together, whereas theories about the physical world are usually taken to be successive approximations to the way it has really been functioning all the time.

I.3.62. Yet a good understanding of social processes is essential to forecasting in almost all areas. Although many attempts at quantification have been made and certain short-term regular patterns of behaviour have been found to be reasonably predictable, "explaining" long-term processes is far more difficult. Under low information conditions, the estimation of a model's

coefficients becomes a problem in itself. Model validation is either difficult or impossible.

All this does not mean that the prospects of quantitative methods in social forecasting are hopeless. But it does mean that their scope is limited, and that semi-quantitative and qualitative methods still have to be extensively relied on.

I.3.63. Uncertainty in forecasting arises on the one hand from uncertainty in data and theory, and on the other from the many difficulties of manipulating them. Where data are few and theory is weak, no amount of sophistication can compensate, and modesty befits forecasting. A keen understanding of the plethora of implicit biases and sources of uncertainty in one's own forecast is vital, but exceedingly difficult to achieve. If only for that reason, Europe Plus Thirty should, wherever possible, expound its work to competent outside audiences on the one hand, and pay close attention to what is done elsewhere on the other (see Part IV below).

More about the forecasting process

I.3.64. An experienced forecasting team has at its disposal various methods which, as we noted, it will apply as a particular problem seems to warrant. The choice will depend, among other things, on the kind of issues and the purpose for which the forecast is intended. Any group of forecasters should develop ways of working together which make the best use of the available talent and information to meet the needs of the decision-makers in question, and to suit the intended forum of discussion. The methods sought ought to provide the right kind of communication across the specialist areas of reasearch within and outside a research team. If they do, that will reinforce two things: inter-disciplinary team work and "multi-disciplinary individuals". Often the difficulty of achieving the first has meant that most synthesis is left to be achieved by certain individuals, but this is not the best way to do it. In a forecasting unit with an integrative role, the work is best carried out by teams of "multi-disciplinary individuals", that is people expert in one field, but with the ability to perceive and understand the relevance of information from others. The importance of building up this particular skill cannot be over-emphasised.

I.3.65. Equally important is communication between forecasters, policy-makers and the public at large. By presenting an overview of the linkages between complex policy areas, by making sure that all important aspects are brought

out explicitly and clearly, by showing the conceivable consequences of different policies, and by many other means, it can help structure thinking and communication about alternative futures among all concerned. Long-term forecasting can be a form of mutual education by public conjecture and hypothesis.

I.3.66. Although a certain method may seem most appropriate to the analysis of a particular issue, its results may not satisfy the policy making process it is designed to serve. Urgency for information marks democratic government: politicians facing urgent problems cannot wait for comprehensive analyses to emerge. Almost by definition, many important issues are new in one or more ways and although they could, in principle, be "best" dealt with by a certain combination of methods, if that combination takes too long,it is useless. So the more simple and straightforward forecasting methods have so far tended to provide inputs to urgent policy questions, despite their acknowledged inadequacy. We hope that by devoting unprecedented attention to the rhythm of the decision cycle (which we consider below), Europe Plus Thirty will be able to go some way to putting this right. In the meantime, we note that a "better" forecast which arrives too late need not be entirely wasted; it can be checked against events and the lessons can be turned to account next time. So can the lessons learned from the "successes and failures" of everybody else's forecasts (which is why forecasts, perhaps more than anything else, ought to be published).

Europe Plus Thirty would be well placed to improve on existing methods and combinations of methods in forecasting, because it would be looking at all aspects of the life of a quarter of a billion people who are among the most "developed" in the world, because those people have a new, still rudimentary, form of common government, because it would be closely and directly related to the decision-making process of that government, and because this collection of attributes does not apply to any other forecasting agency in the world.

Using forecasting: the outputs

I.3.67. So much for the kitchen. We turn now to the table.

When discussing the use of forecasting, it is important to have a correct mental image of the subject, which is not one of a policy-maker rapidly turning the pages of a booklet containing forecasts. We would on the contrary adopt a systems view and regard a forecasting institute as a unit continuously interchanging information with its "customers" on a number of different levels. Such an intricate system cannot be described in a single paragraph; in fact, most of Part IV is devoted to a description of the

relationship as we see it for Europe Plus Thirty. In the rest of this chapter, we base ourselves mainly on the experience of nation states since that is, so far, the main experience which is relevant to the European Community.

The policy-making cycle

I.3.68. Let us start with a simplified, schematic, picture of the policy-making cycle. It does not correspond to any particular part of any particular power structure, and there are parts of particular power structures which do not resemble it at all. But we think most of them do resemble it, most of the time.

a) We will break into the cycle at a point where the public power concerned has a policy: the policy is being applied, is having some effect, and is not too much questioned. (There are moments like that, very brief ones.) Then defects in the policy begin to appear: it is not having the desired effect; or it is, but the effect itself begins to appear pointless or noxious. This ends the first phase.

b) So the organs of power enter the second phase of the cycle: consideration of policy change. This means, first of all, seeking alternative policies which promise to achieve the objectives of the former policy in a better way, or to achieve new, successor objectives instead. The search will take into account three kinds of evidence: 1) experience gained during the first phase, 2) the experience of others, if any who have been pursuing different policies (de facto social experiment) and 3) forecasting about the possible effects of various alternative new policies, (which will itself, of course, also take 1 and 2 into account). After this, the various policy options have to be evaluated, their costs and benefits have to be compared, and a choice has to be made. This does not mean that the policy maker will automatically follow the reasoning of his forecasters and policy analysts, because he also has to consider the immediate demands of the electorate who put him where he is, to say nothing of his own conscience and standards. The outcome of this phase of our idealised policy-making process is the selection (or confirmation) of one or several objectives expressed in dates and figures (Goal Choice Cone) and the formulation of plans of action to achieve them (Means Choice Cone).

c) The third and last phase of the policy cycle consists of putting whatever plan is adopted into action by the exercise of the political power appropriate to the social framework within which it is to operate (implementation).

This sketch of a decision-making process laid up in heaven is useful because it enables us to see that forecasting affects the cycle of policy-making in two of the three phases, and is affected by it in the third. Near the end of the first phase, when the defects of the current policy are beginning to appear, forecasts must already be at hand to explore the long-term future context in which new policies would take effect, to see if it may not undergo changes that would themselves affect the choice of a new policy.

I.3.69. In the second phase, forecasts have to be made of the costs and benefits of the alternative policies so as to reveal their positive and negative impacts. This aspect of forecasting is all the more important when it is carried out for a social and economic entity the size of the European Community, because the decisions that the EEC takes have multiple consequences, not only within the member countries, but also on other countries.

I.3.70. The third phase, that of policy implementation, affects forecasters, for as soon as they know the policy to be applied, they have to set up observations to check the accuracy of what they themselves have been saying about it. And on this we wish to enlarge.

We think that many of the failures of forecasting so far have been due to lack of contact between forecasters and policy-makers during and concerning the implementation of a particular policy, which is no doubt due to the correct conviction of both sides that the forecaster has nothing to do with the process of implementation itself: that is for executive government and belongs to elected politicians and, under them, administrators. But this does not mean the forecaster has nothing to learn from the implementation phase of the policy cycle. By definition, the implementation problems are the largest where the gap between plans and reality is greatest, and any forecaster who ignored the significance of this gap would be of little use to his fellow men.

I.3.71. Real-life examples are plentiful on the national level: ambitious building plans that were not realised (sometimes because the responsible

administration could not spend the money voted); plans to eliminate regional disparities that turned out to have all kind of consequences - except the expected and desired ones; agricultural and industrial reforms that ran aground because of various deadlocks; even (so far) the Community's own plans for economic and monetary union; and so on (energy) and so forth (transport). The mechanisms that play a part are numerous; they range from intrinsically ill-conceived plans to the influence of particular political leaders and the inertia or incompetence of administrative units. Any forecasting that ignored these difficulties would be "Weltfremd", and if anything is liable to be more dangerous than a "wrong" forecast, it is a "Weltfremd" forecast. Corrupt administration, powerful and eccentric political leaders, a stubborn and apparently "reactionary" regional public opinion, all these are part of the real world, and the real world is what forecasters are attempting to forecast about.

We must now return to the policy-making and forecasting cycle as a whole, and ask: what are the practical arrangements which might come closest to achieving this ideal cycle in the real and muddled world? To answer this question, we must consider the transfer of knowledge on two different levels: the political and administrative.

The political level

I.3.72. It is not enough for the policy-maker (whether for instance a national minister or a European Commissioner) to have by him people who are executing his current policy; so much is obvious. He must also have - and close by him - people whose job it is to help him sort out all the pressures towards change, and all the ways in which change can be considered. (Of the latter, the attempted rationality of forecasting is only one.) These people must have a carefully considered mix of professional and political backgrounds, and must be organised and placed in the structure in exactly the best way. What this means in practice is bound to depend to some extent on the politics and personality of the decision-maker. "People of the Left" commonly favour planning, and "people of the Right" commonly look askance at it, but there is no left/right division in attitudes to forecasting. This is another reason for keeping planning and forecasting separate in our minds.

I.3.73. In the governments of the member states, the central planning arrangements within the bureaucracy and the individuals who take part in them vary

widely in their ability to handle the "prospective approach" to social, technological, and political affairs, and in their ability to ensure that its fruits are available to the right minister at the right time. This is so not only from country to country, but also from ministry to ministry within the same country. The best are, as far as we can see, faultless, the worst might just as well not be there at all; it is indeed a wide spread. The OECD is just beginning a comparative study of government machinery among its member states, which will probably deal with this problem among others. We think the European Commission and Council should follow and contribute to that study, and perhaps conduct a parallel one of their own; it could be smaller in range, since the differences in structure (though not, as we have said, in efficiency) are less among the Community states than among the wider membership of OECD. On the other hand it would have to be more thorough, since it is, or should be, among the functions of national member bureaucracies to cooperate structurally with the Community bureaucracy.

If experience shows one thing, it is that without direct personal access of the forecaster to the decision-maker himself, the whole operation is bound to be accident prone. We make concrete proposals about this in Part IV below.

The administrative level

1.3.74. Whether they are European or national, complex administrations owe their very existence at least partly to the need to coordinate and condense an enormous flow of information, ideally so that details are taken care of at the appropriate levels on the way up while the essence is transmitted to the top. Necessary as this process is, it entails the possibility that important information may be suppressed or distorted, perhaps because it simply is not recognised as such, because it was nobody's job to do the cross-sectoral scanning which alone could have recognised it. In any case the information is bound to be delayed but, after all, that is better than if it were to remain unnoticed in a flood of trivia.

What can we learn from this? At least two things:

- Any administration must keep a close watch on how it filters information, and how long the transmission of information takes.
- The communication system between a forecasting instrument and the public power it serves should be designed so that:

  (1) information is exchanged at all relevant levels,

  (2) the links at each level are as short as possible,

  (3) the recipients and the producers of forecasts have direct access to each other at all these levels.

So much for the first aspect of a complex organisation: its multi-level structure.

I.3.75. Another, equally important, aspect is that national administrations have for centuries had to split up their activities - and hence their communications and planning procedures - either by departmentalisation or decentralisation, or by both. Long-term problems are now so wide-ranging and so interrelated that this traditional slicing of activities is becoming less and less satisfactory. Yet the tendency towards fragmentation still flourishes, paradoxically stimulating the need for integrated or indeed re-integrating forecasting while making it ever more difficult to convert its results into effective policies and plans. Fascinating examples can be found in almost any member country.

In one or two cases, a distinct improvement has been achieved by changing the degree of differentiation. For example, where certain broad tasks of national governmentahad come to be distributed over a large number of relatively autonomous ministries or directorates (having any number of overlaps), reorganisation into a smaller number of "big spenders" has substantially improved the situation.

I.3.76. From a forecasting point of view, countries characterised by strong centralisation appear to be in a favourable position, at least at first sight. The difficulties of collecting timely, consistent and accurate data, of using forecasting in decision-making and planning, and of effectively implementing plans, seem here less formidable. Conversely, if the different parts of a country have a constitutionally guaranteed autonomy, even the collection of basic data may demand excessive effort and cost.

I.3.77. On the other hand, strong centralisation of a country may also mean strong ministries or directorates; in some lights it looks like a choice between horizontal and vertical dislocation. Indeed, some

countries manage to combine pronounced decentralisation with strong specialist ministries. In either case, the coordination of forecasting, planning and the implementation of plans, may present almost insurmountable problems. To be sure, these problems have not gone unnoticed, and a variety of attempts has been made to overcome them (project groups for governmental and administrative reforms, commissions for social and economic change, task forces assembled to attack the problems "as a whole", and so on and so forth).

I.3.78. When the European Community was set up in the 1950's and 60's there could be no question of its resembling a centralised state; it had of course to be far more regionalised than even its most regionalised member. To horizontal disgregation, which was inevitable, was added vertical disgregation (which was perhaps not so necessary); ministerial compartmentalisation was so well established in the member countries that it was instantly reflected in the structure of the Commission.

This does not imply that the prospects for forecasting at this level are hopeless. On the contrary, as we argued in Chapter I.1., precisely because of its long-term integrative character, Europe Plus Thirty may - provided it is granted enough time and weight - help to bring about a greater sense of direction and a better coordination of planning.

I.3.79. It is clear from all this that European Communities forecasting will have to be done in a situation characterised by powerful cross-currents. Because of its long-term, integrating nature, it may help to reduce the differences between what seems to be necessary and what seems to be achievable, but only if it has been designed so as to take account of the perils among which it has to operate.

Conclusion

I.3.80. The European Community is very different from any individual country and the long-term integrated forecasting instrument it needs will be quite different from any other forecasting unit in existence. It will have a greater variety of contacts and clients, and its modes of operation will probably be different. It will not do any significant

data-collection itself. It will have several clients; we discuss this in Part IV. It will have to serve the Commission, to assist its planners in developing and evaluating programmes of action, and to inform both the public (including all kinds of groupings) and the Parliaments of the Community and its member countries.

As we pointed out at the end of Chapter I.1., the degree of "autonomous self-coordination" between the many Directorates-General of the Commission is limited. There is thus a risk that Europe Plus Thirty will be confronted with the heterogeneous forecasting requirements of the Commission's individual departments, which could, if it were careless or weak, lead to a fragmentation of its own activities. The best way to avoid this, and to ensure that the forecasting results will be useful for practical action, is that those responsible for planning should take part in the preceding problem analysis, data evaluation and discussion on the criteria for relevance, so that they can see by direct experience how everything hangs together.

The difficulties of providing the Communities with effective forecasting are formidable, but not unsurmountable. We have discussed them at length because Europe Plus Thirty must be set up and work in full recognition of their existence.

We are convinced that the difficulties have to be surmounted and that the work has to be done. There is really no choice. The question is whether or not the European Communities make the best possible use of the available knowledge, combined with the intuition, the gift for hypothesis, the imagination and all other faculties at man's disposal, to prepare for the future.

This is what we call Integrated Forecasting, and we shall attempt to describe it in the next chapter.

Meanwhile, the answer is obvious.

4. INTEGRATING FORECASTING AT THE LEVEL OF THE EUROPEAN COMMUNITIES

Introduction

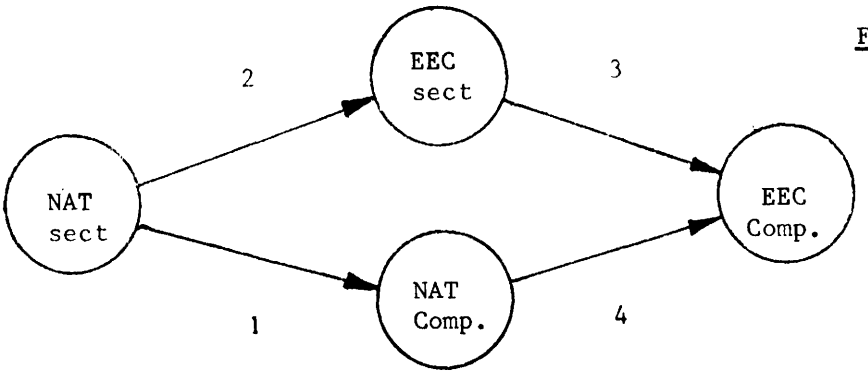
I.4.1. In the last chapter we discoursed in general about the inputs of forecasting, about its methodology, and about its integration with the planning and executive process. We now consider the lights by which these could be put together to provide what a particular public power, the European Communities, needs in 1976 and onwards, and shall try to suggest the governing purposes and procedures which might be adopted for this task.

Before addressing ourselves to the more difficult parts of this task, let us briefly describe the first most obvious step towards integrated forecasting that a European forecasting unit might take: the integration of existing sectoral and national forecasts.

A first step towards integrating forecasting

I.4.2. Since the European Community is made up of member states that are doing forecasting and connected studies for public policy purposes (although mainly for the short and medium term), it appears that the first step towards integrating Community-wide forecasting could be the process depicted in Figure 1,

FIGURE 1



which provides two routes from national sectoral forecasts to Community comprehensive forecasts: via Community sectoral forecasts and via national

national comprehensive forecasts. Since the Community has its own sectoral policies, is already a Common Market, and intends in due course to become an Economic Union, the upper route, via Community sectoral forecasts, is clearly the more useful for its purposes. But the lower route, via national comprehensive forecasts should also be followed, if manpower is available, for two reasons. Firstly, it would provide a check on the upper route and, secondly, it would parallel the main route by which, for the time being, Europe Plus Thirty could obtain comprehensive forecasts about the world outside the Community, namely, by the integration of national aggregates.

A. National scale: from sectoral to comprehensive forecasts

I.4.3. Every national comprehensive forecast represents a convergence of three partial forecasts, each deriving from a particular "resource" or group of "resources": people, goods and services,and geographical space, and each setting out, for a nearer or further time horizon, what might be the future situation on:

a) The demographic aspect: the number of total inhabitants and of the active population, broken down by multiple criteria: age, sex, education level, employment sector, socio-professional class etc.

b) The socio-economic aspect: production, imports, internal and external use of national production, social parameters, calculated on the basis of the demographic data and on hypotheses about the behaviour of economic and social agents, and distinguishing between different industrial sectors, public versus private enterprises, etc.

c) The geographical aspect: the distribution of the above variables according to regional and type-of-settlement criteria (rural versus urban, metropolitan versus small and medium cities, city centre versus suburb, etc.).

I.4.4. The techniques of this integration of sectoral forecasts into a national framework are not uniformly advanced. It seems to us that aspects (a) and (b) are adequately articulated, and so are aspects (a) and (c), but we have to admit that we do not know very well how to integrate aspects (b) and (c), that is: to foresee either the socio-economic implications of different spatial alternatives, or the spatial implications of socio-economic alternatives.

Nevertheless, we feel intuitively that the two aspects have strong mutual influences which it would be good to unravel in advance, rather than contenting oneself with ex post facto perceptions. Most of the necessary work will have to be done at national level, and Europe Plus Thirty could and should encourage and help coordinate this.

B. From National to EEC scale: Sectoral Forecasts

I.4.5. To make this step, Community-wide standardisation of data is urgently needed. This sectoral integration to Community level would present no further difficulty if all the resources concerned stayed put inside each member country; in that case it would be enough to add up all the national figures to arrive at a European total. Unfortunately for forecasters, the stay-put case is not the general one.

I.4.6. As we shall see in Part II, Chapter 3, forecasting migration is the most fragile part of demographic forecasting. This difficulty is accentuated by the principle of free movement of persons inside the EEC, and by the possibility that heavily labour-exporting countries, like Turkey, may sooner or later become members of the Community. That is one important source of incompatibility among national forecasts and it consequently furnishes an argument in favour of trying to construct a Community-scale forecast which would, in effect, apply a coherence test to the national forecasts.

I.4.7. The geographical aspects seem at first sight simpler, since land does not move (though the juridical ownership of it does), and since the internal frontiers of the Community are, in the absence of territorial claims, stable. So one might conclude that totting up national forecasts of land use (particularly for urbanisation) would necessarily lead to a coherent total at the European level. But there are two exceptions to this rule. The first follows from the existence of migratory movements - among the active population like workers in frontier zones, and among the inactive, like retired people - for which the summation of national forecasts might come to a non-zero result. The second exception concerns the resources one might call common, or not appropriated, like stocks of fish beyond national zones, the atmosphere, and international waterways. These resources present a problem in that they could give rise to claims or uses by two or more member states

which are mutually incompatible. Since they are not yet generally the object of explicit forecasting, this difficulty has not yet been clearly felt, but there is no doubt that here too the summation of national forecasts need not necessarily lead to a correct Community forecast. That is the second field in which the application of a coherence test would be justified.

I.4.8. As regards goods and services, it could be that the sum of the exports to its Community partners foreseen by each member differs from the sum of the foreseen imports over all member states. This risk has been increased by the oil crisis, which could lead the West European nations to "export their deficits" by reducing purchases and boosting sales. Now it is clear that the sum of these courses of action would lead to results which are incompatible with the expectations of the separate countries. The problem has certainly not gone unobserved, but its solution is hindered by the fact that the national foreign trade forecasts of the member countries do not always distinguish between the EEC and the rest of the world. This obstacle has been surmounted by the European Commission's Study Group on Medium Term Economic Assessments, which has mounted a coherence test taking as its point of departure the total volume of <u>imports</u> foreseen by the member countries for 1978, and inferring from it the proportion which, according to past trends, should go to swell intra-EEC export flows. The result represents the fraction of total imports which is assumed to be covered by exports out of the EEC. The relation between this future result and the total of exports going out of the EEC allows us to see whether the expected growth of the latter is implausible.

I.4.9. It is clear therefore that the compilation of Community sectoral forecasts does not pose especially arduous problems and the risks of incoherence are fairly limited. As to the sectors which should be tackled first, this must depend on an assessment of urgency which can most usefully be made when the work is about to start. No doubt at the moment energy and agriculture would be high on the list, but that is only at the moment. Five years ago it would have been environment, and two years hence there may have been another "crisis", perhaps in raw material dependencies or in labour mobility. Owing to the crisis-oriented way affairs have been managed until now, accents tend to shift rapidly. As to the most serious methodological difficulty: the inter-relation of economic and geographical aspects, it stems not from the Community-wide character of the forecasts, but from the present state of our knowledge.

C. EEC scale: from Sectoral to Comprehensive Forecasts

I.4.10. Technically, the work at this stage would be the same as that at (A), i.e., the integration of national sectoral forecasts into national comprehensive forecasts. This is the stage which would provide some of the teleonomies we suggested in I.1., it would define the first cone (goal-choice cone), and should be conducted so as to provide the sharpest separation of the impossible from the possible.

D. From National to EEC scale: Comprehensive Forecasts

I.4.11. If stage (C) above yields the results we hope and believe it can, then this work should be done as a check on it, and as a frame of reference for whatever integration of extra-Community forecasting has to be attempted. Since the national comprehensive forecasts do not yet really exist, it could not be started as soon as (C).

We turn now to the question how long-term integrated forecasting could be made most useful to the Community.

A future-oriented approach to policy making. Some key concepts

I.4.12. The approaches and procedures used in public policy making in all countries and at every level have not yet been adequately adjusted to the pace, content, and scale of change that is - and will continue to be - experienced, both within European societies and in their world environment. This multi-faceted change creates new demands, as well as new opportunities, for collective action to arise out of deliberate and systematic thinking by the political and administrative institutions responsible for the future of the European Community. What we are trying to identify throughout this report is a systematic approach to public policy, which presumes that prescribed goals will be more likely to be achieved by a thoughtfully determined course of action than by relying on chance, intuition or short-term compromises and expediency. There is no unanimously agreed phrase for such an attitude towards action. While we talk here about forecasting and policy analysis, alternative phrases such as long-range planning or even systems analysis could equally be used. More than the label, what matters is the substance.

I.4.13. As we wrote in our general introduction, we think our era is characterised by two great groups of changes now in progress. One is the new insistence in Western Europe on greater social relevance from government policies, and reduced human inequality. The other comprises the increasingly "systemic" nature or interconnectedness of society's problems and the emergence of a "world system" in which no country can ever again be an island unto itself, and in which a new volatility of social structures is bound to create more and more "discontinuities" in the fabric of human history. These two clusters constitute a strikingly new environment for collective action. They make some older concepts obsolete, and call for fresh approaches. We shall now try to clarify some new concepts of policy making that follow from these large-scale transformations in people's thoughts and their societies.

The expectation of social relevance

I.4.14. By social relevance we mean that the members of a polity increasingly expect public policy to make a real difference in their condition in a direct, tangible way. This expectation is at variance with conventional styles of policy in which outcomes are expressed and measured by the amount of resources used. By contrast, its fulfilment requires result-oriented policy making. This implies that consciously collected information about past or current results is taken into account while making decisions, which is in itself a kind of Copernican revolution in the world of politics. Among other things, it would imply that the goals (instead of the means) would have to be specified in meaningful terms, and that policy evaluation would be done on a regular basis.

The drive for greater equality

I.4.15. This drive is bound to affect public policy because, up to now, the typical way to assess a policy consisted of looking at its average outcomes, while there is now a greater concern for its distribution among various nations, age groups, sexes, socio-economic classes, residential areas, and so on.

The "systemic" character of social issues

I.4.16. This refers to the well known, though often ignored, interrelations typical of advanced societies where developments in one sector both influence and are influenced by many other sectors. The traditional picture of a direct relationship between means and goals has to give place to a more complex vision, in which any policy or programme may be helped or hampered by what happens in other areas of public action, on which it may in turn have a number of positive and negative effects. Hence the current interest in impact assessments comparing alternative systems (in production, transportation, service delivery, etc.) in terms of their comparative advantages and disadvantages.

The perception of the world as a system

I.4.17. The word "system" is used to emphasise the existence of an international configuration in which the effects of trends or events in one region are disseminated very fast into the world at large. The more one sees things this way, the less can one ignore extra-national/EEC forces, and the external impacts of domestic/EEC policies, and the less can one believe, whether implicitly or explicitly, in uniquely national/EEC solutions.(1) More and more, the existence of "only one earth" requires that policy makers, including the Community policy-makers, take factors and impacts outside Europe into consideration. By no means an easy task, particularly so because its methodology is still in its infancy.

The volatility of society - Discontinuities

I.4.18. Discontinuities in technology, social custom, culture, and so on, seem to be another key attribute of the current period. In times of greater stability it was legitimate to see the future as a more or less enlarged version of the past, but the most surprising thing now is a "surprise-free projection" that happens to come true. To detect or anticipate important incipient trends through futures research is becoming more and more indispensable to policy making.

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(1) The duality national/EEC is meant to suggest that "parochialism" is a relative concept, according to whether one thinks in terms of one's nation vs. EEC, or of EEC vs. the rest of the world.

Some preliminary steps towards integrating Community forecasting

I.4.19. These concepts have now to be translated into operational methods and procedures for in an imperfect, that is human, world even the soundest principles of conduct must be adapted not only to political realities but also to the current limitations of the state of the art in forecasting, policy analysis, planning and organisation. We hope the following suggestions will help to go beyond muddling through while avoiding the traps into which too many endeavours towards "scientific policy-making" have fallen in the past. We shall discuss these steps as so many building blocks in a decision-making process.

Result-oriented approach: social reporting and evaluative studies

I.4.20. We have seen that the first consequence of the need for social relevance is that policy-design variables should reflect the effects on the "target population" as closely as possible. At present this is not the case. To repeat an example we used earlier: in health matters the most widely used information is the amount of public and private expenditure allocated to medical care, which - although pleasantly precise, readily obtained, and easily compared to other expenditure - gives an indirect and distorted picture of the real health of the people. Expenditure on education is an equally bad way to measure the "educatedness" of a generation. Hence the interest in social indicators - ie. measurements of those aspects of social reality which are of direct normative interest - which we mentioned in the last chapter.

I.4.21. One way of turning the few currently available social indicators to practical use would be to undertake social forecasting to obtain qualitative answers to such basic questions as: in which direction are the constituent factors of the welfare of the Europeans likely to develop in the future? Are they likely to progress, stagnate or regress? We believe that before launching a series of forecasts intended to delineate the range of possible futures in various areas of social concern (the goal-choice cone) one should undertake a thorough assessment of the present situation and the recent history. At the risk of repeating what we have already said in the preceding chapter, we mention the following two reasons:

There is no meaningful break between future and past, but rather a continuum which unites what has existed until now and a plurality of imaginable futures. Yet, though the fabric may be continuous, certain threads may be broken, and texture and colours may change abruptly. We cannot predict where and how such changes will occur in the future, but the least we can do is to draw upon the lessons derived from the route travelled so far.

I.4.22 Two key problems of any result-oriented social policy making are perhaps best tackled by looking at the past first, identifying the components of European Welfare (using, e.g., the OECD List[1]) and gauging the extent to which what we see indicates "progress". These problems concern:

a) the differences between intermediate consumption (allocations) and end product (result); and:

b) the choice of a method of non-monetary weighting for the things measured

I.4.23. Concerning (a). If we want to know how the health of Europeans has changed (improved or deteriorated) since, say, 1955, we must first "operationalise" the concept of health. Unfortunately, most of the available data relate to the technical, financial, and human means allocated to the health care delivery system, representing what the economists would call 'intermediate consumption', while - as discussed earlier - the variable of concern is of course the effect or 'end product' called health.

I.4.24. Concerning (b). When dealing with market goods and services, it is possible to synthesise the diversity of upward and downward movements in different sectors into a single aggregate, by weighting the contribution of each sector through the market price of its output. This enables us to calculate the GNP and, for instance, the way it changes owing to increased industrial and tertiary output on the one hand and a decline in agricultural employment on the other. It is hard to transpose this approach to an area like that of health, even though one is faced with the same kind of problems, i.e. that of measuring changes in opposite directions by a single aggregate figure: it can

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(1) List of Social Concerns Common to most OECD Countries - OECD, Paris, 1973.

happen that death rates drop at the same time that disability among the elderly increases. Certainly the utilisation of "shadow prices" makes it possible to make certain comparisons, but their use is strictly limited. If, for example, the "value" of the supplementary years of a working person is represented by the wage he or she earns, people outside the labour force would be misrepresented seriously. The difficulties become even more formidable when one tries to compare changes in dissimilar social concerns (like crime, communications, transportation and pollution).

I.4.25. This is why, in our opinion, it makes no sense to synthesise these divergent developments arbitrarily into some kind of social GNP by assigning "market values" to non-market outputs. (See II.15 below.) The only reasonable course is to translate the developments as best one can into (non-monetary) social indicators, leaving everyone to make his own weighting in view of the diversity of past and future developments. (We will meet exactly the same problem in connection with effect- or impact-assessment).

I.4.26. The result-oriented approach makes sense only if the studies are not conducted once and for all, but steadily or at regular intervals. The accumulation of social knowledge thus obtained would be not only of scientific interest but also of the highest political value, because it would provide the Communities with a collective feeling of their "present" state, and thus of a shared future.

I.4.27. One possible form for these enquiries into European welfare might be the gradual development of a social report, published at regular intervals as part of and backing for the forecasting or teleonomies (for instance every two years),which would not aim immediately at extensive coverage, but would proceed step by step, dealing first with the more tractable aspects of the matter.

I.4.28. For policy evaluation, social monitoring is not sufficient. To stick to the same example: states of health in a country depend on many factors apart from health care delivery (for instance, environmental variables and "life styles"). Therefore we think there is a separate case to be made for evaluative studies. Their aim would be to assess, about some condition of society, the amount which is due to a specific policy or programme, and the "residual"

explainable in terms of other factors (including the effect of other policies, whether intended or not). Policy evaluation could follow this pattern:

- Specification of the goals, that is to say: the desired future shape of a system (e.g. exploitation of technology, education, transport, agriculture. Goal-Choice Cone: see General Introduction).
- Translation of this desired shape into a certain number of indicators. We suspect these will often have to be tailor-made. (Location of "goal" on the plane across the base of the Goal-Choice Cone.)
- Rough estimation of the desired values of these indicators. (This is optional, for it may be sufficient to establish an ordinal ranking and to show the direction and sequence the indicators should move if the relevant policy is to be considered successful.)
- Determination of the real and the desired rate of approach to the goals (relevant to Cone of Means-Choice).
- Measurement of the changes owing to the policies assessed. This is a difficult task, but it should be done whenever it is possible to compare the "treated" with an "untreated" sample (i.e. not affected by the policy in question).

Social Equality

I.4.29. An insistent demand for social equality is indisputably part of the current Zeitgeist in Europe, and policy making has to allow for it more than ever. Even policies explicitly focussed on redistribution of income are still largely unconcerned about the real effects of the huge amounts of money they recycle every year as social cash benefits. Of great importance are also those sectoral policies that do not have clear egalitarian goals but nevertheless strongly affect distribution. For instance, the discussion about revising the Common Agricultural Policy would be much improved if it could be based on adequate studies assessing its social and international distributive effects.
So we suggest that new major policies at EEC level, before being introduced, should be assessed with regard to the way their various benefits and disbenefits are likely to be distributed among different

social groups, different member nations, and different parts of the world outside the European Community. This is par excellence a job for Europe Plus Thirty.

Policy interactions

I.4.30. One big advantage of the approach advocated here is that it aims to reveal the interactions among policies, and their expected and unexpected effects on any group of people.

There are many ways of comparing alternative policies in terms of costs and effects, monetary and otherwise; the importance of not forcing individual effects into the straightjacket of cash valuation or utility-weighted units must be re-emphasised. There are several reasons for this:

- that a single measure of effectiveness would conceal areas of strength or weakness in each solution, and would make impossible cross-impact comparisons between systems;
- unquantifiable impacts would have to be excluded from the analysis, so they would have to be displayed in a different, "softer", and possibly less convincing form.
- finally, translating qualitatively different impacts into commensurate units implies value judgements by the analysts, which may or may not be visible, and may or may not agree with those of the decision makers. This is especially troublesome in a political environment such as the European Community where one has to consider a diversity of decision makers at different levels, and where development of agreement on the desired weighting or importance of various impacts is a significant part of the decision process itself. Therefore the procedure used for comparing the impacts should probably seek to show the alternative policies ranking for each particular effect, rather than evaluating them by some common yardstick.

World perspective

I.4.31. The increasing interdependence between the various parts of the world means that the approaches outlined above should be applied to the

external policies of the Community as well as the internal ones. This implies: (1) identification of the constellation of policy goals (among which some trade-offs will have to be struck); (2) comparison among alternative policies (according to a pattern rather similar to effect assessment); and (3) sensitivity analysis of the rankings thus obtained, to see whether they are substantially changed by taking into account different future "world developments". In saying this, we are aware that it is a counsel of perfection.

Towards fruitful forecasting

I.4.32. It is widely accepted that sound policy making must take due consideration of the future under two aspects: (1) as a potential outcome of current processes and (2) as the intended goal of deliberate actions. As explained at the end of the preceding chapter, it is very difficult to ensure that the results of forecasting are effectively used in the policy-making and planning process. Consequently, forecasting runs a grave danger of degenerating into a substitute for action, rather than making a contribution to it. No ready recipe exists to avoid this degeneration, and the two additional suggestions we now put forward do not, in themselves, provide any guarantee. They are:

a) That exploratory forecasting be conducted by Europe Plus Thirty within the framework of the social and general monitoring we described above. This would mean that social forecasting is initiated only in those fields where retrospective studies on welfare components have already been completed, whether nationally or by the Community as such. Several benefits could be expected. Firstly, the forecasters would not have to spend a lot of time gathering data on past trends. Secondly, social reporting would hopefully take on a new dimension thanks to this two-way interaction between assessment of past performance and scanning through possible alternative new developments. And, thirdly, it would provide a built-in mechanism against proliferation of forecasts done primarily for technical display.

b) As far as policy-oriented studies are concerned, it would be a safeguard against irrelevance to reverse the usual path, which starts by looking at the future and often stops before policy analysis proper. That is to say, a policy formulation process would be initiated as described earlier, with the whole gamut of effect-assessment taking place in the context of the world as of now. Logically, it is only after this that it would be advisable to consider more distant time horizons to check whether reasoning about, say, 1990, instead of 1975, makes any difference in the rankings of the policy alternatives. Then, roughly speaking, there are two possibilities. Either the relative effects are not significantly altered, or they are and only the latter would warrant a fuller study of those postulated future changes that do seem to make a difference.

Priorities

I.4.33. We conclude with a word about priorities. Throughout this chapter three pairs of complementary variables were used:

- Past versus Future: To look into the future is a basic requirement for effective collective action; an awareness of the past is indispensable;
- Process versus Policy: Social reality is a mix (in varying proportions) of processes (or "les pesanteurs sociologiques") and policies, or of conditions and will, to use different language;
- EEC versus Outer World: The European Community is, like every living entity, divided between the conflicting loyalties of what it owes to itself and what it owes to the outer world, and this tension is present everywhere, including the choices that will be made about our recommendations.

I.4.34. By combining these three pairs of variables we obtain eight cells, which allows us to display the gist of our proposals in tabular form.

	PAST		FUTURE	
	Intra-EEC	Outer World	Intra-EEC	Outer World
Processes	(1)	(2)	(3)	(4)
EEC Policies	(5)	(6)	(7)	(8)

Cell (1) : Social and other monitoring, in welfare terms where possible, within the Community.

Cell (2) : Worldwide monitoring.

Cell (3) : Exploratory facet of forecasting;)
) Mainly Cone of goal
Cell (4) : Contextual exploratory forecasting.) choice.

Cell (5) Ex post facto evaluation of EEC internal policies.

Cell (6) : Ex post facto evaluation of EEC external policies.

Cell (7) and (8) : Policy analysis proper, combining goal definition, impact assessment, and means choice. Teleonomy as a whole.

This scheme is of course extremely simplified. Europe Plus Thirty cannot neglect any of the cells. But as a very rough guide, we suggest that the following order of priority be assigned to them as objects of work.

No.2 will have to be eliminated for systematic study; it is simply too vast. It must just be held present in the mind, and interrogated when necessary.

No.6 can also be eliminated, since Community policies towards the outer world really only began with the Yaoundé Convention of 1971, and are too recent to be assessed for the moment.

We recommend that most attention be given to Nos. 7 and 8, and to the other four - that is, 1, 3, 4, and 5 - as backing and context for 7 and 8.

Conclusion

I.4.35. We have felt the temptation, in this chapter and the last, to go further and to lay out in some detail an actual programme of work for Europe Plus Thirty, complete with instructions regarding the nature and form of inputs, the methods of forecasting to be adopted for each stage or sector of the work, quantified relationships between variables, values for technical coefficients, sets of equations to be derived and applied, etc. etc. We have resisted this temptation out of a wish to avoid prejudicing the freedom of action of the first director of Europe Plus Thirty. His job, and that of his staff, will be extremely difficult in any case, and

we do not think it will be made easier by too detailed a "manual of instructions" laid down in advance. If the right man is selected, he will be at least the professional equal of the forecasters who have worked on this report, and we would not feel justified in tying his hands any tighter than we have already done in the foregoing chapters, and shall do in the following ones, especially the immediately following chapter II.1., which contains three detailed examples of problem-oriented forecasting.

FIELDS FOR FORECASTING

1. INTRODUCTION

II.1. 1. As we explained in the General Introduction, this is the point in our report where we turn from the general to the particular.

In Part I we described the forecasting needs of the EEC, how these were - or were not - fulfilled up to now, and where and how forecasting is done within EEC countries and elsewhere. We then gave a general survey of existing methods, their possibilities, and the problems that may attend their use, and finally we attempted a general outline of what we mean when we speak about long-term integrated forecasting for the Community as a whole. By integrated forecasting we mean two things:

- its being integrated well enough with the Community policy-making process to be of real help to those developing, implementing and evaluating policy;
- its not being limited to a single sector like technology, or economics, but encompassing all sectors relevant to the particular problem area in question, and to the teleonomies we described in the General Introduction.

II.1.2. During all the remaining sixteen chapters of this Part, we would ask the reader to remember our overriding insistence on integration. We are aware that by including so much material on these sixteen separate sectors, we risk his forgetting it; that risk we have to take. Western Europe is not such a light or simple phenomenon that we can throw up an airy arch and say: "Look, that will take the strain". It is on the contrary old, heavy, hurtling, and complex; and a very great deal is known about it and all its parts. A proposal for forecasting which took little or no account of this weight and complexity of knowledge would not be a worthy answer to the questions we have been asked by the Council of Ministers.

II.1. 3. But before embarking on the sixteen sectoral chapters, we shall here give three examples of the way we think integrated forecasting might be carried out to meet particular demands, or solve particular problems, as opposed to the general process of long-term forecasting, or teleonomy, as we described it in our General Introduction. These three examples are intended to help bridge the gap between general and particular.

Three examples of integrated forecasting directed to Policy analysis.

II.1. 4. Our three examples concern 1) a high-speed railway system, 2) a low energy-use scenario, and 3) the effects of different education patterns, especially on labour. The first, on transport, is in fact already being carried out; it is the COST 33 programme undertaken jointly by the Commission and OECD, and mentioned in I.1. above. We commend it as a well-thought out job. The other two, on energy and education, are not being done anywhere as far as we know, but they well might be. They are thus naturally described more tentatively than the first, which has already had the benefit of much skilled definition and refinement.

A Transport example

II.1. 5. This example is very much technology oriented and is in fact close to a technology assessment.

A proposal has been made for the construction of a very high-speed railway network for passenger movement between major European cities. This proposal would require cooperation between governments and probably major government assistance in several ways. It is therefore relevant to put the following questions: what would be the long-term effects of such a development on the volume and pattern of passenger traffic by road, rail and air, on transport costs (including man-hours spent travelling), energy consumption, accidents, air pollution, land use, regional distribution of population and employment, and on the cities served by the system ?

In order to answer these questions, one needs to forecast events both with and without the proposed railway system. Of course, there may be more than one possible "without" situation.

II.1. 6. In this example the endogenous variables consist of the railway system and other transport and planning factors that could be controlled and specified as part of the policy on which the forecast is based. They are primarily technological.

The exogenous variables include:

i) size of population by country;
ii) distribution of population by region;
iii) distribution of population between urban and rural areas;
iv) distribution of population by household size;
v) gross regional product by region;
vi) average household income by region;
vii) distribution of household income (by income group);
viii) proportion of car-owning households by region;
ix) unit operating costs (in real terms) of cars, aircraft and railways.

The fixed factors include those parts of the transport system not subject to change, geographical features, climate, social habits and conventions, political conditions and economic policies.

The dependent factors are then those effects which the forecaster is asked to forecast, i.e. traffic volume, costs, energy consumption, etc.

II.1. 7. It is clear that the endogenous variables must be carefully defined and specified as forecasting assumptions. The exogenous variables must be forecast for the target year. The fixed factors must be identified. Then, given these three sets of factors, functional relationships must be found between them and the dependent variables. It is these relationships which constitute the technical part of the forecasting procedure.

II.1. 8. Now, in the example cited, the transport system provides most of the endogenous variables and the fixed factors; these parts of the work lie within the normal competence of a transport specialist. But the exogenous variables, on which the results of the forecast depend, consist mainly of matters outside his expertise. He is not the best person to make forecasts of population and income; nor of the prices of materials and labour upon which future vehicle operating costs will depend.

Again, while some of the dependent variables are transport variables, others are not, and lie outside the transport specialist's field, e.g. environmental effects and regional policy issues. Transport studies often raise social and political issues which are all too easily ignored in a straight technological approach.

II.1. 9. An integrated transport forecast of the type described should be able to draw on other forecasters for the demographic and economic forecasts he requires; and in the development of functional relationships between the dependent variables and other factors, assistance should be obtainable from specialists in the various fields involved. These relationships are of value to both sides; the environmentalist is as interested in the effect of transport on the environment as is the transport planner. In other studies it will be the environmentalist who comes to the transport specialist for a forecast; for him, transport may be an exogenous variable.

II.1.10. A study of this type would ideally call for an even broader framework, including research on people's need for transport services. This would mean an empirical investigation of the reasons for which people travel, their development, and their dependency on and elasticity against costs and convenience. The acceptance of a future system by its potential users is one of the most tricky questions for the systems analyst.

A high-speed passenger transport system is only one among many transport systems, and inevitably has repercussions on the development of the others, so that fixed factors might have to be treated as variables in a second round of the study.

II.1.11. Thus, for this particular example of a high-speed railway project, one sees the need for close collaboration between forecasters working separately on the demographic, macro-economic, energy, regional planning and environmental fields as well as the transport sector itself.

An Energy example

II.1.12. Suppose that the European Commission decided to examine deliberate policies to reduce energy growth rates substantially. Studies of this kind have already been made in the USA and started in many European countries. A question might be put as follows: given a specified (low) rate of energy growth, what effects would be expected on certain energy using sectors ?

II.1.13. Within the Commission and its affiliated institutions there is much expertise on how to design lower growth rates for energy supply. These questions fall within the energy sector. What the Commission

now lacks is the expertise to consider the multitude of impacts that low energy growth would make on energy-using sectors; that is, on the demand side of the energy equation. These impacts are certain to be complex, with effects that reverberate throughout many different sectors. They demand integrated forecasting.

II.1.14. This example is one in which scenario writing would play an important part, although systems modelling would no doubt come into the picture as well. To illustrate, we give here just some of the questions that would have to be considered by forecasters working within and across the subject areas considered in Part II of our report:

II.1.15. Agriculture is a fairly energy-intensive industry. Would the use of machinery and fertilisers decrease, and the use of labour increase ? What effects would the latter change have on land use planning, transport policies, and the like ? Since animal products are the most energy-intensive, would countries like the Netherlands be more affected than others which are predominantly cereal-producers ? Since more intensive production of any kind increases energy use, what are the implications for broad policies of food self-sufficiency and of food imports ? Could agriculture itself become a substantial energy-supplier through the conversion of animal and vegetable wastes into fuels, or even by growing crops intended solely for fuel production ? In the European Middle Ages, brushwood was cultivated for fuel, and cowdung is still the main household fuel of India. Again, what are the regional implications ?

II.1.16. Industry uses energy-intensive materials and has increasingly replaced labour by energy-intensive machinery. Would there be a partial return to more labour-intensive methods, and if so, with what implications for employment rates, settlement patterns, the siting of industry, transport, and so forth ? Would there be significant shifts in material usage, and with what effects on trade (e.g. natural rubber and textiles in place of synthetics) ? Which sectors of industry would be most affected ? Might some industry (e.g. aluminium) respond by transferring out of Europe ? What changes would there be in the relative prices of different products and services ? And how might these affect consumer choices; with new patterns of 'selective growth' ?

II.1.17. Transport would certainly experience major impacts. These in turn could affect regional planning, urban forms, the siting of facilities such as 'out of town' shopping centres and, not least, tourism. Forecasts would need to ask searching questions about the degree to which transport industries can adapt - e.g. by producing more energy-efficient vehicles - and the degree to which public policies could be influential - e.g. the promotion of public as opposed to private transport. One would also need to examine the possible role of Communications in reducing the need for personal travel.

II.1.18. Environment and pollution impacts might be considerable. Lower energy growth would alleviate many pollution problems which arise directly from the burning of fuels, but might create new ones. Pollution abatement itself consumes energy: would industries be able to 'afford' it ? New products designed to help save energy might impose health risks on workers: the use of the highly toxic weedkiller paraquat to save cultivations on the farm is a notable example. Many similar effects would need to be forecast; for example by technology assessment methods.

II.1.19. Science and Technology; to what extent could innovation be directed towards more energy-efficient production, such as enzyme technology, integrated 'total energy' systems, more durable 'long life' products, re-cycling techniques, and so forth ? What would be the effects of any of these changes on other sectors: employment, industry, materials, etc. etc. and on energy demand itself ?

II.1.20. In these and other ways the forecaster on the energy sector needs the close collaboration of forecasters working in other sectors, just as they in turn need his particular expertise.

An Education-Employment example

II.1.21. This third example is the most challenging of all since it has to deal with many unknowns. It would require a highly "creative" and informed group of professionals to come up with results.

Suppose that the Commission wished to explore the implications of certain proposed educational programmes. A question might be put to Europe Plus Thirty as follows:

What are the implications for the active population of a raised level of formal education and a system of recurrent education ?

II.1.22. The first task of Europe Plus Thirty when confronted with this question would be to set it in an analytical framework. This would mean more precise specification of the question, which would require refinement. Secondary education is now universal in most western European countries, and higher education is fast becoming an activity for the general public. Schemes providing for educational leaves-of-absence and family support during these leaves are being explored or legislated for in several countries. In short, given our current knowledge of the numbers of people that will most probably fill each cohort, and the likelihood of their attaining given educational "levels", we may expect a labour force with a higher level of formal education at the end of the century, and one that continually updates its skills and knowledge through recurrent, job-oriented training. (See II.7 below)

II.1.23. The implications of these dependent variables are both complicated and extensive. They reveal connections with several other sectors. As a preliminary and illustrative listing of those implications we suggest the following. Some of these are dealt with in greater detail in the following sections of Part II.

a) Would women continue increasingly to work outside the home ? What changes in work patterns (especially if women choose part-time work) and in family life, and what changes in the demand for day care centres, pre-school programmes etc., could be expected ? What would be the effect of less maternal care for infants, and more institutional care, on their characters when they grow up ?

b) How would a raised level of education affect the ability of the individual to cope with modern society ? In what ways would improved education increase awareness of the functioning of society and social relationships, and therefore of how to better make one's way in the world ? Examples might be the use of contraception, access to official "channels" and programmes, and to some degree, the reduction of accident rates and improved health. Would a generally raised level

lead to increased competition for the good things of life, or an increased acceptance that they must be shared equally ?

c) To what extent would access to more education by all lead to increased pursuit of education for its own sake ? If education becomes less important in securing individual financial security (see II.7 below), would it then be thought of by many students less as a means to more money and more as an end in itself ?

d) To what extent would a shift of emphasis on the intrinsic value of education mean decreased educational equality ? If education loses its force as a means to financial security, would it become less attractive to those in "under privileged positions" ? Would the economically disadvantaged therefore tend not to take advantage of educational opportunities ?

e) What would be the economic impact of recurrent education in terms of GNP, public expenditure, etc. ? How would it affect the cost of teachers, and the cost of physical facilities and their modification ?

f) What effects would raised levels of education have on work organisation ? Would better educated workers demand changes in job design and organisation, and greater participation, etc. ? To what extent would these changes include rotation, and different mixes of tasks ?

g) Would there be an increased imbalance between the number of graduates and the number of traditionally appropriate openings for them ? If people with advanced education begin to take "lower" positions, what effect would this have on pay differential between, for example, manual and non-manual work ? What repercussions would this have on the aspirations of the less-educated worker, and on job design ?

h) How would raised formal education affect the doing of unpleasant work ? How would "dirty" or unattractive work be redesigned or upgraded to be more attractive ? Alternatively, to what extent could or should it be moved

to other parts of the world ? How would this affect foreign worker arrangements, and balance of trade, and what would be the political considerations ?

i) What kind of, and what increase in, provisions for mid-career education could be expected ? How would the job training programmes and paid leaves of absence for recurrent education bring about increased flexibility in terms of substitution for the worker, re-entry etc. ?

II.1.24. These three examples illustrate the sort of issues, and their relationship with neighbouring expertise, that Europe Plus Thirty could tackle if required.

THE SECTORS.

II.1.25. We turn now to the sectors themselves. In a series of short chapters we consider sixteen different fields of human activity or knowledge, and ask in each case whether forecasting in that field might be a necessary part of integrated forecasting and, if so, whether it is being sufficiently done elsewhere, or needs to be done by Europe Plus Thirty. If it does, we suggest what Europe Plus Thirty should do about it.

Most of the chapters point out the linkages between their own subject matter and those of the others, which is of course the essence of integrated forecasting. In order to display these linkages as comprehensively as possible, we provide a matrix by way of illustration. The influence of the sector at the head of each column on each of the sectors down the left-hand side is shown thus; ▨ for large: ⊡ for smaller but real, and □ for negligible. By "influence", we mean two things: 1) Would a change in the top sector entail a change in the left-hand sector ? and 2) Does the top sector make demands on the left-hand sector ?

MATRIX

(Active)		CLIMATE	POPULATION	AGRICULTURE	HEALTH	SOCIETY	EDUCATION	SC. & TECH.	INDUSTRY	ENERGY	MATERIALS	ENVIRONMENT	TRANSPORT	COMMUNICATIONS	ECON. & FIN.	DEFENCE	POLIT. & INST.
(Passive)		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
CLIMATE	2			0				0	0	0	0	0	0			0	
POPULATION	3	0		0		0		0									0
AGRICULTURE	4				0	0	0		0						0	0	
HEALTH	5	0	0	0		0			0	0			0			0	
SOCIETY	6										0						
EDUCATION	7			0	0							0	0			0	
SC. & TECH.	8			0								0		0			
INDUSTRY	9		0	0	0									0			
ENERGY	10	0	0		0	0	0				0					0	
MATERIALS	11		0			0	0						0	0		0	
ENVIRONMENT	12	0			0	0					0						
TRANSPORT	13	0		0	0		0				0					0	
COMMUNICATIONS	14	0	0		0										0		0
ECON. & FIN.	15		0			0						0		0			
DEFENCE	16	0			0					0	0	0	0				
POLIT. & INST.	17		0	0	0			0		0		0					

We have discussed at some length what order we should place the following chapters in; it was impossible to find a wholly satisfactory sequence. This is simply a reflection on the whole subject of this study: because everything hangs together in a single web of dependency it does not matter very much where we begin. Therefore, no deep meaning should be ascribed to the order we have adopted. Le tout est dans le tout, et vice versa.

2. CLIMATE

II.2.1. We start this Part of our report with a discussion of the possibility of climatic forecasting, for obvious reasons; the climate is the final and absolute arbiter of human destinies. If it changes, there is no fighting against it; we just have to change our ways of life. To anticipate the nature, the scale, the speed, the signs, and the causes of changes in the climate would be helpful.

But first, a word about terminology. In meteorology, a long-term weather forecast means a week, or at most a month. In climatology, it means, say, thirty years. For the time-scale of Europe Plus Thirty, which we have defined as 4 - 30 years, we must obviously adopt climatological language. We elaborate below.

Historical Background

II.2.2. From time to time rather abrupt shifts of climatic patterns are observed. The last one happened between 1959 and 1963, and was partly due to the eruption of the Agung volcano in Bali in 1963. It consisted of an average cooling of the lower troposphere (0-5,500 meters) of the whole zone between 65°N and 90°N, by 0.56°C.

Between 1920 and 1960 climatic conditions had been unusually favourable, and this makes it easy for us to forget that in the last 500-600 years considerably worse conditions prevailed. What has happened may happen again; we have to understand why it happens, and that means looking at the historical data to see if patterns and causes can be established.

II.2.3. Instrumental observations exist from about 1680 onwards. Those aside, there are enough reliable indirect sources to allow us to evaluate the climatic development during the last millenium; for instance weather diaries; tree rings; pollen investigations in peat-bogs; cereal prices. With the help of this 'proxy' data, H. Lamb (1) has estimated the following values for middle England, compared with the period 1901 - 1950, in °C.

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(1) H.H. Lamb, Palaeogeogr., Palaeoclim., Palaeoecol. 1 (1965)

Time Period	Temperature			Precipitation	
	Winter	Summer	Year	Summer	Year
4000 B.C.	+ 1.0	+ 2.0	+ 1.6	+ 15%	+ 10%
1150 - 1300 A.D.	- 0.1	+ 0.9	+ 0.7	- 15%	+ 3%
1600 - 1700 A.D.	- 1.1	- 0.5	- 0.7	0	+ 2%

II.2.4. The Middle Ages (ca. 900 - 1300) were clearly warmer and drier than today in the warm season (vegetation period); wine was produced in England. After several discontinuities, with anomalies that even by today's standards were extreme (especially 1310 - 1350 and 1428 - 1460), there was a transformation which began in about 1560. This cold and snowy period is exaggeratedly referred to as a "little ice age". The period lasted with a few small breaks until 1850; it was marked by strong precipitation and a high water level of the lakes in the Mediterranean area, in the Near East and in Southern Russia; drift ice blocked the coast of Iceland for five to six months a year and even advanced to the Faroes.

II.2.5. Whereas the warm period in the Middle Ages, with noticeably less storms on the Atlantic and the disappearance of drift ice along the East Greenland coast south of ca. 70°N, brought about good conditions for cultivation in most European countries, yet the period of anomalies at the end of the Middle Ages and especially in the "little ice age" brought many crop failures, especially in marginal lands such as Iceland, Scotland and Norway. The average growing season was shortened by several weeks. The appearance of worldwide stratospheric turbidity after volcanic eruptions (e.g. 1601, 1783, 1815, 1883 and 1912) led to much adverse summer weather.

II.2.6. The development of the climate in the northern hemisphere in the past 15 years has shown that the 40 year period 1920 - 1960, usually defined as a "normal period", was in fact abnormal, especially if related to the last 500 - 600 years. The latest development has many traits which correspond more to the climate of the latter half of the 19th century, than to the decades before 1960. These changes have had a strong economic impact upon some areas (India, the Sahel belt). The recent cooling of the Arctic (by

about 1^{o} - 2^{o} on a yearly basis, by 3^{o} - 6^{o}C for the winter months) may have led over several years to a shift of climatic regimes, at least in Africa and large parts of South Asia, affecting the water balance.

II.2.7. The sensitivity of agricultural production to climatic anomalies - such as drought or shortening of the growing season - is hardly less today than it was two centuries ago. Recent developments give good examples of the political consequences of food shortages: revolutions in Ethiopia and Mali, and the crisis caused by surreptitious Soviet grain purchases in America in 1973 and 1974. An earlier climatically induced political event was the great emigration to America. The potato-blight famine of 1846 in Ireland was effected by a period of extreme humidity during the weather-sensitive growth phase of the potato.

II.2.8. Today, it cannot be excluded that the world's grain harvest might be reduced, after simultaneous climatic anomalies, by about 10 percent in one year or by 15 percent or even more in two consecutive years. Taken with the continuing population growth rate, this might eventually lead to widespread social unrest, to increased international tensions, and to their expression in, for instance, increased terrorism.

And indeed, the last ice age itself was only 17,000 years ago. The ice disappeared 8,500 years ago in Scandinavia and 6,500 years ago in Canada. 6,000 years ago there was a world-wide warm period which lasted for several centuries. In this period the Arctic drift ice retreated to the north coasts of Spitzbergen and Greenland. The transition between the Ice Age and the post-glacial warm period between 12,000 and 10,500 years ago was characterised by very abrupt climatic changes, and the decisive upheavals may have taken place within a lifetime. Later climatic changes, too, apparently did not occur slowly, but rather rapidly in the form of often repeated large-scale weather patterns. This situation leads one naturally to consider whether anomalous atmospheric conditions could be forecast for a whole year and, more to our purpose, whether assertions can be made about the longer-term development of the climate.

Methods of climatic forecasting

II.2.9. In contrast to the weather of a day or a week, the word climate is used for the average atmospheric conditions of a decade or a "normal"

thirty year period. By climatic forecasting we understand periods of one year and beyond. Whether, and if so how, a realistic forecast on a physicomathematical basis is possible, is being actively discussed in learned circles. Monthly forecasts are being made by different meteorological offices, in the USA, UK, Federal Republic of Germany, and also in the USSR with empirical and semi-empirical methods; they are not coordinated. The results are only partially satisfactory: temperature forecasts are slightly better than random guesses, whereas it is difficult to maintain that rainfall forecasts are an improvement on chance. Most long-term forecasts are only published in learned and official circles, and are only of limited use for economic planning.

II.2.10. The position today is that short-term weather forecasts (24-48 hours) drawn up by numerical (physico-mathematical) methods can be extended with some skill to forecasts up to about 5 days. Some experiments have indicated that by including yet more physical processes in the models 8 - 10 day forecasts can be achieved. This work is being carried forward at a new institute for medium-range weather forecasting at Reading, in the UK, financed by the governments of the Community countries plus Austria, Greece, Portugal, Spain, Sweden, Switzerland and Yugoslavia.

II.2.11. Climatic forecasting is not simply extended weather forecasting. It needs to include data on physical processes at the interfaces between atmosphere, ocean, ice, and the upper layers of the solid earth. Research on this, empirical as well as on a model basis, is progressing. The comprehensive models which have been developed so far are capable of taking the interaction between atmosphere and ocean into consideration; they enable us to outline a fairly realistic simulation of the existing climate, even if the mesh of the grid is still too coarse. But a satisfactory climatic forecast cannot be expected from them; we still need improved simulations of the physical processes, but the tremendous amount of calculations required is prohibitive. Undigested data reach the meteorological offices in the range of hundred of millions a day. So we need to reach simultaneous solutions in a system of at least 7 non-linear differential equations at several hundred thousand grid points. The world is represented by some 10,000 grid points, each representing about 400 Km of the world's surface horizontally and 2 Km vertically. There are 6 - 12 levels in the atmosphere alone, going up to 30 Km, and the interaction between the different levels must be taken into account. All small and medium-sized processes have to be parameterised, that is, expressed as functions of larger

processes. Even for the most efficient computers the time needed for a result is about 10% of the forecast time, which for our thirty-year purposes would mean that a computer would need several years just to work out the calculations. Meteorology's demands on computers are far greater than those of other sciences. Many experts hope that the development of new model types on a statistical-dynamical base will bring improvements.

II.2.12. Given all this, we cannot say whether or to what degree climatic forecasting for a year or a decade will become possible. At least two important climatogenic processes cannot reasonably be forecast: large volcanic eruptions (e.g. Krakatoa 1883, Agung 1963,)and possible fluctuations in the sun's radiation. But progress in other fields has been so remarkable and encouraging that the majority of experts have recently reached a conditionally positive attitude to the possibility of climatic forecasts (1).

Weather and Climate Modification

II.2.13. Understanding the way man modifies weather and climate has become one of the most challenging tasks of meteorology. Since the local climate depends to a large extent on the physical properties of the underlying surface, its vegetation and soil, any substantial modification of these can alter essential climatic parameters. A good example is an irrigated oasis: here the maximum temperature is 3- 5° C lower than in the surrounding desert, while the relative humidity increases by 20-30%. Deforestation, overgrazing of natural grasslands (after the destruction of the great predator animals and the domestication of goats, cattle, etc.) and irrigation have caused not negligible climatic changes during the last 4-8,000 years in Europe, the Mediterranean, Near and Middle East, India and China, over many millions of km^2.

II.2.14. Since the beginning of the industrial era, the emission of CO_2 from fossil burning fuels, from air pollution of various sorts and the direct input of energy into the atmosphere e.g. waste heat from power stations) have added substantially to the hitherto nearly imperceptible processes described above. The CO_2-content has increased from 290 to about 325 ppm (part per million) and will (on present trends) reach the 400 ppm mark, probably soon after the turn of the century.

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(1) WMO-GARP Conference on Climate Modelling, July/August 1974; to be published in GARP Publication Series.

II.2.15. In spite of the oil crisis, the trend of man-made climatogenic factors[1] is expected further to increase, though perhaps more slowly. The exponential growth of population together with the industrialisation of the Third World and the raising of its living standard will be responsible for that, even if energy conservation and near-zero, or even zero or negative, growth rate in the developed countries were to replace the recent trends.

II.2.16. The CO_2 storage capacity of the oceans, which at present absorb about 50 percent of CO_2 from fossil combustion, is limited. Leading specialists expect that, after a mixing period of about 60 years, the stored carbon dioxide will be released into the air and that an increase of the air's CO_2-content by a factor of 5 or more might be expected in the second half of the next century.[2] These inadvertent man-made effects might then lead to a general warming, and to the retreat of the Arctic sea ice into a position like that of the early Middle Ages. The diversion of fresh water for irrigation from the Siberian and Canadian rivers, if that were to occur on a large scale, would accelerate the retreat and thinning of the Arctic sea ice. With a drastic increase of CO_2, even its central part, which has probably remained constant during the last million years, could eventually disappear.[3] In this case a northward shift of all large-scale climatic belts by several hundred kms. might be expected, together with a disappearance of the winter rains in the Mediterranean, Near and Middle East, Soviet Central Asia, and California/Utah. Since at present about 8 percent of the run-off waters from all continents is used by man, such a shift would necessitate, in many densely populated areas, a drastic readaptation to a new and unprecedented pattern of agriculture and water supply. (A major retreat, or even the disappearance of the floating Arctic sea ice would not, any more than an ice cube melting in a glass of whisky, cause a rise of the sea level. The melting of the continental ice sheet of Greenland, on the other hand, would; but this should be a very slow process lasting probably more than 1,000 years.)

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(1) SMIC Report: Inadvertent Climate Modification. Report of the Study of Man's Impact on Climate. MIT Press, 1971, 308 pp.

(2) (As in No. 1 on page 5.)

(3) M.I. Budyko. Izmeniya Klimata. Leningrad, 1974, 280 pp.

II.2.17. Now this catastrophic chain of events is something which might happen; nobody can say it will, and nobody can even say how likely it is to happen. It is taken seriously in learned circles; that is all we can say at the moment, and that is good enough reason for the nations to press ahead with the construction of the models we have mentioned above, since only by their use can the probabilities of these events be made amenable to discussion. Until this, there can be no basis on which to consider whether we ought (because of this scenario) to start burning less fossil fuel now, or indeed planning for a new sort of economy in a hundred years' time.

II.2.18. In many countries man's ability intentionally to modify the weather has been extensively investigated during the last decades. It is possible to dissipate supercooled fogs (which, however, represent only 5 percent of all fogs), but many other programmes - artificial rainfall, hail prevention, mitigation of tropical hurricanes - have led to controversial results(1). This is the more true if one takes into account the large and sometimes unexpected side effects. Some types of clouds along the upwind slopes of mountains can be stimulated to increased rainfall; but this means only a redistribution of rainfall, at the expense of downwind areas. In the absence of cloud-forming processes - e.g. during droughts or in arid countries, where it is most wanted - artificial stimulation of effective rainfall is (and will remain) unsuccessful.

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(1) National Academy of Sciences: Weather and Climate Modification, Problems and Progress. Washington, D.C., 1973, 258 pp.
W.N. Hess: Weather and Climate Modification, New York, 1974, 1025 pp.

At any rate, more research is needed before reliable results for the operational use of weather modification can be obtained. Because of the dimensions of decisive experiments in an unlimited atmosphere, the social and legal aspects at national and international levels should receive increasing attention. There is already a proposal at UN to ban the use of weather modification; its "peaceful" use may be just as much in need of regulation.

II.2.19. One of the most urgent purposes of mathematical models is to describe the possible effects of (a) unpredictable natural events and (b) the inadvertent and intentional impacts of man on the climatic system.

(a) covers volcanic eruptions, fluctuations in the sun's radiation in different bands of the spectrum, and, possibly, partial surges of the Antarctic ice.

(b) covers the influx of energy and CO_2; air pollution including the effect of supersonic transport on the stratosphere; transformation of vegetation, eg. in the equatorial rain forests; and large reservoirs river-turning, and irrigation projects.

II.2.20. These "sensitivty studies" (1) i.e. mathematical experiments on the response of the model to such events, are an indispensable step towards long-term climatic forecasts. They may be useful for some socio-economic decisions; especially for projects dealing with climate and weather modification, for estimates of the climatic effects of particles in the air, of the CO_2 content, and of thermal pollution. To test these models we need meteorological and oceanographic observations in largely predigested form.

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(1) We are speaking here not of the sensitivity with which the model represents reality, but of the degree to which one group of variables as represented in the model shows itself sensitive to changes in others.

Implications and Applications of Climatic Forecasting

II.2.21. The history of the climate over the last 1,000 years is, as we have seen, much more varied than experience of the last decades would suggest, and we need to reconstruct the climatic history of the last 800 - 1,000 years with the help of studies based on quantifiable "proxy" data. This laborious preparation of data should be encouraged and supported. The unrepeatable early observation series (especially before 1850) should after critical review be refurbished, made comparable, and then published. We would hope that the meteorological offices of the Community countries will selectively process their own mass of observations and derive from them representative, homogeneous and standardised time-series. The same applies to all other countries, given the global character of the climate. This work will probably be initiated and encouraged by the World Meteorological Organisation, and there need be little action by the European Communities as such.

II.2.22. For the development of climate forecasting models, we need at present a series of "sensitivity studies", to which the results of model calculations and forecasts in the socio-economic field can be subjected. Or again, one can feed the results of climatological models into an agricultural production model. An empirical model with regional dependencies is in development at the University of Madison, Wisconsin, USA (Department of Environmental Sciences). Further investigations of the social consequences of climatically conditioned famines are being mounted in international cooperation.

A climatic forecast can be prepared with a loose connection to other sectors, and the results can then be put into multisectoral models, and the other way round. The results of the various alternative inputs can then serve as a base for politico-economic discussion.

II.2.23. At the moment several institutes for meteorological forecasting are being built up; they will no doubt undertake the development of suitable models, or at least the preliminary phases of them. The Communities as such could, as far as was desired, support these efforts. A model developed for 8-10 day forecasts can be further developed so as to estimate climatic trends with regional differentiation, by the inclusion of physical processes

such as: interaction between atmosphere/ocean/ice; interaction between the atmospheric water balance and soil moisture; turbidity caused by tropospheric particles; and thermal pollution.

II.2.24. The provision of all available climate data in a predigested form plays a special role, that is: the presentation of anomalies in elements of the climate (temperature, precipitation, surface pressure) on a global basis for each year, even each season. These ought to be made available back to 1850, and if possible before, and be stored on magnetic tape. A thorough treatment of these data is necessary, because they serve as a test not only for model calculations and sensitivity studies, but also for historical studies of circulation anomalies occurring simultaneously in far distant areas, of their causes, and of their perhaps quasi-cyclical nature. The simultaneous appearance of climatic anomalies with economic effects has to be investigated by all available statistical methods. The collection of data and empirical studies of this kind is especially necessary at the beginning, in order to verify and supplement model calculations. It can be done at relatively low cost in universities or small research institutes, and would deal with a neglected aspect of the overall problem.

II.2.25. All this, of course, is a world job; not specifically a European one: we mention it here because it will (or should) provide the general framework within which, in climatology, Europe Plus Thirty must operate, and draw its own local conditions.

Of the other sectors in which Europe Plus Thirty will be forecasting, the one most obviously sensitive to climatic change is that of agriculture, forestry and fisheries. The implications are of their nature even more critical for food storage than food production. Health and energy consumption are also directly dependent on climate. Through these three - food, health and energy - most of the other sectors considered in this section of our report depend indirectly on climate.

Recommendations

II.2.26. a) Climatology is not a subject where Europe Plus Thirty, as

the long-term forecasting agency of the European Communities, will need to do its own forecasts. It will be enough if it knows what is going on elsewhere, and encourages studies which are useful to it. It should from time to time call conferences or seminars on the subject, but should not normally devote resources to research contracts or other down-line work.

b) Within this limitation, Europe Plus Thirty should encourage quantitative historical studies of climatic fluctuations on a global basis, including their effects on food production, and the collection of:
   (i) Meteorological data back to about 1850.
   (ii) "Proxy Data" back to about 1000 AD.

c) It should likewise encourage i) the setting up of a data bank suitable for testing all kinds of climatic forecasting models and for detailed investigation of the space and time correlation of climatic anomalies, and ii) climatic prediction models of the atmosphere-ocean-ice-soil system with sufficient resolution for the European area. The results of both should be available to Europe Plus Thirty.

d) Europe Plus Thirty should be able to call on the services of a climatologist or agrometeorologist with a good knowledge and awareness of climatic history and the climate-harvest relation. It should take account of long-term climatic scenarios in all its work.

3. POPULATION

Brief Historical Outline

II.3.1. All planning for people, and thus all forecasting for people, must start (after climate) from some thoughts about how many people one is planning or forecasting for, and what age and sex balance there is or may be. We therefore turn next to demographic forecasting.

It is a twentieth century phenomenon. Before that, some authors had concerned themselves with demographic development, but they were trying to discover a general 'law', like Malthus in his famous work, which explained population tendencies by means of a law presented generically and in a form hard to quantify. It was more the product of doctrines and theories of population than of a scientific approach to population forecasts. Toward the middle of the nineteenth century, an attempt at the mathematical formulation of a 'law' of population was made by the Belgians Quételet and Verhulst.(1) Verhulst applied a function, which was known as logistic, and which was much used. Despite other attempts such as the recent recourse to the methods devised by Box and Jenkins,(2) for several decades demographers have more or less given up attempting to project the total size of a population by means of any more or less complex mathematical function. First of all the rigidity of the function makes it impossible to take into account the fairly rapid changes to be encountered today in fertility and in spatial mobility in the industrialised countries. Secondly, the users of statistics are no longer satisfied by mere knowledge of the projected absolute size of the population. Increasingly, they need information about the development of other characteristics of the population : numbers of births and deaths, number of migrants, structure of the population by age and sex, etc. This is because demographic forecasts are needed today to work out secondary or derived forecasts (school attendance, working population, households, housing, etc.) which require at the very least a knowledge of the future population by sex and age.

II.3.2. During the two decades before the second world war, demographers began to concentrate on working out forecasts by the 'component method'.

(1) A. Quetelet: Sur l'homme et le développement de ses facultés, ou Essai de Physique Sociale. (2 vol.) Paris 1835.

P. F. Verhulst: "Notice sur la loi que la population suit dans son accroissement", dans "Correspondance mathématique et physique" publiée par A. Quetelet, Bruxelles 1838.

(2) As in J. L. M. Saboia: Modelling and forecasting populations by time series, Demography, 1974, 11 (3), 483 - 492.

Here the population was projected by age and sex, differentiating the separate development of fertility, mortality, and, if relevant, of spatial mobility. Briefly, this method would start with a population broken down by age and sex according to a census taken at moment t (the 'vector' at moment t). A so-called 'projection matrix' is then applied to it, summarising the fertility, mortality and possible spatial mobility within the span of a period of n years, and one thus obtains the population (projected) at the moment t+n. The 'population vector' can also take into account the structure of the population according to marriage status, or any other demographic feature. The 'projection matrix' will take into account these added structures by incorporating probabilities of transition from one status to another. But in the absence of data such characteristics are in practice usually limited to structure by age and sex, sometimes taking marriage status into account.

II.3.3. At present all industrialised countries use this component method for their demographic forecasts. It also gives information about demographic events (births, deaths, possibly marriages and migrations) that are likely to occur during each stage of projection. Lastly, it makes it possible to take into account the separate development of the components of the trend (fertility, mortality, spatial mobility), and it may incorporate the relations between them. In what follows, we shall restrict ourselves to this type of forecast.

Choice of assumptions

II.3.4. Demographic forecasts are always worked out on the assumption that the population in question will never by struck by a catastrophe. More so, demographers frequently accentuate the uncertainty of their forecasts by basing them on multiple assumptions. In an extreme case, that of the 'Royal Commission on Population' in Britain in 1950, no less than sixteen different forecasts were presented to the prospective users, based on different assumptions of probable development of the components of the demographic trend. The advice of the United Nations in this context is more modest; it consists of a medium forecast described as 'the most probable', flanked by two other forecasts described as 'high' and 'low'. International practice does not always follow the advice of the United Nations; in the forecasts coordinated by the OECD for example (see below) the United Nations' advice was heeded at first, then temporarily abandoned, and returned to in the two forecasts more recently published, in a slightly different form - that is, by applying 'correctives' to the forecasts based on 'the most reasonable' assumptions.

II.3.5. We do not believe that it is always desirable to present the user with a variety of forecasts based on various assumption about the development of the demographic components. We would advise rather the publication of a single forecast judged 'the most reasonable', accompanied by explanation of the effect a modification of the assumptions would have on the demographic trajectory, via subsidiary projections. This single forecast would still have to be frequently revised. If one opts nevertheless for several forecasts, it is necessary to stipulate clearly the assumptions used for each one, so as to allow the user to choose from among them the assumption which he regards as best suited to his purpose.

Demographic forecasts and data requirements

II.3.6. The aim of this section is to show what methods are currently being used, and to point out the problems they pose in the sphere of data gathering. Only the component approach, which is used almost universally in the industrial countries, will be considered here.

II.3.7. As we have seen, this approach is based on the knowledge, at a given moment, of the population (of a country, region etc.) broken down according to certain characteristics, generally age and sex, sometimes marriage status. These data are provided by the census, the date of which usually determines the forecasts' point of departure. A 'projection matrix' is applied to this original population, made up of indices expressing the 'likelihood' of bearing a live child, of surviving, of migrating etc., during the stage of projection selected. The projection is generally made stage by stage: the original population is usually projected over one or five years, then a projection matrix, identical to or different from the first one, is applied to this population (depending on whether the components are constant or not), and the operation is begun all over again. In extrapolating past trends, care is taken to make a retrospective analysis of the demographic situation by means of the appropriate demographic indices; these are usually obtained by combining the data provided by the records of registry offices with those provided by the census. These indices will then be projected into the future, and will go to make up the projection matrix at each stage of the forecast.

II.3.8. The basic data are provided by official sources, both as far as the original population and the initial projection matrix are concerned, because only the State has the right to take a census or to record the basic facts of a person's existence (birth, marriage, change of residence, death).

II.3.9. Forecasts of mortality are based on an assessment of the trends of probability of survival, according to the age and sex group. This assessment can be made by keeping the probabilities constant, by extrapolating the indices observed in the past through graphic or mathematical graduation, by fixing a target level of future mortality and by interpolation between the current level and the target level during each stage of the projection. Contrary to expectations, there has been a growth in the probability of death for men in certain age groups during the last two decades in industrialised countries. This novel situation has led some countries (such as the Netherlands) to draw up their mortality forecasts according not only to age and sex, but also according to the causes of death. Despite the difficulties of this approach (determination of the main cause of death, modifications in the taxonomy of mortal illness) it is probably better than simple forecasting of mortality by age and sex. The question is not very important, since a mistaken assessment of mortality usually does not have such serious consequences for the validity of the overall forecasts as mistaken assessments of fertility and of migration trends.

II.3.10. Correct prediction of fertility remains a critical factor in demographic forecasts. In the past, forecasting was based essentially on the extrapolation of the fertility trends by calendar years according to the age of the women. The failure of these forecasts led demographers to question this approach; the fertility indices had been so much influenced during and after the war by postponements and catching-up of marriages and of births. They therefore provided an inaccurate expression of the basic tendencies of procreative behaviour. To remedy this fault, two new approaches were introduced: firstly, the indices were made more specific, so as to take into account not only age, but also the duration of the marriage and number of children already born (Bourgeois-Pichat, Henry, Grabill) (1); secondly, separate forecasts were made for groups (cohorts) who were born or married within the course of the same year (Whelpton) (2). The two methods can be combined, and their respective advantages considered.

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(1) J. Bourgeois-Pichat: Mesure de la fécondité des populations. Paris, Cahier INED no. 12, 1950.

L. Henry: Fécondité des mariages: nouvelle méthode de mesure. Paris, Cahier INED no. 16, 1953.

W. H. Grabill: Derivation of age-specific first marriage rates and of birth rates specific for order of birth and interval since first marriage or since birthdate of the first child, U.S. Bureau of the Census, unpublished white paper (cited in D.S. Akers: Cohort fertility versus parity progression as methods of projecting births. Demography, 1965, vol 2, p. 416).

(2) P. K. Whelpton: Cohort analysis and fertility projections, in Emerging techniques in Population Research, Milbank Memorial Fund, New York 1963, pp. 39 - 64.

There is some diversity in the approaches adopted by the member countries of OECD. In the last series of forecasts it published, fertility was projected, according to the country, in terms of the age of women (sometimes by cohorts and sometimes not), in terms of age and matrimonial status, and in terms of age at marriage and duration of marriage.

II.3.11. The problem is to forecast correctly not only the final number of children of each woman or couple, but also the changes in the spacing of the births. It was thought that this problem could be solved by questioning married women, using a special survey to discover their expectations about the size of their own families; but this proved vain. The family size expected does not remain constant, and furthermore the future birth rate will be largely the responsibility of women not yet married (and even not yet born). Again, couples' expectations about the spacing of births are somewhat vague, and statements about the expected size of a family seem to be a matter of fashion. The recent fall in fertility was not reflected in the level of expectations, which puts their usefulness, as far as forecasting is concerned, seriously in doubt.

II.3.12. It does not seem to us that forecasting would be improved by further increasing the specificity of the relevant indices; in any case, it is hard to imagine how the official statistics of the industrial countries could collect more information on the characteristics of births and parents without wearying the public and thus endangering the quality of the replies. There are two possible new approaches. One would be further to elucidate theoretical relations between measurements by calendar year and measurements by cohorts. The other, more important, would be to find out more about what determines procreative behaviour, and to go beyond the somewhat naive approach of simply asking women about the kind of family they desire and expect; different methods of research can be used to measure individual aspirations and expectations about fertility which have recourse mainly to projective tests, utility functions of the family size, variable schemes of family size formation incorporating the differential use of contraceptive methods, etc. Here forecasting merges into basic research into fertility and social values.

II.3.13. Migration forecasting remains the most delicate sector of demographic forecasting, for several reasons. First, data on migration,both internal and external

are far from satisfactory; indeed few countries even require a declaration of residence. Second, clandestine immigration is common and, again, emigrants' departures often escape the statistical net. Lastly, migrations (particularly external ones) are influenced more than other demographic phenomena by economic and political considerations, so that simple extrapolation of past trends may be more misleading than usual. So predictions about this factor are bound to be unreliable; many countries project only the migratory balance (immigration minus emigration or vice versa) which is then broken down by age and added to the forecast. Others use a model estimate (a somewhat arbitrary round figure) of the migratory balance. Others again attempt to forecast the flow of immigration amd emigration on the basis of more or less plausible assumptions. But all distinguish two types of forecast: one with migration and one without. The characteristics of emigrants being generally different from those of immigrants, we feel it preferable to assess the two flows separately; the migratory balance also has the disadvantage of representing a difference between two quantities and may therefore fluctuate quite erratically. But the main problem is to learn more about the causes of migration, the better to be able to forecast it; these causes are complex, depending not only on economic conditions but also upon the individual characters of the migrants. Various econometric works have attempted to pinpoint them, but their usual defect is that they are based on aggregate variables which do not really explain individual behaviour. A more hopeful approach might be to incorporate into a single model the individual variables, and some contextual variables as indicators of socio-economic conditions. One would also have to include political factors, since one may expect the political powers (national or supranational) to intervene more. Once again, it would be difficult to separate demographic forecasting from basic research, this time into the causes of population movement.

Assessment of demographic forecasting

II.3.14. When the forecast is a projection, there is no need to assess it (except in the sense of checking the calculations). When the forecast is a prediction, one may and most certainly must compare it with reality when the time comes. One can also compare an older prediction with a more recent one. Experience shows that long-term demographic predictions have not on the whole been very accurate; estimates of the course of fertility and of spatial mobility have often been very faulty. Still,

we are sure that demographic forecasts remain indispensable. Firstly, one can quite easily forecast the size of the population presently alive, if migration is not too important, which at once makes it possible to forecast, for example, the development of the school-age or working-age population, in the short and medium terms. At the national level the external migration balance is usually fairly limited; thus in this case one can make forecasts based essentially on the natural trend of the population, which is less subject to the hazards of the economic and political situation than is migration. Lastly, although the future is as obscure to him as to everyone else, the demographer is probably better than others at avoiding obvious mistakes, such as neglecting the effect of the age structure on the trend, or forecasting fertility on the basis of transitory behaviour. And population forecasts may certainly serve as a basis for action, even if they only draw the attention of the politician to the consequences that the realisation of the basic assumptions of the forecast would have.

International programmes from the European viewpoint

II.3.15. Various programmes for the coordination of and research in demographic forecasting have been set up, particularly by OECD and the United Nations.

About every five years since 1957, the OECD has published a report on the population forecasts of its member countries. The OECD does not make these forecasts itself, but coordinates those produced by the statistical agencies of the member governments. The member governments have all agreed in OECD to take a single starting point (1st January 1970, for the last forecasts published), and to produce the results according to a common pattern, with the same stages of projections, same terms of projection, and same presentation. They have not agreed on any particular methodology, but they have agreed that two projections, with and without migration, should be drawn up, that the 'most reasonable' assumptions should be adopted for fertility, mortality and migration, and that possible variants should be clarified. The OECD also coordinates projections of households and working population made by the members on the basis of population Forecasts. The material is collected on a questionnaire devised by the OECD for the member countries.

II.3.16 The United Nations' programme is very similar. Forecasts on a worldwide, regional and national scale were published in 1952, 1955, 1958, 1966 and 1973. Here too the member countries, or at least the industrial ones, were asked to provide forecasts about their respective populations. As far as Europe was concerned, the project was answerable to the 'Conference of European Statisticians' convened by the U.N. Statistical Commission and the U.N. Economic Commission for Europe. As with OECD, the United Nations did not standardise any methodology, but aimed at unifying the starting dates and results of the forecasts.

II.3.17. Besides these two general programmes, there are several international undertakings more specifically concerned with international migration. The OECD recently set up a 'Permanent System of Migration Observation' (SOPEMI), whose aim is to note the movement of workers from one European country to another: the system is based on the reports of correspondents chosen personally. The United Nations has just set up a new project for the exchange of data on international migration, which should enable a country to know more about the size of its emigration indirectly through the immigration statistics of other countries. Lastly, the Council of Europe has passed a resolution inviting the 'Intergovernmental Council for European Migration' (CIME) to consider implementing a joint project for the elaboration of medium and long-term forecasts of migration within Europe, also taking into account the countries of emigration of the non-European Mediterranean. The CIME has expressed the wish to work together with the other organisations active in this field.

The role of the European Communities

II.3.18 At present the European Communities do not make or coordinate population forecasts (though they do collect available forecasts made by the member countries). Their only existing programmes aim at coordinating the censuses of the member countries, and at drawing up migration statistics on a common basis, the latter being still under discussion. But the Community Statistical Office has recently proposed to approach member states for information about current and future population projections on the national and regional levels, and to discuss a system of projections on a uniform basis for member countries.

II.3.19 It is obvious that in its policy-making the Community cannot ignore demographic forecasts, since its own policies may influence the demographic

variables (for instance, labour policy will influence spatial mobility) and conversely changes in demographic variables could affect the Community's policies (for example, a very low fertility would make for yet older populations, and would influence labour and health policies among others). In particular, methods of fertility control have changed radically in the last ten years and it is to be expected that they will become even safer and more certain in the next ten years. A method of preventing conception after intercourse or of terminating pregnancy very early may become available. Women may then be able freely to determine for themselves how many children they will bear. Fertility could be reduced to a level which could halt population growth or even lead to an eventual decline of population in developed countries. The outcome cannot be known yet, but the possibility of considerable changes in the age distribution of the population must be remembered in forecasting social, health, education, housing and employment requirements.

II.3.20. The Community could also monitor the effects of possible national population policies (none actually exist at present in the Community) and in some cases - such as migration - establish its own policy in this field. The Community might also in time be led to make its own forecasts, its own estimates and projections, particularly since in Europe many natural socio-economic regions straddle national frontiers, and are commonly neglected in national forecasting.

We think the Community might well also encourage more basic research into what determines mortality, fertility and spatial mobility, largely by following the main lines of research outlined above.

But above all, of course, we are sure the Community must include demographic inputs in any general work of social, economic and technological forecasting it may undertake. If you don't know how many people you are forecasting things for, and people of what sort, then your forecasting is so much wind. Demography is a necessary condition of all forecasting.

Recommendations

II.3.21 Practically speaking, therefore, we think that, whatever Community forecasting unit is set up, it should ensure these inputs. It should obtain from the C.S.O., from the member governments' statistical departments, and from OECD and the United Nations whatever material it needs, some of

which would of course be published in any case. Its next task would be to forecast future inter-relations between Community population and Community policy, particularly when the repercussions transcend national frontiers or when the Community is involved as such, for example spatial mobility within the Community following the freedom of movement, or the demographic and economic effects of a Community policy on immigration from outside the Common Market. Its third, and most important, task would be to provide the demographic data needed by the specialists in economic and social affairs to work out the general forecasts and assessments which will be the main part of its work. It is precisely in the inter-relations between human activities that demographic forecasting should increasingly be active. Lastly, Europe Plus Thirty should, we think, advise the European Commission on any basic programme of research which it may wish to sponsor through Community contracts or financed nationally in universities and learned institutions, into those aspects of human behaviour which determine population levels and structures. This, as we have stated above, seems to us the next step in the necessary development of the science of demography itself.

II.3.22. As with climatology, we think that Europe Plus Thirty should be able to call on the part-time services of one or two highly skilled demographers. The main work is already done elsewhere, and it will be enough if Europe Plus Thirty is assured of access to it, and of the best possible specialist help in selecting and handling the data necessary for its own work. As with climatology and with education (see below) it should from time to time call conferences or seminars on the subject, and commission special studies.

PART II

4. AGRICULTURE, FISHERIES AND FORESTRY

General background

II.4.1. The rapid technical development in agriculture in the Western countries in the last hundred years has been largely stimulated by government research which has not only made it possible for production to keep pace with the growing population, but also for a steadily shrinking fraction of the working population to be engaged in it.

Because of the low price elasticity of both supply and demand, the largely uncontrollable yield fluctuations, and the related instability of agricultural markets, in practically all the industrialised countries the prices of agricultural raw materials on the domestic market are subject to government intervention, to protect either the consumer or the producer against the uncertainties of free market forces.

II.4.2. With fisheries, the situation is different. Outside certain narrow national limits (which are likely to be changed by the third U.N. Conference on the Law of the Sea), fish are a common resource, to which access is open. The industry increasingly uses techniques of industrialised hunting, and governments subsidise fishing fleets not only to protect consumer and producer against market forces and natural fluctuations in the stock of fish, but also to protect the national "take" of the common resource against other, competitively subsidised, national efforts. Fisheries are now heavily over-capitalised; the same catch could often be obtained for half the effort. Until recently it was widely believed that the world catch could be doubled or trebled without more than local damage to stocks from overfishing, but this view no longer prevails. The world fish catch, measured by weight, nearly doubled between 1958 and 1968; but since 1968, despite a continued increase in fishing effort, it has failed to increase, and in some seas has fallen. Only costs have continued to rise. Effective fishery management, including the regulation of access, could still improve prospects for another increase in the availability of fish protein, and a reduction in the cost of obtaining it.

II.4.3. In agriculture, major structural changes have occurred both in consumption and in the production, processing and distribution of vegetable and animal products. The calorific value of food consumption per head in the countries of the West is very high (c. 3000 kcal); it is now at a stand-still or barely increasing, but the volume of agricultural production is still going up. This is due to the replacement of vegetable by animal products, which requires an increasing conversion of vegetable material into meat, with a substantial loss of calories; e.g., in order to produce 100 calories in the form of pork an intake of approximately 400 calories in the form of fodder is needed.

II.4.4. Some of the feed intake is waste as regards human consumption; some is not. Take for instance fish used for feed (and sometimes for fertilizer). There are three distinct cases, namely: a) fish which cannot be used directly as food (e.g. anchoveta, fish waste), b) fish which, though originally suitable for human food, is processed as meal (or fertiliser) because it is damaged or stale, and c) fish which, though suitable for human food, is processed into meal or fertilizer for economic reasons (e.g. North Sea herring). Obviously the intrinsic soundness of the operation is different in the three cases.

II.4.5. Urbanisation and regional specialisation within agriculture, fishing, and food processing have (within Europe) widened the average distance between production and final consumption. Thus the supply and distribution of food has become increasingly dependent upon the trade and transport system.

II.4.6. In agriculture, the trendwise increase in yield per ha. (c. 2% annually) is accompanied by an increasing use of fertilizers and crop protection agents. In the member countries of the EEC the use of fertilizers has increased fourfold since 1950.

II.4.7. In farming, the general increase in prosperity has led to the large-scale replacement of manual workers by machinery, which is a way of replacing solar energy by fossil energy. In the last 20 years the number of agricultural workers fell by about half in the EEC countries, the decrease in animal power was even greater, and the use of tractors and other engines and the use of energy (oil, gas, electricity) has increased four times.

Mechanisation and automation require larger farms, and fewer farmers. Despite the decrease in the number of farms - 2½% per annum in the EEC since 1960 - the small family farm is still characteristic of West European agriculture. Within the Community about 80% of farms are smaller than 20 ha. (45% in the UK, but 95% in Italy). Since 1960 the average size of farms bigger than 1 ha. has only increased from 12½ to 15½ ha.

II.4.8. Parallel processes have operated in fishing. Recent increases in the total catch of the nine EEC countries have been modest (1948: c. 3 m tonnes; 1958: c. 3.6 m tonnes; 1968: c. 4.8 m tonnes; 1973: 4.76 m tonnes) but there has been a parallel reduction in manpower, and a parallel increase in the average size and capacity of vessels and equipment, and in the average consumption of energy expended per unit of food obtained. Equally, there are communities of small inshore fishermen, using traditional, small-scale, low-energy methods,whose way of life has changed as little as that of some small farmers.

II.4.9. In the growing sector of food processing, on the other hand, pronounced tendencies towards concentration are afoot. The food processing industry is expanding its influence on the raw materials market (contract farming) and on the distribution of the end-product. The advent of supermarkets etc. has also caused change in the distribution pattern of foodstuffs, which increases the need for food processing (standardisation, packaging, etc.).

All this has been made possible by cheap fossil fuels.

II.4.10. For the most part, the Community eats home-grown food. The following figure shows the relation between home supply and home consumption (breakeven point = 100) of important food items (av. 1972).

TABLE 1

	Whole EEC	France	West Germany	Italy	UK	Netherlands	Belgium & Luxbg	Denmark	Ireland
Grains*	90	168	79	67		28	43	97	63
Sugar*	92	162	96	72	32	111	217	125	108
Potatoes*	101	102	96	90	98	134	97	108	103
Meat	92	94	82	69	67	174	123	345	244
Butter	106	122	114	74	23	388	121	323	203
Cheese	102	116	85	80	61	224	48	246	522
Vegetables	94	97	39	111	74	198	119	82	117
Fruit	76	96	40	128	32	63	60	56	25
Oils & Fats		45	33	57		29	29		

*Data for 1972/73

The United Kingdom, West Germany and Italy are predominantly importers of agricultural products; France, the Netherlands, Ireland and Denmark have for many products an export surplus. These differences are compensated for by intra-EEC trade (as the first column shows). Trade with third countries is increasing. In 1972 the values(in units of account) of imports and exports of agricultural raw materials and food from third countries were as follows:

Imports	13.1	(bill. units of account)
Exports	3.8	(")
Balance	-9.3	(")

The balance of trade with the four main blocs of partners was as follows:

U.S.A.	-1.6
Other Developed countries	-2.2
Developing "	-4.5
Communist "	-1.0
	-9.3

For the most part the imports of the Community are tropical agricultural products and raw material for fodder.

II.4.11. Among the member countries there are considerable differences in food consumption habits, partly traditional, partly as a consequence of different prosperity levels. The following table shows the average individual consumption (in kg per head) of important food items in the member countries (av. 1972):

TABLE 2 (1)

	Wheat flour*	Potatoes*	Sugar*	Meat	Fish*	Butter	Margarine
France	73	94	35	97	14.4	8.6	3.3
West Germany	67	94	34	87	9.1	7.1	9.2
Italy	129	39	30	62	11.1	1.9	0.7
United Kingdom		99		78	16.4	7.2	6.3
Netherlands	62	83	45	67	8.6	2.0	17.9
Belgium/Luxb.	77	111	28	85	5.4	8.2	12.8
Denmark	66	69	48	64	31.8	8.6	18.2
Ireland	83	117	46	86	8.2	12.4	

* Data for 1972/73

The consumption of meat, vegetables and fruit has grown regularly during recent decades, whilst the consumption of bread and potatoes has decreased.

(1) Source for Tables 1 and 2 : EUROSTAT

II.4.12. As regards agriculture, the European Communities already possess wide powers and instruments via the Common Agricultural Policy (CAP); it is in fact the only field in which the Community has real supra-national authority. As regards fisheries, its authority and functions have been comparatively slow to develop. This will change in the likely event of UNCLOS III permitting coastal states to establish,either individually or grouped in regional bodies, an Exclusive Economic Zone (EEZ) of up to 200 nautical miles, within which exclusively to exploit the natural resources (and perhaps also to control pollution and scientific research).

II.4.13. In the longer term the Community's responsibility, and the need for knowledge and insight deriving from it, may extend to the following fields:

- ensuring the food supply within the EEC quantitatively and qualitatively, including safety from biological, chemical, or radiation contamination.
- the efficiency of food production within the socio-economic frame-work of the EEC, both on land, in coastal waters, and within the EEZ of member states;
- the contribution that the EEC should make to the improvement of the world food supply;
- the distribution of income between the agricultural, fishery, and the other sectors, and the quality of life in rural regions and fishing communities;
- the dependence of food supply on energy and raw materials, and energy budgeting within agriculture and the fishing industry;
- the ecological aspects of modern agriculture and fisheries;
- substitution between vegetable and animal products (food, timber, fibres, fodder, fertilizer, etc.) and synthetic raw materials;
- sea-use planning, or the priorities to be observed between different uses of a given area of sea.

All these may conflict with one another.

Agriculture

Objectives and instruments of the Common Agricultural Policy

II.4.14. The establishment of a common market for agricultural produce required a supranational agricultural policy to take over the function of the former national policies for price stabilisation and income support.

The goal of the CAP is to guarantee a reasonable income for the farming population, and its main instrument is a price policy. Within the EC a price level is laid down for a number of important agricultural products which offers a reasonable remuneration for the producers. Via a complicated system of market regulation, the domestic market is therefore detached from erratic price movements on the international markets. Variable levies and subsidies on imports and exports are an essential part of the CAP, and so are intervention measures (support buying, stock financing, encouragement of consumption). Insofar as internal production differs from internal demand, equilibrium on the internal market is pursued by influencing foreign trade. Disequilibria on the internal market are thus passed on to the international markets.

II.4.15. The manner in which the CAP supports the incomes of agricultural producers means that consumers of foodstuffs have to pay a price regarded as reasonable reimbursement for agricultural production within the Community. When production differs from domestic consumption, the costs of import or export subsidies (dependent on the price level outside the Common Market) and of possible interventions on the internal market are borne by the European Guidance and Guarantee Fund. The yield of levies on imports or exports constitute the revenues of the Fund. In past years it has become clear how sensitive the Fund's budget is to disequilibria on the home market and to price movements on the international markets. Butter and meat "mountains" have caused the outgoings from the Fund to reach alarming proportions, and have led to politically highly damaging sales of meat and butter to the Soviet Union at prices much lower than those paid by the consumer within the Community. If charitable subsidies are to be paid to Eastern Europe, we take it for granted the Community would wish as soon as possible to obtain forecasting good enough to ensure that that is done by political decision, and not by economic accident.

II.4.16. If agricultural production in the EEC continues to increase faster than consumption, the budgetary burdens of the CAP could continue to grow apace, depending on price levels outside. The CAP can exert only little influence on the long-term developments of supply and demand with respect to food products within the EEC. In fact it does not do much more than tinker with the problem in the short term, by comparing a given internal supply and a given internal demand and by using foreign trade

as a manipulable balancing quantity. Only when this remedy threatens to become too expensive, as with butter and meat, is an attempt made to influence domestic production by changes in relative prices or by incidental measures such as bonuses for switching to a different type of farming, slaughtering grants, etc. Little is known about the effect of such measures, but, in its Memorandum on adjustment of the common agricultural policy (October 1973) the Commission recognises the need for a better "grip" on the volume and composition of production to prevent too great a call on the Fund.

II.4.17. It is also an object of the CAP to encourage structural adjustments in production. In this field responsibility is still vested primarily in the Member States. The EEC is trying to coordinate these activities and to key them to common interests. The structural changes in agriculture (increase in farm size, retrenchment of labour, forms of cooperation, contractual ties with trade and industry) have been caused by rapid overall economic growth and technical development, and the present structural policy aims further to reduce the number of farmers and farmworkers (alternative employment, retraining, schemes for farm amalgamation), to improve the infrastructure (opening up of remote areas, re-allocation of holdings, water control), and to modernise farm equipment (interest subsidies for certain investments). In this connection "efficiency" has so far been interpreted above all as lower costs per unit of product for the individual agricultural entrepreneur.

Widening the objectives and the need for policy-oriented forecasting

II.4.18. Even within the limited objectives of the present CAP there is a great need for research into the long-term development of supply and demand. Forecasting in this field has confined itself too much to an extrapolation of historical trends, and, as we argued in our General Introduction, this alone is never much use.

II.4.19. On the basis of its permanent supranational responsibility for food and agriculture, the EEC will have to widen and deepen its policy. It will not be able to confine itself simply to reacting to more or less autonomous developments in production and consumption. The increasing interweaving of these developments with other social interests (both inside and outside the Community) will make it necessary to formulate explicit longer-term objectives with respect to volume, composition, and technical and economic organisation of food production. The need for policy-oriented forecasting will become more urgent.

II.4.20. The great world food shortage since 1972, which harms most those least able to help themselves, spotlights the role that the agricultural policy of the rich countries (and therefore of the EEC) should play in improving the world food situation. In the short term the wealthy countries, with their agricultural technology, may be called upon to face acute emergency situations by increasing food aid and by building up and financing strategic food stocks. But in the longer term a solution to the world problem can be attained only by stepping up agricultural production in the poor countries themselves, for which financial and technical assistance will have to be increased. Moreover, the agricultural policy by which the rich countries protect their own farmers will have to be amended, in order to achieve stable prices in world markets. The wealthy countries will be able to achieve these conditions by controlling their own production (and if necessary their own consumption too) so as to avoid disrupting the international markets both by price-cutting and by price-raising. This would call for policies capable of influencing the development of agricultural production and food consumption much more effectively than the present market-regulating measures, and devising and comparing alternative policies would call for substantial forecasting. In this, EEC policy will need the backing of research into long-term developments in food on a world-wide scale. This research should be carried out in close cooperation with FAO and OECD. It requires a multidisciplinary approach in agriculture, economics, demography, sociology, oceanography, climatology, etc.

II.4.21. The energy and raw materials shortage has made us aware of the vulnerability of our food supplies. Recent studies of the consumption of fossil energy will have to extend to the whole chain of the food supply, the transportation and processing of foodstuffs, and their physical location. The merits of alternative production systems must also be evaluated with reference to our long-term expectation about the price of energy and raw materials for food production (more or less regional specialisation in agricultural production and food-processing; alternative degrees of mechanisation and of fertilizer use). The agricultural sector is not only a consumer of fossil energy; it can also bring forth products which are useful as fuel (straw, wood, alcohol).

II.4.22. As we noted above, there is increasing concern about the environmental impacts of modern agriculture, particularly pollution, ecological disturbance, and the spoiling of beautiful landscapes by asbestos barns, by the grubbing up of orchards and hedges, and by the destruction of fine old farm buildings. Forecasting could help assess alternative ways of meeting this concern.

II.4.23. Whether or not battery-reared and fish-fed veal, bacon, or chicken is as good for you as the natural variety, it is certainly not as nice, and everywhere people are ready to pay more for the natural taste. In an industry which stood more or less on its own feet, that would not be a reason for forecasting. But agriculture is, in the Community, highly dependent on public power, and that means the forecasting done for the public power should include this matter.

II.4.24. Present agricultural policy bears obvious traces of the "growth philosophy" of the Fifties and Sixties. Price support as the principal instrument of income policy perpetuates the prevailing income differentials due to differences in farm size. The resulting economic situation led to an increase in farm size and socially undesirable side-effects, such as depopulation of the countryside, turning rural areas into business centres, demand for more jobs in non-agricultural sectors etc. Now that increase in productivity has become a highly conditional objective in our society, there is every reason fundamentally to rethink the part that the agricultural sector should play. This rethinking makes forward-looking research desirable into the effects that alternative forms of production might have on income distribution, population density in rural regions, competition within the EEC and with non-member countries, burdens on the Fund, etc., and above all on employment outside agriculture.

Fisheries

II.4.25. The period during which exclusive economic zones (EEZ's) are likely to be established in the U.N. coincides with that during which the Council of Ministers of the Community, according to the 1973 Act of Accession, "shall examine the provisions which could follow the derogation, in force until December 31st 1982", from normal Community rules concerning non-discrimination towards other member states'

citizens and enterprises. At present this derogation merely allows protection to local inshore fishermen to certain specified waters off Britain, Denmark, and Ireland. But, because the establishment of EEZ's will permit the regulation of access to what are now High Seas Fisheries, the examination could well embrace the whole subject of the Community's functions and policy relating to offshore development and sea use planning within the new zones. Productive European fisheries are only one aspect of this.

II.4.26. Sea use planning as a concept, which we discuss in II.12 below, is scarcely beyond the embryonic stage, and fishery management, which must now be developed as a function of government, is still in its infancy. Under international law access to all fisheries beyond 12 nautical miles (n.m.) from the shore has up to now been open, and state membership of International Fishery Commissions, and observance of the restrictions the Commissions propose, has been, in effect, voluntary.

II.4.27. Fast moving and powerfully equipped distant water fishing fleets are now ubiquitous; they are able to engage in "pulse-fishing", to clear one area and swiftly move on to the next. The Russian and the Japanese fleets are by far the largest. Between them, according to FAO figures, the Soviet Union and Japan in 1973 landed nearly 30% of the world catch; in 1968 it had been 23% and in 1958, 21%. Flag-of-convenience fishing vessels are also now operating - vessels, that is, registered in states which do not observe or enforce international norms of crewing, safety, pollution control, etc. These developments will face the EEC with quite unfamiliar problems of physical enforcement. Indeed, the establishment of EEZ's will for the first time enable coastal governments, singly or preferably in regional groupings, effectively to manage the fisheries off their shores. Fisheries in the North East Atlantic, and particularly in the North Sea, are some of the most prolific in the world; while those in the Mediterranean, though less prolific, are, in money terms, particularly valuable. In each area there are non-EEC countries conducting important fisheries, and Community fishery management policies will need, from the beginning, to be coordinated with the governments, fishing industries, and research organisations of these neighbour countries.

II.4.28. Although fishery statistics are notoriously uncertain, and the dynamics of individual fish stocks still obscure, considerable information is available from national, regional and international sources. The International Council for the Exploration of the Seas (ICES) at Copenhagen, OECD, FAO, and certain other bodies all conduct research and collect and publish information. None of it is policy-oriented, in the way that will be required when the regulation and management of all off-shore resources falls, by international agreement, to the coastal state, and, thereby in turn, to the European Communities.

Forestry

Developments in the world

II.4.29. Demand for timber is strongly dependent on technical development. In the U.S. the annual consumption comes to about 2000 m^3 per 1000 inhabitants, of which nearly 50% is in the form of pulpwood (raw material for the paper industry); the level in the Community is about 800 m^3 per 1000 inhabitants, with the same percentage for pulpwood. In developing countries the volume of accessible forests is the determining factor; wood is mainly used as fuel. FAO projections show a rapid increase of world demand for timber, especially given the growing need of the paper industry. (We do not need to repeat our view of projection.)

II.4.30. The average annual growth of timber in existing forests limits production if reserves are to be maintained. In many areas this limit has not yet been reached. Nevertheless, large areas of natural forests in tropical regions are being lost by injudicious unplanned felling, or by turning forests into farm land.

On continuation of present trends it must be feared that eventually a structural world deficiency of timber may arise. There are also climatogenic implications. The threatening scarcity might be countered by enlarging the forest areas. Because of the long time of maturing (15 to 50 years, according to the sort of tree) early planning is imperative. Forestry, therefore, is a subject that stringently requires long-term forecasting.

II.4.31. The EEC is not rich in forests. For each 1000 inhabitants there are 110 ha. against 1450 in the U.S. or 3100 ha. in the Soviet Union. The Community has to import about 50% of its wood (for the UK and for the Netherlands this percentage is still higher). The annual value of these imports is more than 5 billion units of account. Most of the imports are pulpwood; the paper industry in the EEC is 80% dependent on imports from third countries. But the export surplus of the traditional suppliers (Canada, Northern and Eastern Europe) is diminishing fast as home demand increases, and there is a tendency there to manufacture paper for export rathr than to export the raw material. This adds to the vulnerability of the EEC timber supply.

II.4.32. The European Commission encourages afforestation in areas less suited for farm production. The Commission's main purpose is to improve the farm land structure, e.g. by protection against storms, and better equilibrium between soil and water. But the production of timber is also promoted because of the growing demand and because of the favourable labour aspects for the agricultural population. Forestry does not need daily attention; it can neatly be scheduled in the yearly pattern of farm work, it provides a welcome supplementary employment, especially in mountainous and remote areas, and many people from outside agriculture like to lend a hand. It is enjoyable work for the healthy.

Need for long-term forecasting

II.4.33 All this will require a thorough analysis of the future supply of and demand for timber, both in the Community and in third countries. Cooperation with FAO and OECD in the research work is desirable.

The necessary research should cover all the possibilities which might contribute to a less vulnerable position for the Community. This involves the substitution of wood by man-made materials, particularly in the packaging industry, economising on wood consumption by cutting down waste (e.g. sawing, production of cellulose), and the effect on paper use of introducing modern telecommunications systems.

II.4.34. The research should evaluate the possibilities of a larger timber production within the Community, observing all the consequences on other fields, e.g. food production. Higher yields from the existing forests through better exploitation and the introduction of fast-

growing varieties may be attainable. In the long run, however, a reduced dependence on imports - if that is desirable - can only be realised by an enlargement of the forest area.

II.4.35. Forests not only provide wood; they also stabilise and enrich the environment, afford space for recreation, and differentiation of the inland scenery. A consistent long-term forestry policy should take into account all the manifold aspects involved. The same goes, of course, for policy-oriented forecasting in forestry.

Character of policy-oriented forecasting

Object of forecasting

II.4.36. The many interests mentioned in the preceding sections are closely interwoven and often competitive. Forecasting will therefore have to be of an overall nature. It will have to try to indicate the influence of alternative future developments on all relevant subfields (e.g. the internal food supply, the world food situation, environment, the call on raw materials, the uses made of the seas, income and employment distribution etc.). This overall forecasting must therefore be of a multidisciplinary nature. It will clearly have to be geared to the problems facing policy-making agencies, which means that policy variables should be explicitly introduced into a forecasting model so that the policy-maker can weigh the effect of alternative measures.

II.4.37. If forecasting is to meet this requirement, research should try to identify the causal relations in the socio-economic process. For the food supply system, for instance, in addition to quantitative information on the technical input-output relations in the various links in the production chain, insight is needed into the conduct of the "actors", i.e. the producers and consumers of food, in order to assist the policy-maker in the formulation of objectives, which must often be pursued by influencing behaviour (via prices, taxes, restrictions, etc.)

Practical considerations

II.4.38. Important preliminary work has already been done in this field by a working party which has reported on forecasts for agriculture on the instructions of the European Commission[1]. Partly as a result of

1) "Landwirtschaftliche Vorausschätzungen", Hausmitteilungen über Landwirtschaft Nr. 48 (Sept. 1969) and Nr. 63 (October 1970), EEC Commission, Directorate-General for Agriculture.

this report, the European Commission (Directorate-General for Agriculture) has made a forecast of production and consumption of agricultural products in 1977 in the EEC. The results have been published.(1) This study was carried out in cooperation by six institutes from different Member States, and the forecast for the EEC is the sum of the forecasts made for the separate Member States. Differences in the statistical base material imposed restrictions on the methods used, which are not identical for the various countries. The forecasts make common assumptions regarding developments outside the agricultural sector (incomes, prices, unchanged policy). The forecast of future production is based mainly on trend extrapolation; owing to shortage of data and time, advanced techniques could not be employed.

Recommendations

II.4.39 Policy-oriented research will have the best chance of success if it can take place within a central instrument at Community level which also does forecasting in other fields. The research team which within Europe Plus Thirty will be charged with forecasting in the agriculture, fisheries and forestry sector should consist of about 7 persons, viz: 2 agricultural scientists, 1 expert in fisheries, 2 agricultural economists and 2 econometricians. Looking outwards, it should keep in close touch not only with FAO, but also with the proposed International Food Policy Research Institute in Washington, if the latter comes into being. Looking inwards, it should maintain close contacts with experts in research institutes at national level for technical and economic know-how in subfields and regional statistical information. But the main emphasis of the research will have to fall on the central team. This set-up is also the best guarantee of close interaction between research workers and those who hope to make use of the results, in order to achieve policy objectives. Up to now the gap between the two parties has often been too great, to the detriment of both research and policy. As far as fisheries is concerned, the research has not been done at all.

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(1) "Projektionen über Erzeugung und Verbrauch landwirtschaftlicher Erzeugnisse 1977", Hausmitteilungen über Landwirtschaft Nr. 129 (April 1974).

5. HEALTH

Present pattern

II.5. 1. The countries of the Community have health patterns which are broadly similar. The differences derive at least in part from differences in the environment and in the national services for the protection or promotion of health. Professional health services are available in all countries at approximately the same level of sophistication, though there are wide differences in their organisation and accessibility to the public. These factors affect the practicability of long term forecasting for the Community as a whole.

II.5. 2. It is possible to define in general terms the factors which influence health and from recent trends to suggest what kind of development may be expected in the future. But the likely progress in science relevant to medicine cannot be projected from present knowledge beyond some cautious estimates for the next decade. Scientific advances could make possible major changes in our ability to prevent or delay the onset of chronic disease, including cancer, or arrest or control its course. Social and environmental factors could affect the incidence and severity of accidents which are a principal cause of disability and death. The great advances in control of acute and curable diseases, apart from mental illness, have mostly been achieved already.

II.5. 3. Progress in developing the health services has been by a series of short steps with occasional longer strides at times propitious for change, such as the combination of circumstances social, material and political, in Britain at the end of the World War II. The pressures for orderly development and the rising cost are causing a general drift in all countries toward greater centralisation, using regional and local planning within national policies. The method of financing services differs considerably within the nine countries: the use of insurance and of payment by fee per service on the one hand, or central taxation and salary or capitation on the other, has an effect on the

form of the service to patients. It does not seem likely that the pressures for change will lead all countries to an almost identical pattern, as has happened in Eastern Europe, but there may well be far greater similarities in the future than exist now. Certainly there are opportunities within the Community for other members to make substantial improvements by applying methods proven by individual countries in an idiom suitable to themselves.

The changing cost

II.5.4. All member countries spend between 5.0 and 7.0 per cent of their GNP on health. All have broadly similar statistical indices of health, with marginal differences in favour of the Netherlands and Denmark. These indices do not suggest that the amount spent on health correlates closely with the result achieved, but rather that some systems may operate more economically than others for much the same result. We discussed this phenomenon in I.4 above.

II.5.5. The cost of health care has been escalating rapidly during the last 15 years - more in some countries than in others - so that it has become clear that selection of priorities will be necessary in future. No country will be able to provide all the services that would be technically practicable, given the resources. The total demand that such services would make on trained manpower and on money would become prohibitive. Such selection as is practised now is intuitive rather than rational, and all our countries urgently need to devise improved methods of choice and of application of choices.

The precursors of current changes

II.5.6. A recent report by the Canadian Department of Health[1] identifies four main components which will affect health in the future as: human biology, environment, lifestyle, and health care organisation. These are components that have not been clearly evaluated in the past, perhaps because the preoccupation has been mainly medical, and thus disposed to attribute more of the demonstrable health improvement to technical medical intervention than can be justified in a dispassionate assessment.

II.5.7. Life expectancy has greatly increased in all our countries during this century, but that process began in the 18th century when the rapid

(1) Lalonde M.: "A New Perspective on the Health of Canadians", 1974, Canadian Ministry of National Health and Welfare.

increase in population, first in France and later in Britain, began. Similar increases occurred in other countries, though not on exactly the same time scale. They were probably mainly attributable to better nutrition, to improved sanitation and housing, and to better public understanding of the contribution these general factors make to health. The direct contribution of medicine through therapy was limited until the last forty years or so.

II.5. 8. Mortality in infancy is now little more than one tenth of that of a century ago. The present low infant mortality rate of 12 to 20 per 1000 may be expected to fall further in all the nine countries, perhaps to a figure as low as 10; but even this cannot produce a large effect on overall life expectancy. Drugs effective against a wide range of infections and vaccines which give specific protection against many common epidemic diseases mainly affecting children have been developed and made widely available in the last forty years and have produced further improvement.

II.5. 9. There is now a radical change of emphasis in health care from preoccupation with acute, potentially lethal, but often completely curable, disease to simple specific preventive programmes, and supportive and ameliorative treatment of chronic illness with the object of retardation rather than cure. The chief problems of the developing countries are still those of controlling infection and a large research effort is still needed in the Community directed against diseases that are now rare in our group of countries but still common in theirs, if we are to help them.

II.5.10. It is the experience of all the countries of the Community that the number of people over the age of 65 in the population has increased rapidly in the last 25 years and it is certain that this increase will continue during the next decade. Moreover during that time and in the following decade the number aged over 75 will increase proportionately even more. Since the very old make disproportionately large calls upon health services and institutions, the total load on the social budget, including the health budget, must increase.

II.5.11. All those who are born must eventually die; the great change during this century has been that most of us have grown or will grow old in our way to our deaths. Disease processes of various kinds develop more or

less insidiously as ageing proceeds. One or more of these morbid processes will finally be determined as the cause of death and one or more of them is likely to produce disability before - often long before - death. The great health problem of the future is thus the prevention or postponement of the clinical emergence of chronic degenerative disease and the disability which accompanies it. In all our countries by far the largest component is cardiovascular disease, especially of the coronary arteries. Accidents, poisoning and violence, the various forms of cancer, and chronic respiratory disease are the other main causes of death. In all the countries the age specific rates for women are less than for men, excluding cancer. Some relevant figures are given in Table 1 and show that an important factor in future health and social organisation will be the predominance of women in the older age groups.

TABLE 1

	Life Expectancy		Perinatal Mortality	Mortality per million			
				Males		Females	
	Males	Females		35-44	45-54	35-44	45-54
Belgium	68.3	74.3	25.1	2757	7722	1615	4240
Denmark	71.1	75.7	18.9	2311	5994	1886	4241
France	68.5	75.9	25.4	3650	8050	1773	4135
Irish Republic	69.3*	72.7*	26.1	2612	7393	1818	5181
Italy	69.9*	75.2*	32.4	2802	7046	1587	3796
Luxembourg	67.4	73.8	24.7*	3468	8901	1784	5000
Netherlands	71.1	76.5	19.6	2086	6100	1473	3418
West Germany	68.5	74.4	25.2	3051	7372	1919	4368
United Kingdom:							
England & Wales	69.1	75.1	23.7	2298	7242	1737	4379
Northern Ireland	69.3	74.0	29.2	2801	8263	1882	4720
Scotland	67.5	73.4	25.6	3195	8757	2098	5646

Source: WHO Health Statistics - quoted by Maxwell(1)
Year 1969 except*

(1) Maxwell, R. "Health Care: The Growing Dilemma" Pub. McKinsey & Co.

The possibility of reducing morbidity and mortality

II.5.12. Forecasting in various fields will be affected by changes in morbidity and mortality. We are in much the same position as our forebears a hundred years ago who were able to initiate changes in the sanitary condition of the population which were highly successful in the long run without knowing the scientific rationale of what they did. Once the nature of infective agents was known, the measures were made far more effective. The nature of the underlying degenerative processes may not be known, but some empirical measures undoubtedly would be successful now if the public could be persuaded to apply them. It is probable that identifiable external factors are responsible for the incidence of at least half of the cases of cancer, and cancer of some sites is almost wholly due to a known external cause. In Britain over a quarter of all deaths from cancer are due to cigarette smoking, and over one third of those in men; in the other countries the proportion, though not yet as high, is rising in both men and women. Some - probably most - changes which would have a beneficial effect on health require changes of habit or lifestyle by systematic individual effort, and those changes would be more likely if, for one thing, the commercial promotion and public facilitation of cigarette smoking were forbidden.

II.5.13. It is certain that some of the causative factors in degenerative and malignant disease will be more clearly understood within the next 30 years. It is to be expected that some of these factors will be chemical or physical, and present in circumstances which make it possible to remove or reduce them without calling upon a change in human behaviour.

II.5.14. Exposure to various chemical or physical agents in the work situation can be reduced or removed by statutory requirement. Some methods of working which produce damaging trauma over a long period can be modified. Other exposures which affect the unborn foetus will also be identified and modified in ways which will reduce the occurrence of prematurity and congenital defect, e.g. maternal smoking. Atmospheric pollution in general and exposure to dust and fume in the work situation will be modifiable. Some factors naturally present in food or added to it in processing may be incriminated. Abuse of alcohol and some psychotropic drugs are common socio-medical problems. Some potent therapeutic drugs may be shown to be toxic to some patients through idiosyncrasy or prolonged exposure and some may even be effective in the short term but associated with increase in malignant disease after prolonged use.

II.5.15. An association of softness in drinking water and raised mortality from cardiovascular disease has been shown in some countries, and a causal relationship if demonstrated would require substantial changes in the water and in the means of its distribution. It is probable also that the possibility of improving health by the addition of some factors to generally used food or water will be established. If so, better means of obtaining public and professional understanding will be needed if their use is not to be frustrated by uninformed opposition, like that to the fluoridation of drinking water.

II.5.16. It is probable that better understanding of diet and nutrition will be used to promote changes in dietary habits, which will affect agriculture. It is to be expected that the use of tobacco in the world will decline - perhaps to a large extent - as understanding spreads. The land used to grow it can then be used for food production (but a reduction in tobacco consumption would also increase the population). The consumption of sucrose may decline as a measure to reduce obesity and indirectly the occurrence of diabetes and perhaps heart disease. The use of animal fats may be reduced, and the choice of alternative vegetable fats may require changes in the type of rape seed used. If human wastes come to be used as fertilizer in Western agriculture as they commonly are in some Eastern countries, new precautions against the transmission of enteric infections will be needed.

II.5.17. Mental illness and handicap have been making increasing demands on health services for the last twenty years, but during that time methods used in those services have greatly improved. The Danish and Dutch services provide good examples. This has been mainly due to better medico-social management, assisted by the new drugs that have become available. The former high mortality from intercurrent infections in hospital populations of the mentally ill or handicapped has been reduced, and as a result those populations now include many older and more dependent persons. It is to be expected that improved pharmacological treatment of the mentally ill will become available, but more social support will then be needed for the larger population of older mentally enfeebled persons in the community or in hostels. For these, and for the mentally robust elderly, energy policies will need to take account of the necessity of adequate space heating in homes.

II.5.18. The study of human genetics has advanced rapidly in recent years but it is still at a fairly primitive stage. Popular fears about the possibility of "genetic engineering" probably go much too far, but genetic mechanisms will certainly have been elucidated and more precise prognoses will be available to intending parents, and in some societies artificial insemination by donor (AID) as well. Early prenatal diagnosis of some congenital handicaps will probably be possible so that such pregnancies can be terminated where the law permits. As we mentioned in II.3., methods of controlling pregnancy and parturition may become so safe and precise that they will largely be in the hands of women themselves.

II.5.19. Accidents are the cause of a large proportion of the deaths of younger men, and therefore contribute largely to the total years of life lost before the age of 65. If a substantial proportion of these years of productive life could be saved, the contribution to society would be greater than from a small average extension of the life span.

II.5.20. The problem of the increase in venereal disease is closely related to changes in sexual mores, and has only been controlled by social measures successfully in the Peoples' Republic of China. Vaccines could become available should their use be acceptable.

II.5.21. Modification of life-style could make a far greater contribution to the improvement of health and the prolongation of active life than more technical medical activities are likely to do by the year 2005. If such results are to be achieved, governments and the health professions will have to devise more effective measures of health education than they have yet deployed. To persuade the individual that his enjoyment and expectation of life would be enhanced by abstention from fast driving, smoking cigarettes, drinking more than small amounts of alcohol, over-eating, and lapsing into physical idleness at an early age, has not been seriously attempted. Intrusion into the social choices of the public and the profitability of certain industries would be necessary if governments were to take these possibilities seriously. The gain would be measured in years added to healthier lives - more than might be expected from intervention of any other kind. Since no country has been successful in any of this, the results of such meagre steps as have been taken should be exchanged amongst them. The work of Europe + 30 could not but show the benefits to be achieved.

II.5.22. Much highly sophisticated medical work is already undertaken for gains which may be problematical for the individual and even less certain for society. Pressure of financial constraints on the one hand and of emergence of new scientific possibilities on the other will certainly ensure that a deliberate selection of priorities within health services becomes normal practice.

A forecasting unit can project the trends of such studies and examine interactions with other trends.

II.5.23. This discussion has been mainly concerned with the scientific progress to be expected. The changing pattern of illness, the ageing of the population and the increasing potency of the drugs available for medical use will make the provision of satisfactory primary and continuing health care even more important. The means used to secure this vary somewhat, and in some countries it has become increasingly difficult to maintain a satisfactory health care team to work outside hospital. Changes in medical education and the organisation of medical practice are likely to be required as best fits the organisation of health and social security services in each country, but each can learn from the others. Hospitals may become more expensive concentrations of scientific facilities on one side but may also have increasing long stay components on the other. They will only be economically feasible and medically effective insofar as they are orientated towards the support of community care.

II.5.24. The main need of the countries of the Community is fuller exchange of information rather than adjustment to a single pattern. This can be developed from existing liaison arrangements. Long range forecasting on health prospects or bio-medical advance is hazardous and must be imprecise. The application of new bio-medical progress to organised health care could be greatly improved, but by national rather than international effort.

Recommendations

II.5.25. Europe Plus Thirty will need continuing medical input because health is affected by climate, environment, and energy, and both

affects and is affected by the shape of our populations, our institutions, economy, industry, food supply, education, and society in general. In all these Europe Plus Thirty should be doing forecasting, and medical inputs based on wide medical and allied scientific contacts are necessary. "Medical" is taken here to comprehend the health professions and related science.

I.5.26. The simplest way for Europe Plus Thirty to make some general prognostication about potential development in the bio-medical field will be to look at progress already being made but not yet generally applied, and we have given some examples of this above. It will therefore need continuing medical participation and a source of medical advice. On the other hand, it will not require a substantial medical section "in house". Even a whole time team member would probably not be a suitable solution because the kind of broad-based knowledge of the bio-medical field and practical association with health service required would diminish rapidly in an individual recruited for whole time work. A medical participant would need both a knowledge base to which expert associates continually contribute, and practical links with services. The best solution would be the part-time involvement of a senior medical member of an active university department or special institute such as might be found in several countries in the Community. Such a base department or institute might need strengthening so that the senior member would in effect lead a part-time team of other members of the staff. This would give a wider range of expertise and outside information sources. The leader of this group would need to work in close liaison with the Chief Medical Officers or equivalents in all nine countries, with the heads of national medical research agencies, and with WHO. The effect would be to give Europe Plus Thirty the equivalent of more than one whole time medical staff.

II.5.27. In short, we recommend broadly the same pattern here as we recommend for climatology, demography, and education: that Europe Plus Thirty should be able to call on the part-time services of the right people, and should call seminars as needed.

6. SOCIAL STRUCTURES AND VALUES

II.6.1. The vastness and variety of society, which makes forecasting about it so important, also makes it hard to forecast about. Unlike other sectoral forecasting (technological, demographic, economic, etc.) social forecasting is concerned with the system - society - that controls, and contains the behaviour of all the others. At the outset, therefore, we have to stress the difference of forecasting in this area from forecasting in all others. Society is the fabric itself within which all the other sectors we talk about are threads. All other variables and systems assume a context, and it is society.

II.6.2. In this chapter we shall not discuss the possibility of forecasting about this whole fabric, only forecasting about certain threads in it which we commonly call "social", and which are not included in other chapters of our report. We have in mind such threads as religious belief and organisation. the administration of justice and order, the family, trade unions, consumer associations, social work and public welfare, racial and other minorities, the arts and culture in general, recreation and leisure. Even to talk about all these would swamp our report; so we shall only take examples.

II.6.3. But first, a general caution to which we attach the very greatest importance. All the other chapters of Part II concern forecasting about matters which may, and indeed should, be planned in a democracy - technology, the economy, energy, etc. And the same is true of much of this chapter; the administration of justice, public welfare, etc. may and should be planned. But there is an exception; it is contained in the word "values" at the head of the chapter. By values we mean simply what people think about things, what they think important, what they want. One may legitimately forecast about value changes, about the "transvaluation of values"; indeed it is most useful to do so. But one may on no account plan them, in the sense of seeking to bring them about or prevent them. To do so would be to manipulate the very identity of people, and our experience and abhorrence of that is one

of the reasons why we have been able to form a Western European Community at all. It is not so everywhere, but our states exist to serve the values and wishes of individuals, and the European Communities are an emanation of our states. This chapter therefore treats, in part, of things which must never be planned, and forecasting about which must therefore never tend towards the choice of goals.

II.6.4. There is no such thing as a social expert; nobody can know society as, for instance, the technologist knows technology. There is no body of social theory which allows us to define the structure or properties of the social system as such. One has to approach the subject pragmatically; i.e. choose the best method for the procurement of the set of facts required. It might be repeated public opinion surveys; it might be the identification of opinion-forming groups, who we assume think today as others will think tomorrow; it might be official surveys and public records, it might be "participant observation", (a technique of anthropology, whereby a specialist actually lives and works with a group under study), it might be "analysis by precursive events" as we described it in I.3. A vast amount of all of these already exists at national level.

II.6.5. Our expectations and forecasts of social change, as in other fields, must depend on our knowledge of past changes. This knowledge alone gives us some concept of general, systematic change, as opposed to random and contingent changes. As we remarked in I.3. above, you need either historical data series or theories, and a theory not based on the former is not much use.

II.6.6. Theories abound in this field. Perhaps society is mainly changed by economic factors, as Marx said, or by changing values and beliefs, as de Tocqueville and Weber said. De Tocqueville's analysis of the transforming force of the "passion for equality " in Democracy in America remains one of the finest exercises in "social forecasting". So also Max Weber and Tawney on the role of the "protestant ethic" in bringing about capitalist development in Western Europe, and - at the other end, as it were - the force of scientific and technical rationality

(or bureaucracy) as the overriding impulse in the future development of industrial society.

Or perhaps it is mainly changed by technology, with all other social changes seen as the effects of adjustment to technological change. New technologies, such as railways, force society to adapt. Thus technology shapes our mental map of society. This model is particularly popular with certain contemporary futurologists, e.g. Alvin Tofler. "Technology, the great growling engine of change."

Or perhaps there is an ineluctable cycle about everything as, in their different ways, Spengler and Toynbee maintained.

II.6.7. All these thories have their consequences for social forecasting, but, since they are mostly contradictory, we recommend that Europe Plus Thirty should not allow its work to be too much influenced by any one of them. It would be better to seek to apply each or any of them - or others - to various situations as hypotheses which may, or may not, suggest useful tools for social analysis and thus, deriving therefrom, for forecasting.

II.6.8. Putting various theories and preconceptions together with the empirical data which will come its way, Europe Plus Thirty can ask of each: What sort of politics does this model imply ? To what extent under this hypothesis do technical possibilities limit the political options ? What range of life-styles is possible if society really works as this theory says it does ? Can this theory be used to foreshadow demands which may in future be made by society on technology and on the economy ? And so on.

II.6.9. For instance, Daniel Bell's contention about the increasing "technification" of institutions in decision-making is shared by many others of more radical disposition like Alain Touraine and Jürgen Habermas. His model - like Marcuse's and many radical ones - comes out of a period of economic growth; it would therefore be instructive for the forecasting team as a whole to compare it with models that accept slow or zero growth, such as Robert Heilbronner's Enquiry into the Human Prospect[1]

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(1) Pub. by Norton, New York, 1974.

and Schumacher's Small is Beautiful.[1] The latter is particularly instructive in emphasising the importance of local control and a human scale with an appropriate technology to match. These tracts were both written before the energy crisis.

II.6.10. The values, structures, and life styles, the rise or fall of which would be fit subjects of speculation for Europe Plus Thirty, could be extremely numerous. What follows is to be taken as illustration, not precept.

Substantive areas that need exploring

An ageing population

II.6.11. The increasing average age of our populations is one certain demographic trend which will certainly affect predominant social values and attitudes; it will promote those which are commoner among older people than younger, and may well yet further increase the tension between old and young. It is harder to determine what the older people of tomorrow will actually want; probably stability and order, but to say that is not to imply right-wing politics. The demand could well be for stability and order within a more, not less, collectivist frame. Such questions deserve speculation.

The problem of commitment

II.6.12. The rational management of production implied in most projections of modern industrial society depends for its working on a strong commitment on the part of the workforce, especially the technical, professional, and white collar workers. What if - as some evidence suggests - this declines? There has recently been some reaction amongst younger professionals against involvement in conventional professional practices; some lawyers, architects, social workers, teachers, have not wanted to push the familiar career pattern. Status has become less important. Some have simply withdrawn, as casual "freelances" or social security clients. Others, more interestingly, have gone into or set up new agencies and practices, using their skills and experience

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(1) E. Schumacher. Pub. by Blond, London 1973.

in a manner which they consider more truly in accordance with the principles of their vocation. Examples are: neighbourhood law centres, community centres, local action groups, environmentalist groups, etc. These trends point to a weakening of commitment to the existing social structure, and a commitment to something else, more local, more grassroots, more capillary. The shift has been made easier by the dispersal of skills and knowledge, which were hitherto concentrated in large cities, into small towns and suburbs as the metropolitan population declines.

The trend implies a disillusionment with the nation state and its centralising tendencies. But another reaction is also noticeable, and is of more interest to the Community: the one which looks beyond the nation state to the international. For some time now it has mainly been the economic and scientific elites which have tried to push international aggregation - and this is very much the knowledge class.

II.6.13. Is there an up-valuation of service, loyalty and responsibility, because people at the local, smaller level hope to have more control over what happens? If so, it might apply also to industry,where perhaps a radical change within industries - especially the secondary - might resolve the problems of boredom, voluntary absenteeism, strikes, and industrial sabotage. Some managements are redesigning the organisation of work to make it more involving. Already some firms have started to break up the assembly line organisation, in the direction of more autonomous working units responsible for a diversity of tasks and more complete components.

II.6.14. These trends and the problems associated with them are so far rather new, and they deserve close study in so far as they have implications for the future of European societies. It is, perhaps, worth considering whether these trends among European youth may be a product of the undisturbed full-employment, economic-growth, period of the last two decades. Recent changes in study and career preferences observed among university students in several European countries (and in the U.S.) suggest that doubts as to economic stability and employment possibilities may now be tending to reestablish a more traditional relationship to work, and to reawaken interest in a stable and orderly society. What is the dividing line between a trend and a fad?

Beliefs and values

II.6.15. What are the limits of tolerance in a society with highly articulated, if not always rational, political and organisational structures? Is it possible to say anything about the "value stretch" that can co-exist with basic efficiency and coordination? Expectations on the future of industrial society mostly assume the scientific view of the world. It was commonly expected that industrial society would bring in the secular society; it would be a society in which people thought more and more of nature and reality as science dispelled the force of the supernatural, the unobservable, the undemonstrable. But these expectations have not been fulfilled. Even if institutional religion has declined, there has been no lack of secular ideologies and "scientific" faiths for industrial man to espouse. To add to this, in latter years in the West, we have seen a great burgeoning of cults and sects of a quasi or explicitly religious character, which are now reaching back into the established churches. Society still needs emotional bonds, which are not found in the realm of politics and economics. Difficult as it must be, we need to get some inkling of the likely character of thought and feeling in the late twentieth century, of the everyday assumptions, beliefs and working hypotheses by which people will wish to guide their lives, of the aspirations they will have for themselves and their children. How likely, for instance, is a revival of mass religion within the established churches? What of the "therapeutic communities", of sects, cults, and other expressions of exclusiveness and retreat? What is the future of deliberate unreason?

II.6.16. In thinking about the future Europe Plus Thirty should speculate about the compatibility of a pluralism of values with the functioning of a science-based economy and society. Forecasting about values - difficult as it may be - has to be done, since values are the inner bloodstream of any social system. And this forecasting, as we argued above, must be of a different kind from most that we recommend, since freedom itself is at stake.

The family

II.6.17. The family is worthy of separate investigation. How are its day-to-day and intimate structures likely to develop? What might be the effect on family structure of the determined movement by women to get a uniform equality with men? What might be required to offset the problems of household management and child rearing, and what would be the effect on the children, if the mothers of young children increasingly seek fulfilment outside the home? For instance, can one envisage that old people could be "brought back" to play a major role in the upbringing of their grandchildren? Or, conversely, that women would come to demand a basic right to part-time work? Can one assume that the nuclear family will for ever remain untrammelled and free floating, as the sole relevant family unit - relevant, that is, both for its members and in the eyes of the social institutions outside it?

II.6.18. Significant changes in the family size and structure and in its life cycle already are under way in most European countries. The number of children in average families has fallen sharply, with the consequence that the child-rearing period in a typical family is now shorter than a generation ago. Because of higher living standards and improvements in the housing situation, families and even single young people live alone. The time needed for cooking and cleaning has fallen thanks to better equipment and changes in consumption patterns (more ready-made food, etc.). All in all, family structures have changed, the activities in the family have changed too, and the length - and content - of the different stages of the typical life cycle of European families have changed accordingly.

II.6.19. The commune, and even the extended family, are here and there superseding the nuclear family as the closest framework for the individual, though usually in a transient way. If the trend solidifies, it would have implications for new housing. Even the nuclear family itself has become surrounded by a host of other institutions, advising, giving, cajoling, remedying, threatening. Far from taking the pressure off families, these many points of contact make life more complicated.

Families have had to become small archives of information and expertise to cope successfully with the welter of institutional demands made on them, instead of the other way round. These demands come alongside of a parallel process which has been making it more difficult for family members to live near each other, to help and support each other, and at the same time abolishing or diminishing the informal sources of support and advice once available in neighbourhood communities. All these changes interact.

Minorities

II.6.20. We care pretty well for the minorities we can see: most member countries devote ever increasing resources of money and skills to making life decent for the immigrant workers in our industrial cities, and the same applies to disabled people, the old, one-parent families, and so on. But it would be worth forecasting about what may happen to a minority "we" hardly ever see, the very poorest citizens of the Community, the islanders of Italy and Scotland, and the Eskimo tribesmen of Greenland. Here the argument shades off into regional policy of the familiar sort, but it behoves democratic and would-be compassionate societies to pay special attention to the poorest of all. The same applies to gypsies, who are increasingly suffering from the erosion of their traditional territory, the roadside verge.

Values again: What are people supposed to do all day?

II.6.21. For a century now, it has been taken for granted by all but the arts and crafts movements that the pride of science and the duty of technology is to allow people to work less. If three small farms are united and their hedges and walls are erased so that bigger tractors can be used, that is progress and productivity, and the peasant can go to the city and earn more. If an industrial process can be automated, that is progress and productivity too, and if the former peasant is thrown out of work again that is a short-term structural shake-out, and he will soon be "re-absorbed" elsewhere. If he learns to be a bus conductor, he is caught by "overmanning"

and the one-man bus crew. And if he has a natural gift for juggling or acrobacy, who wants that when they can see the Russians on TV?

Moreover, a certain taint of unmanliness still, in some Community countries, hangs over the whole service sector: it used to be punished by selective taxes in order to get people into the production sector, which seemed much more virile. And so the vicious circle begins again.

II.6.22. It is largely recognised now that the best technology we can export to Asia and Africa is labour-intensive, or "intermediate" or "alternative" technology. May the day be coming when our values shift so that we begin to think the same about ourselves? Will the present deep ambiguity in our values about leisure (good) and unemployment (bad) be resolved and, if so, which way?

The whole subject has deep and so far unexplored interdependencies not only with social values, but also with politics, resource use and depletion, technology, demography, education, and economics (including for this purpose industry and agriculture).

Mitbestimmungsrecht

II.6.23. The countries of the Community are at very different stages on the road to the establishment of worker participation in the control of productive and other enterprises. Germany was the pioneer, Denmark is also well ahead. The acceptability of the pattern depends on the general history and psychology of industrial relations in the countries concerned, and is closely linked (though which is chicken and which is egg is hard to determine) with the degree of material prosperity. Italy and Britain, the poorest of the industrial member countries, still tend to pursue untrammelled confrontation between managementand labour.

II.6.24. The possibility of a Community policy in this matter has b under discussion for some time. Such a policy might be linked with the articles or constitution which could be declared necessary if a company were to qualify as a "European company", or it might be devised some other way. Forecasting about the possible long-term social, industrial and economic results, and educational requirements, of different ways of doing it could be a part of Europe Plus Thirty's work.

Recommendations

II.6.25. As we said,there are as yet no experts in social forecasting in the sense that there are experts in technological, economic, or demographic forecasting. Therefore we think Europe Plus Thirty should include a number of social scientists whose function would be threefold. First, to ensure, with and through the Community Statistical Office and the national statistical offices, a supply of social data to Europe Plus Thirty which is relevant to its needs, remembering that it will exist to speculate and forecast about the future of the European Community as a whole and to do technology assessment for it. Second, to take part in the general development of the nascent practice (we cannot yet say science or art) of social forecasting. And third, to work in and with all the forecasting which is done in Europe Plus Thirty to ensure that knowledge about society and social trends, and the probability of social "surprises", are never overlooked. In this work, it will need to keep closely in touch with the Foundation for the Improvement of Living and Working Conditions which it has recently been decided to establish in Dublin: the work of the two bodies must be complementary.

II.6.26. The importance of social forecasting as such cannot at present be assessed but it seems to us potentially so great that we would not here recommend, as we do for some other sectors, that Europe Plus Thirty should rely on the part-time presence of outside people. We recommend that there should be 6 - 8 people in the central team; and that the skills of those chosen should reflect the pattern of work to be undertaken. Seminars, out-house contracts and short attachments should be used in the usual way.

7. EDUCATION

II.7.1. Nearly all Western European countries have had broadly similar educational experiences since the end of the Second World War. There has been an enrolment explosion caused partly by population increase and partly by increased participation rates, first at primary and secondary and then at the higher levels of education. The period of rapid expansion was accompanied by severe shortages of many kinds of teachers. Subsequently, in about 1970, educational growth slowed down in many countries, again partly as a result of slower population growth and partly because young people are showing less enthusiasm for upper secondary and higher education than seemed likely only a few years ago. This slower rate of growth has been accompanied by a tendency to teacher surplus, and indeed unemployment.

II.7.2. Other developments have been similar in many European countries. A few may be listed almost at random. There is the movement away from rigid selection at the beginning of secondary school; the tendency towards child-centred rather than teacher-centred, subject-centred, or state requirement-centred models of instruction, and towards the growth of non-traditional subjects, such as social sciences, and of vocational subjects in secondary and higher education; there have been attempts to use the educational system as an instrument of social engineering, as a means of promoting a more equal society and a more "advanced" economy; there has been the introduction of new methods like television, radio, film, magnetic tape; there has been student militancy in nearly all European countries; and latterly there has been the growing preoccupation with the costs of, and the returns on, education.

II.7.3. Education has a very long-term effect. Most people leave school before they are twenty and live for another half century. Information, ideas, and modes of thought learned in primary school influence behaviour sixty years later, and some effects can be even longer-lived than that. A teacher in training may teach for another forty years. The pupils he teaches at the end of his career will still be directly influenced a century from now, and of course it only tails off slowly, even after that. School building also casts its shadow forward. Building a particular type of school has a strong influence for a long

period ahead on what kind of teaching takes place in it, although wonders can be done in using buildings otherwise than they were intended.

Four Alternative Scenarios

II.7.4. Education has a central role in shaping the society of the future, but must also be the servant of that society.

The past two centuries have seen the industrial and then the scientific revolution, and they exercised a profound influence on the structure and content of our educational system. The school as we know it today has been shaped largely by the industrial revolution, in which the family was split up as a production unit and both parents worked long hours in factories and workshops. The scientific revolution of the Twentieth Century has demanded scientific and technical professional training, so that secondary schools and universities have been places where students go to learn how to do things and to accumulate factual information, rather than to discover themselves and learn how to think.

Here are four alternative scenarios:

II.7.5. The next thirty years may see a continuation of this economic growth after the pause of the early 1970s. Some commentators claim that if it does our societies will become increasingly dehumanised: technocratic and economic interactions will continue to replace relationships between people, the "protestant work ethic" and competitiveness will become even more pervasive than they are now, and the role of education will increasingly be that of providing credentials for a carefully selected meritocratic elite.

II.7.6. A more optimistic view is that it is only the freedom from want brought about by economic growth that will permit mankind the luxury of improved human relationships freed from the pressures of economic necessity. The education system of such a genuinely affluent society could concentrate on the personal development of its pupils and students, and on preparing them for lives of constructive leisure and satisfying work experience, rather than having to provide them with the intellectual weapons needed for success in the rat race. It could also afford to provide opportunities for "recharging the intellectual batteries" through periods of study and reflection by adults at intervals throughout their working lives.

II.7.7. An alternative view, common at present, is that the Western world is about to experience several decades of slower economic growth - slower at any rate than that experienced since World War II. People who welcome the prospect of "zero economic growth" claim that it would engender other social values than those which predominate today. They speak of a growing tendency "to do one's own thing", to relate to people in small groups rather than large impersonal work places, and to pursue self-fulfilment in cooperation with others instead of through competition to reach the "top" of a career structure. Protagonists of this school of thought expect to see increasing participation by workers in the organisation of their work, so that work itself becomes an intrinsically satisfying experience rather than an instrument for producing at once goods and the income to purchase other goods. Education in such a society might correspond to the vision of the de-schoolers, and become much more closely integrated with work and leisure activities. Like work itself, the aim of education would become self-fulfilment and not preparation for a life external to the educational system.

II.7.8. But an opposite view of the likely social effects of zero economic growth is equally possible. It may lead not to a more harmonious society but to one in which competition for resources is intensified. Individuals may struggle all the harder to reach the tops of fewer and smaller economic trees; it may become impossible to make further progress towards equal educational opportunities for all as education has to compete for resources with everything else, with health, transport, social security, private consumption and so on. Within education, the competition for resources between the various sectors - primary, secondary, higher, adult - already shows signs of intensifying. The reduced education budgets of recent years may be a portent of things to come. The graduate unemployment of the early 1970s in many countries illustrates another danger: reduced job opportunities for those with high educational qualifications can lead to considerable hardship and might result in frustration and anger being turned against existing social structures. This in turn might prove either constructive or destructive.

II.7.9. Europe Plus Thirty could perform a useful function by considering the likelihood of each of the four scenarios outlined above and by exploring the implications of each for education and for society as a whole. In particular, it could examine ways in which the educational system could be used as an instrument for promoting what may be called the optimistic alternative, whether the general rate of economic growth be fast or slow.

Economics of Education

II.7.10. A common assumption underlying all these scenarios of the future of education is that the growth of public expenditure cannot go on "ad infinitum". Therefore, if its forecasting is to be useful, Europe Plus Thirty will have to have a close look at cost-development.

II.7.11. From the 1950s to the end of the 1960s education expenditures increased their share of GNP from 2-3% to some 6-9%. This growth in the total share could only take place at the cost of other sectors, and at some point firm financial priorities, which would become even more firm in an era of "steady state", will have to be established. In the 1970s, and for the foreseeable future, the four sectors of education will have to compete keenly for public resources after a period of rapid overall expansion: (a) pre-school education; (b) school education; (c) higher education; (d) adult or "life-long" education.

II.7.12. There exists now a branch of economics - the economics of education - which relates expenditures on education in a wide sense to economic development and growth. This is an important area of study which arose at the end of the 1950s when traditional input factors, such as capital in terms of natural resources and numerical measures of labour, could not account for the whole of the economic growth, and one was thereby left with a " residual" factor, sometimes estimated to account for as much as 50% of economic growth. Considering that educational expenditure increased from 1950 to 1965 twice as fast as national income, it was natural to assume some kind of relationship between the educational growth and knowledge explosion on the one hand and economic growth on the other. What will be the implications of reassessing the utilisation of resources when the limits to educational expenditure are reached?

Some recent Developments in Thinking about Educational Policy

II.7.13. In general, education ranks lower in public esteem than it did ten years ago. The massive expansion of secondary and higher education of the 1960s has resulted neither in a more equal society nor a more rapid or intellectual growth. Instead it has given us unemployment of graduates, student unrest, and a feeling that our schools and universities are growing apart from the rest of society.

There have been three recent claimants for special attention in education policy, all deriving to some extent from the disillusion with the effects of earlier expansion.

II.7.14. First is a growing concern with nursery and pre-primary education. The mainspring of this is the increasing evidence that the roots of educational inequality lie far back in early childhood , and that by the time some children start their primary schools it is too late for them ever to catch up with their more fortunate fellows. Europe Plus Thirty could usefully devote some effort to a comparison and projection of what the education services and health services of different countries do for children from birth (and even before it in the form of ante-natal classes for parents) to ensure that all children at least start life with equal educational advantages, and to derive forward studies from that comparison. It goes without saying that any such study in Western Europe would take as a starting point the very high value that is put on democracy and individual freedom. It would for example be no solution to take children away from their mothers at birth in order to minimise the effects of family background, any more than it was when Plato first urged it.

II.7.15. The second new claimant for attention in thinking about educational policy is at the other end of the educational spectrum - the continued education and training of adults. There appear to be at least two separate reasons for promoting adult education. The first is summarised in the often made remark that "the half life of an engineer is six years" - in other words that at the end of six years half the knowledge acquired by an engineer is obsolete. Thus engineers - and doctors, teachers, lawyers, managers, and almost all other skilled workers - need frequent retraining in order to bring them up to date. The second source of interest in

continuing adult education is equality. It is claimed that given the diversity of human abilities, interests, and rates of development, an increase in economic and social equality would be possible if everybody had the opportunity of attending education and training courses at all stages of their working life.

II.7.16. As with pre-school education there could be a role for Europe Plus Thirty in exploring the extent and nature of the potential demand for "recurrent" education. Critics claim that such practical matters as house purchase and family commitments will ensure that it never affects more than a minority of adults. Supporters aver that there is a vast latent demand for the right kind of recurrent education properly integrated with the rest of society. An international study of the demand, actual and latent, present and future, among adults for education and training could be valuable to those concerned with policy in this area.

II.7.17. The third new development is the growing clamour for a closer integration between schools and society; here the growth of parent/teacher associations lies at one end of the spectrum, and the 'de-schooling' movement on the other. Europe Plus Thirty could consider the extent to which institutionalised schooling may cease to be judged an adequate instrument for "socialising" young people and for inculcating the competences they need in the society of today and tomorrow. The immersion of all teenagers in institutionalised schooling has occurred in an era when there have been fundamental changes in the role of the school as an institution, in the society in which it is embedded, and in such previously powerful alternative institutions as the churches and various youth movements. The school does not possess a monopoly of information or of teaching. There are many agents in society that are as "information-rich" as the school; television, radio, record players, the press, libraries, and various leisure activities.

II.7.18. Europe Plus Thirty could consider the likelihood and implications of schools becoming less "institutionalised" and having a less formal contact with society at large; it could focus upon the possible crisis points at which institutionalised education may be dysfunctional with respect to the rest of society, resulting, for example, in university graduates with job aspirations that are unrealistic in relation to the jobs available, or on the other hand in needs for trained people which the universities fail to satisfy. Another

possibility that a forecasting body could explore would be implications of giving teachers the opportunity to alternate between the classroom and the outside world, and conversely giving other workers a chance to become part-time or temporary teachers. There is the basis for a "de facto" social experiment here (see I.3) in a comparison with the system which has applied for many decades in Chile.

International Aspects of Education

II.7.19. So far we have been considering educational developments that are occurring more or less simultaneously in many European countries; since many countries are facing common problems, all are likely to find that they have something to learn from each other. Certainly much of education must remain a national responsibility - many people in Britain and Germany would claim a local responsibility. But no European country nowadays is likely to pursue an educational policy completely uninfluenced by the experience of its neighbours. Apart from anything else, international comparisons are one of the favourite weapons of those who are proposing or opposing a particular educational development. It is useful if such comparisons are made on as reliable a basis as possible. But there are also a number of areas in which education is becoming inherently more international, and in which an international approach to the issue is not merely an adjunct to national policies but essentially is the policy of the countries concerned.

II.7.20. The first of these arises from the international market for qualified manpower. It has long been realised that true international mobility of manpower will be possible only when all educational qualifications have international acceptability. In certain high level occupations international agreements have already been reached or are very near on the international currency of qualifications. Further detailed study is needed before more than the surface of this problem is scratched. Europe Plus Thirty could sponsor forward-looking studies in particular occupational areas and thus help to promote a situation in which all the workers of Europe can find employment where their particular qualifications are most in demand. Such studies should also take account of the general tendency, tersely known as the Brain Drain, for the best educated people in any country to emigrate to another if they can get better

pay and conditions there. This affects not only movement internal to the Community, but also movement into the Community from less developed countries and out of it to the USA.

The flow of engineers, scientists, and doctors into the USA (about half of them from Western Europe) tripled between 1955 and 1967. One way for "down gradient" societies to slow their own brain drain might be the encouragement in them of centres of excellence transcending national frontiers, to which we turn below. The Community has a duty not only to itself in this matter, but also to those down gradient of it, the developing countries. To this also we turn below.

II.7.21. A related issue is the international mobility of students. This has three aspects. a) One is the acceptability of entry qualifications for universities and similar institutions. What is needed in the long run is a European accreditation agency so that any institution in any country can immediately evaluate the entry qualifications of any aspiring entrant to that institution. The establishment of such an agency would require considerable research into the vast number of educational qualifications provided in the various European countries. b) The second aspect is financial. European countries finance their higher education institutions in different ways. In some, students pay fees and are subsidised. In others, all facilities are free but students receive no grant. In others again, students can obtain loans to help finance themselves during their studies. If there is to develop any substantial interchange of students between countries, arrangements must be developed to ensure that such financial mechanisms do not distort the flows of students. c) The third aspect is the existence in some countries and some universities of the numerus clausus, which leads, and might lead increasingly, to an outflow of students to neighbouring countries.

II.7.22. Another factor which makes education inherently international is the high capital intensity of much scientific research. Many research projects require such expensive equipment that it is beyond the reach of any one European country to undertake more than a few of them. And yet if a country does not undertake the research it has no way of ensuring that its young scientists and technologists can keep up with developments in that branch of science. This is clearly an area for European cooperation, and a forecasting body could attempt to identify the areas in which it is likely to become necessary.

Moreover, the argument for European centres of excellence is not confined only to "big science". It applies also to a certain concentration of training facilities, and this can only be made efficient if it ignores national boundaries. Again, it would be useful to identify in advance areas where international centres of excellence of this sort are likely to become desirable.

II.7.23. Another area for international cooperation in educational policy is that of new educational technologies using programmed texts, magnetic tape, and film. This means that whole courses can be packaged, and bought and sold. Already the British Open University has a flourishing trade in such pre-packaged courses, and so have a rapidly growing number of commercial enterprises. Perhaps there should be a Community standards institute to test the various course materials offered for sale and ensure that they are effective according to various criteria, and that it is reasonable to claim that they could be used in different countries. An even more ambitious idea would be the establishment of a European centre for educational technology which could itself develop new course materials.

II.7.24. It may be that the Community will in due course wish, as part of its external relations policy, to further types of education in Europe which will be specifically useful to the developing world; to stimulate a reverse brain drain as part of a coherent drive to overcome the problems and the dangers we touched on in our General Introduction.

An essential preliminary for all such developments would be forward-looking studies that reviewed the possibilities and likely developments in curricula and educational technology for the next quarter of a century.

General Recommendations for Forecasting in Education

II.7.25. Obviously, recommendations about forecasting activities in education under Europe Plus Thirty auspices have to take identified areas of common concern as their point of departure. The Janne Report of 1973 on Community Policy in Education[1] lists a number

(1) Bulletin of the European Communities, Supplement 10/73

of problems which should be recognised by the Community as areas of responsibility. In the present chapter, we have outlined others.

II.7.26. We recommend that Europe Plus Thirty become an organ initiating and developing, for the benefit of the Community, a better insight into the linkages between education and other social sectors, and that it be capable of policy analysis and comparison in this matter. This means continuously looking for and analysing the "educational dimension" of the economic and social problems which the Community has to face.

II.7.27. The Commission disposes since 1974 of an important instrument (D.G. XII) to deal with educational problems. Similarly, the Council of Ministers has created an Education Committee in order to develop educational policies in a certain number of priority areas. Several other departments (probably most of them) of the Commission, and Committees of the Council, are involved in activities which are directly relevant to the future of education.

Coordination between these departments and committees is already taking place but, for reasons due mainly to the nature of large organisations such as the European Communities, this coordination is limited. It may be that an independent body such as Europe Plus Thirty, devoted to interdisciplinary and intersectoral forecasting, can provide some impetus for the development of this linkage.

II.7.28. We recommend that Europe Plus Thirty address itself to studies of the institutional development of educational systems with the aim of anticipatory identification of what changes in structure and content of education would be necessary in order to meet possible changes in society and, conversely, what changes in society are likely to result from present or foreseeable structures and contents of education.

II.7.29. It should also conduct or sponsor forecasting studies, on the basis of systematic collection of statistical and other information, (much of which already exists in UNESCO and OECD) about enrolment, trends on the labour market, and changing preferences with regard to education offered.

II.7.30. The content of the curriculum, where changes tend to be even slower than in the structure of the system, is another area which might benefit from forecasting. The common denominator, as far as the Community is concerned, is the growing internationalisation of the national systems of education, and the common interest lies in the fact that what happens in Europe in the future will be mainly the result of what its children and students are taught is true or good now.

We recommend therefore that studies of the curricula at all levels of the education systems be stimulated in order to lay the basis for forecasting about the teaching of science, civics, philosophy, sociology, history and languages, and as an input for general social forecasting.

II.7.31. We recommend that statistical and other information about student and teacher exchange, as well as information on ongoing activities at the various university institutions in the different countries, be collated under Communities auspices. This would provide a basis for forecasting that would facilitate Community planning in the utilisation of teaching and research resources in certain areas.

Methods Employed in Education Forecasting

II.7.32. Forecasting methodology in education does not differ essentially from that employed in other social areas. Educational changes occur within general socio-economic change. This means that educational forecasting must be related to other areas of forecasting.

Assessments of future trends and developments in education should be based on three main activities:

a) Continuous secondary collection of basic statistics on:

(i) demographic trends and population projections, with particular reference to the age range 5 through 20. (See II.3.)

(ii) enrolment at various levels of the formal educational system.

(iii) cost development.

b) Continuous collection of information related to institutional changes and innovations in the educational systems, such as reforms in structure, content, and methods of instruction.

c) Forecasting studies making regular use of panels of experts in seminars and conferences, to obtain new injections of ideas and vision, and to review and criticise the ongoing work.

Staff Requirements

II.7.33. In order to do this it is necessary, as a minimum, to appoint two professionals having between them general research competence, a broad socially oriented and imaginative perspective on educational problems, and a statistical background in educational planning. We also recommend that Europe Plus Thirty set up a panel of experts in this field. Such a panel should meet regularly with others involved in all aspects of education, e.g. personnel from Ministries of Employment, Social Services, etc., for stocktaking and for discussions of the actual trends and tendencies on the basis of which the forecasting of major aspects of education is conducted.(1) The terms of service should be 3 to 5 years, so as to make successive replacement possible and at the same time have some continuity.

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(1) The European Cultural Foundation has recently set up an institute sponsored among others by the European Communities for the study of the education aspects of European social and economic problems. Its staff is envisaged to be very small since its annual basic budget will be only $120,000. Europe Plus Thirty might well collaborate with it.

8. SCIENCE & TECHNOLOGY

II.8.1. The relationship between mind on the one hand and space, time, matter and energy on the other, is the subject of a huge literature, in which we in the West still largely use the thought structures devised in Greece two and a half thousand years ago. Mind subsists in space, endures in time, and consists of or is a function of matter and energy; but still it is able to apply something called understanding to the very extensions it exists in and the very "things" of which it is made, and there is something about this understanding which enables it to go further and "control" them, or get them to do things they would apparently not otherwise have done. The question whether the laws of nature are "truly" the laws of nature or on the other hand only the laws of science, that is to say, whether they inhere unconditionally in space, time, matter and energy, or whether their inherence is conditional on the activity of that part of those things which we call mind, and thus on the ability of one mind to communicate them to others, dubbing them "laws": this question lies at the heart of any attempt at forecasting about science.

II.8.2. If ever we could describe with certainty the part played in some past scientific discovery respectively by the grasp of an individual mind and by the availability to be grasped of some scientific law which we were enabled, by that particular act of grasping, to describe as such, we should be able to forecast what type of relationship between what type of mind and what type of so far unexplained phenomena would be most likely to produce "results" in the future. Unfortunately the subtlest book yet written about all this, Arthur Koestler's The Sleepwalkers, (1) tends to the conclusion that, far from public policy being able to help the right scientist to the right place, the greatest scientists have only made their greatest discoveries as by-products, unrecognised by their very authors, of enquiries into something else. Forecasting about technology does not pose such arduous problems; laws and propositions about space, time, matter and energy, as they are bandied about between

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(1) pub. Hutchinson, London, 1959

mind and mind, sometimes suggest useful things to do, called inventions, applications of inventions, technologies, etc., and sometimes they do not.

II.8.3. Forecasting both about science itself and about its application in technology must, as usual, be a blend of theory, experience, and imagination. This field is so vast that here, perhaps more than anywhere, the forecasting to be done by Europe Plus Thirty must be related to the powers and functions of the Commission of the European Communities, the European Parliament, and also the member governments which will be its users.

II.8.4. The Commission's function in scientific and technological research is limited. The greater part of what it does is done through its Joint Research Centre, a chain of establishments in Italy, Germany, and the Netherlands, which has been concerned mainly with the vain attempt (to which we return in the next chapter) to develop a European reactor, but is now diversifying.

II.8.5. The Commission spends at present only 0.8% of the public money spent in the Community on scientific research; the rest is spent nationally. An assessment of the way this percentage is likely to change - whether to increase or to decrease to an even tinier figure - must depend on the work of a new committee called CREST: the European Committee on Scientific and Technological Research. We have seen how the functions of the European Community are divided between the Council and the Commission. CREST is a unique hybrid in that its members are the chief research administrators of the member states - in this it resembles any other committee of the Council of Ministers at official level - but its chairman is from the Commission; he is Director General for Science, Research and Education (DG XII). The function of the Committee is broadly to find out, first,what all the member countries are doing, second,to help them coordinate their activities, and,third,to fill the gaps by launching common activities.

II.8.6. The Community is roughly the equal of the U.S. and the Soviet Union in population, education, and wealth. Yet it lags behind them in scientific,and far behind in technological, innovation, and this is all too obviously because the member countries are still competing

against one another as they did a hundred years ago, when all the scientific research in the world was done in Western Europe, and none of it was too expensive to be done on a population base of 30 - 40 million. To eliminate duplication of work, and to obtain economy of scale, is an obviously rational goal. Habit and pride impede it, but they are on the downgrade. CREST is there as the embryo of the organisation which will be needed if this goal is to be achieved.

II.8.7. There are perhaps four general objectives which forecasting can help to achieve. They are:

a) To open new options and maintain an authoritative input of future-oriented technical advice so as to allow decisions to be more broadly based.

b) To identify areas where society's well-being might suffer if decisions were allowed to be dominated by sectional interests or narrowly economic criteria, and to compare alternative policies to put that right.

c) To increase general understanding of the way of thinking of science and technology.

d) To contribute to a major element of contemporary culture.

II.8.8. Of these, the first two suggest themselves especially for the forecasting which ought to be undertaken in this field by Europe Plus Thirty for the Community; namely to facilitate the rational and beneficial exercise of its existing powers and functions and the formulation of new powers and functions which it might seek to obtain; and to provide informed conjecture about the future course of scientific and technical innovation in so far as that may affect the development of society in general and thus of industry and the economy. Over industry and the economy, the Communities exercise substantial powers, and the kind of forecasting we outline here could help them to exercise them to the general good of society.

II.8.9. On the first point, forecasting for the use of existing and foreseeable powers in this very field, there must be a close link

between Europe Plus Thirty and CREST. The art of evaluating the results of scientific research in terms of their direct utility to mankind, and of their indirect utility as leading to the next necessary piece of research, though a rapidly developing one, is still rudimentary. The work done so far usually assumes a single society, within which and for the benefit of which the research is done; the society as a whole is then found to have benefited from it, or not. The very first work on the differential benefiting of different social classes within national societies is now appearing; much of it is far from dispassionate (1) but it is a useful corrective to decades of blind incrementalism. On the other hand there is little work indeed on the differential benefiting of national societies within one region of the world, or indeed within the world as a whole.

II.8.10. There is thus a clear role for Europe Plus Thirty, working as research and forecasting back-up to the unique body called CREST. It should enquire far enough into the question what sort of research has benefited what sort of people to be able to tackle the question: what sort of research is likely in future to benefit what sort of people? It would then be able to proceed to forecast about the likely effects of given quanta of research being undertaken:

a) by the member states of the Community severally,
b) by the Community as such because it is bigger, and
c) by neither (because neither is big enough) so that it has to be done on a world or Western-world basis.

II.8.11 Research is an open-ended commitment. Some sectors - high-energy physics, nuclear physics and engineering, radio astronomy and aerospace are obvious examples - have already become extremely expensive to maintain productively. Other sectors, including oceanography and even some branches of biology, are threatening to join the "big-science" club. Independent national work? Community division of labour?

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(1) Should the assertion that there is no such thing as dispassionate science be debated passionately or dispassionately?

World division of labour ? To take a hypothetical example: geophysical forays into the earth's crust could be valuable to Europe from several standpoints. They could show the way to geothermal energy reserves, especially for the least physically stable regions of southern Europe; they could advance the technology of exploration and exploitation of fossil fuels, especially for nations with large continental shelves; they could open new options for long-term disposal of radioactive wastes, of interest to every nation with a nuclear power programme. A concerted multi-disciplinary effort in geophysics might thus open new options no single nation or sectional interest would consider warranted the necessary "critical size".

II.8.12. Attractive targets for research, considered in relation to the probable time span of Europe Plus Thirty, are now so numerous that it is difficult to assemble a balanced "portfolio of objectives" within the means of any one nation. Valuable options may thus remain closed to Europe unless ways can be found to share the expense. The European Science Foundation (which goes wider than the Community) has now been set up to deal in part with such problems.

II.8.13. Some objectives (e.g. in defence) and some commitments (e.g. to high-energy physics) threaten to distort the totality of scientific effort by monopolising a disproportionate and possibly increasing amount of the talent and cash. Political patronage can also distort objectives. Here is a field where future changes in social and political structures and values may well affect the development of science itself. We are so used to thinking of the effects of science on society that it is important to remember things happen the other way around as well.

II.8.14. Besides providing the social and economic forecasting necessary for the exercise of Community functions in regard to scientific and technical research itself, Europe Plus Thirty will have to provide inputs of speculation and forecasting about the future of science and technology into the general social and economic forecasting it does. It should undertake technological forecasting in those areas where possible technological developments would or might have such substantial effects on the economies and societies of the Community that the Community institutions would, one way or another, be bound to be concerned.

II.8.15. In a world in which energy costs have so abruptly increased there is little question that the most socially and economically fruitful scientific achievement would be cheap thermo-nuclear fusion. Cheap fusion power would afford Europe independence in energy resources, a freedom it cannot now contemplate until well into the next century, and then only if high efficiency fast breeder reactors prove a success. Provided fusion reactor technology could then evolve smoothly from the industrial base now being created for fission reactors - by no means a certainty, for far greater engineering problems, temperatures and neutron fluxes are involved - fusion could mean a return to cheaper energy and the exploitation of very lean mineral resources, even sea-water.

II.8.16. A technologically less demanding way of harnessing fusion power would be the discovery of an efficient method of converting solar energy into electricity or into food (where a mechanism that merely doubled the present abysmally low conversion efficiency of photo-synthesis could, if it were found, dramatically promote growth in crops). Another possibility for a great reduction in energy costs would be the discovery of a simple, low-temperature chemical reaction for splitting water molecules to release hydrogen - a clean fuel. An encouragingly large number of reactions has been discovered in the last few years, although none is simple enough to promise cheap hydrogen yet.

II.8.17. New ways of synthesising very complex substances - food is the obvious example - at much less cost in energy and raw materials would be dramatically important to Europe. The breakthrough could come with an understanding of the subtleties of catalysis (including the mechanisms of the living catalysts, enzymes), or from the work of molecular biologists. Only a few years ago very few people would have predicted that the new science of molecular biology would disclose the opportunities now opening in "genetic engineering," in the tailoring of genetic templates to develop desired characteristics in a living micro-organism. Opportunities within comparatively modest research budgets seem to centre on radical intervention with the behaviour of micro-organisms such as bacteria, having prodigious powers of reproduction. Such nitrogen-fixing organisms might be provided with genetic templates selected so that they synthesise the optimum mixture of proteins to promote growth in animals or plants. It might prove possible to transfer the nitrogen-fixing ability of such organisms to higher plants, giving,

for instance, potatoes and wheat the ability to make their own fertiliser, a prospect which has been described as "a gift to mankind almost as valuable as fire."(1) Other possibilities are the synthesis of vaccines against virus diseases, or the recovery of valuable minerals such as gold or uranium from lean but inexhaustible resources such as sea-water. Each of these opportunities - crop growth promotion especially - have immense implications for population distribution, jobs, transport, etc. that Europe Plus Thirty would have to explore.

II.8.18. Solid-state physics may open major new options in materials science, where the attraction of materials perhaps ten times as strong as they are today is immense in terms of husbanding natural resources, or in sensor technology where the implications of, say, a new mechanism for detecting and locating submarines at great distance to supersede sonar (just as radio-location superseded sound location of aircraft) could change the pattern of mutual assured deterrence between America and Russia, by making the nuclear submarine vulnerable. If this should happen, the entire political structure of mankind would be called in question. Even a sensory mechanism that would give people night vision with the facility of ordinary spectacles or contact lenses could have far-reaching implications in the civil as well as the defence sector.

II.8.19. There is perhaps no better example of an invention whose impact could be profound, but for which identifying the consequences well in advance calls for expertise and imagination of a high order, than the laser, born in 1960. Its promise lies in two quite different directions: as a unique and versatile sensor and as a unique and versatile energy source. Some of the most exciting possibilities today, including laser fusion (microfusion) and laser enrichment of uranium, were not anticipated in the early years of its existence. Lasers of increasing energy and diminishing wavelength, including the "graser" or gamma-ray laser, are almost certain to open fresh vistas, if only indirectly as research tools of unprecedented analytical power.

II.8.20. The question how to forecast about the carrying through of scientific discovery into technological innovation and thence into daily use and

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(1) Professor C.H. Waddington: "Genetic Engineering" - the 1975 Trueman Wood lecture given at the Royal Society of Arts, London, January 1975.

wealth, raises once again the difficult distinction, which we touched on in the Introduction, between forecasting and planning. This carrying forward is being planned all the time in industry, and "corporate planning" rests on forecasting undertaken for the benefit of industry, not of society at large. (We return to this point in the next chapter.) Europe Plus Thirty could undertake systematic forecasting about the costs and benefits of the alternative routes which might be taken by a given scientific discovery through the applied research phase, the development phase, and the prototype phase; through alternative socio-industrial structures, with their different degrees of public answerability; through the different expenditure phases with their related alternative fiscal and subsidy policies; and lastly, through the alternative mixes of national and Community law, tax and subsidy, which do now or might in the future apply to such alternative routes. At every stage careful distinctions would have to be made between the various parties meeting the costs (internal - external, etc.) and the various parties receiving the benefits. This would be an immense task, and one which would only become justifiable as the Community obtained, or saw an immediate likelihood of obtaining, a measure of power to change or affect those routes themselves.

II.8.21. Certainly one can dream, indeed all of us who contributed to this report have probably dreamed, of a world, or even a European Community, capable of taking our prodigious science and technology by the scruff of the neck and bending it by human will to the service of conscious human aims. We dream of deliberately and actively planning their development in a new partnership between government, research and industry, so that the needs of our battered race may be met in time, so that we may command our future, not follow our past. If it were done, it would be necessary to survey and investigate alternative technological options well in advance and, as a kind of sub-continental insurance policy, to ensure that many of them are pursued as far as the pilot plant or engineering prototype stage, so as to be capable of rapid exploitation if the need arose. Diversity of technological development like this would, of course, be very costly and it is unthinkable that all the relevant options could be followed up in each industrialised country. If any attempt were made to grip this matter, and to grip it within the world of democracy, it could not (in Western Europe) be made by any one country alone; it would have to be done by the Community.

II.8.22. Nor would it be wise to attempt any such thing, or even a tenth of it, on the basis of knowledge or opinion about what society needs or wants now; it would need to be based on forecasting about what society is likely to want of science and technology in the future, and this would probably be among the most fertile of the sectoral interactions which could be achieved in a closely integrated forecasting instrument.

II.8.23. Much light is thrown on how this could be done by C.F. von Weizsäcker's tripartite division of the history of science(1). The first phase was the creation by princes of institutions where scientifically minded barbers, stonemasons, and sailors could become something new: scientists. The second phase was that of the autonomy of science, when scientists followed their own noses and always got the money to do it. This was the phase which produced the laws of science, the dignity of science, and the power of scientists. We are now in the third phase, when science and scientific education are so expensive that society has to ration the expenditure and, in doing so, to decide what science shall be done. Times have changed since the first phase; it is no longer princes now, but the diffuse machinery of democracy which has to produce the decisions.

Recommendations

II.8.24. As in many of our fields, we think Europe Plus Thirty should spend considerable effort on finding out what the present causal linkages are. How are social demands on science and technology expressed ? How are they transmitted, and to whom ? What structures and policies exist, and what results do they yield ? There are one or two specialist institutes in Community countries which are well qualified in this field.

II.8.25. Then Europe Plus Thirty must, by the use of task forces, brainstorming, and scenarios, work out alternative future European structures and policies, for comparison by the decision-makers, on the basis of the knowledge acquired.

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(1) Vividly expounded by Ralf Dahrendorf in Proceedings of the Royal Irish Academy 75.C.2., Dublin, 1975.

it must keep scanning in many fields of advanced technology for those breakthroughs (we gave examples above) which, if they happened, would really change people's lives, and would thus demand new policies which might have to be on a Community scale.

Lastly it should scan current experience of the effects of different subsidy and fiscal policies on the development of innovations (that is, development as opposed to research) and should forecast for the Community about alternatives open to it in this matter.

Technological forecasting of the kind outlined in this chapter has much in common with the process of technology assessment: T.A. To this we shall return in Part III below.

II.8.26. To carry out and to catalyse the functions and studies sketched above, we think Europe Plus Thirty should include not less than five to seven specialists. They should be headed, or guided, or should at least be able to call on the services of, two people, one each in the physical and the life sciences, who by their own work and reputation have access to the places where the absolute frontiers of ignorance are being pushed back. There should be extensive use of task forces, short appointments, and contract work.

9. INDUSTRY

II.9.1. In dealing with social forecasting above, we pointed out that the same vastness and variety of the subject matter which made forecasting about it desirable also makes it hard to specify what should be done. The same applies to industry. We in Western Europe are an industrial society; industry is not what we are for, but it is what most of us do.

II.9.2. The arrangement of this Part of our report means that we have already covered, or will cover, many things separately which could be regarded as "running over into industry", or even as being "part of industry". Technology, energy, raw materials, transport, even economics and finance, all could reasonably, though not exhaustively, be considered in this way. Here we deal mainly with manufacturing industry.

II.9.3. In a field so vast, it is best to keep firmly before us the facts that Europe Plus Thirty will be assisting the institutions of the Community, and that what they require assistance in is the formation of policy, and that policy is simply a particular way of exercising powers; no powers, no policy: no assistance needed. The powers the Community now has and those it might acquire must set the boundaries of Europe Plus Thirty's work in this field.

II.9.4. It is therefore useful first to distinguish between three sorts of "industrial forecasting": forecasting about industry for the benefit of industry, forecasting about society as a whole for the benefit of industry, and forecasting about industry for the benefit of society. It is clearly in the last two of these three activities that Europe Plus Thirty must find its role. We are guided throughout by the need to devise forecasting which is useful in identifying and pursuing goals. It is probably more misleading than not to think separately of social goals, economic goals, and industrial goals; there are only social goals. Economics are a means of measurement and reasoning, industry is a means of production, and neither of them can in themselves constitute or provide a goal or goals.

Likewise with technology. It is not enough to watch technology going ahead and then check to see whether its results are going to be harmful; it is better, having chosen our social goals, to see what technological developments can and should be applied to their achievement. We should not be examining so much the social acceptability of new technologies, as the technological possibility of achieving new social goals. Above all, Europe Plus Thirty should speculate about the demands which society may make on industry in the future, and the responses which may be called for from the Community in both industrial and social policy. (See II.6.)

II.9.5. Though designed for the good of society, such an approach could not but be useful to industry itself. In the past West European industry pursued its aims strictly according to economic criteria. It produced goods to be sold on the market, and it was assumed or hoped that the "social good", whatever that was, would automatically be furthered by firms pursuing their individual goals. These goals consisted of maximising the efficiency of the profit-investment cycle, controlling and defending market positions, and devising and adjusting to changes in the product cycle.

It has for some time been clear that industrial activity in itself does not necessarily produce desirable social results. Increased standards of living may go a long way to satisfying needs, but needs are not only for goods; this becomes clear when the trade-off is between the increased production of goods and environmental deterioration or other external costs, or between "economic" efficiency and full employment or satisfaction at work.

II.9.6. This awareness has expressed itself in the development of government interventions, of technology assessment, of an emphasis on qualitative rather than quantitative growth, and in moves towards worker participation in decision-making. People have also become aware that, at a certain point, technological innovation began to be used not only to increase productivity and welfare, but also as an artificial means

to increase the market by shortening the product life cycle and introducing "better" new products in as rapid a succession as possible. The filtering through and resolution of these problems are long-term issues.

II.9.7. In general, this change in attitudes has made it harder for firms to get on with their own business as they see it, namely that of producing profitably. The firm is increasingly torn between its responsibilities towards its shareholders, towards the society in which it operates, and towards its own employees. As a consequence of the confusion over these conflicting responsibilities, industry sees the increasing number of pressure groups (local, trade unions, consumers, environmental) more or less fostered and coordinated by governments, pushing it in different directions and, as it sees it, hampering it from getting on. The resolution of these often contradictory demands makes for a climate in which public accountability is increasingly expected. Formerly, in a period of rapid economic growth, these demands, embodied in pressures on the firm, could be shrouded over by distributing to all sides more of an ever-increasing cake. In enabling this distribution, technology played the major part. But when the workings of technology itself are called in question, and basic resources become scarce and expensive, the situation needs new solutions.

II.9.8. The adoption of Keynesian principles in the post-war period laid the basis, in Europe at least, for the rapid economic growth of the 1950s and 1960s, because it helped to cushion out downswings of the economy. This in turn caused governments to take on the responsibility of ensuring progressive growth. They became more closely involved with industry, because they were the only agencies with the authority to implement the demand policies which could ensure full employment and growth. Three further factors encouraged government involvement: the recognition and open acceptance of industrial development as a prerequisite of national power and independence, the need to direct and regulate "natural" industrial development in order to create a regional and social balance, and the need to mobilise resources which lay beyond the capacity of the individual firm.

II.9.9. Hence the increasing government involvement at the national level, hence also the Communities' attempts to make these involvements compatible first with the ideal of fair competition, and now with a groundwork for possible economic and monetary union. Thus, even though the Community treaties do not explicitly mention industrial or technology policy, the fulfilment of their overall aims make just such policies inevitable. The need for close cooperation of industry and government in forecasting has long been evident, because of the increasing involvement of governments in devising policies for the reform of society as a whole and consequently in changing priorities on what the goods and services are that society needs. The need for close cooperation between member governments and the institutions of the Community is in turn becoming increasingly apparent as the Community pursues both its established aims and those towards the definition and adoption of which it is struggling.

II.9.10. The European Communities, and especially the Commission, are not starting from scratch in all this. The earlier interventions in industrial policy, the "partial communities" of the ECSC and Euratom, have yielded countless lessons of the highest value. Coal and steel were chosen, back in the fifties, as a gauge of courage and wholeheartedness; they were felt to be the backbone of European industry. Their "communitisation" did not yield the results hoped for, and led in particular to the coal crisis of 1958 and the over-production of steel in 1969, because European coal and steel were not considered, or not sufficiently considered, as part of the energy sector as a whole, or as part of the development of the world economy. Euratom (as a "communitisation" of another part of energy production and the R & D therefor) also failed to yield the hoped for result, this time, probably, because a mistake was made about how industrial innovation can be procured and diffused, particularly in a field so intimately connected with military security. One cannot create an establishment, order it to innovate and then, having innovated, secure the adoption of its innovations on the shop floor. Life works more independently, more inconveniently, and above all it works in a way which can better be understood by forecasting about what may happen and better influenced by making decisions only after prolonged forecasting and analysis of the surrounding landscape. So the European

innovations in nuclear energy were made where they would have been made anyhow, that is nationally, and a European nuclear industry did not materialise.

II.9.11. The past experience of the Common Market, then, has shown the difficulties of seeking economic union without a broader industrial policy. The general aims of an industrial policy can only be to ensure a suitable framework for industrial development within the European market and for the application of Community regulations. But the economic forecasts which should have helped industry tended to become ends in themselves, and not instruments to modify and guide decisions. The three programmes prepared by the Committee on Economic Policy (1966-70, 1968-70, 1971-75) were very general attempts in this direction, but would have had to be more precise to enable them to be translated into policies and sectoral decisions.

II.9.12. To what extent the Community will increase its involvement in industrial policy is itself a matter of forecast. Effective Community action in the industrial field will only be obtained when it is possible to formulate a"Community plan". But,while waiting for this eventuality, the Community will no doubt continue to fix general goals for industrial policy, and for technology policy. These might include the easing of restraints on rationalising industry across frontiers, common approaches to fiscal and taxation policy, the development of a Community approach towards non-member states, concerted action towards foreign investment, and the development of regional industrial policy.

II.9.13. The Community might also wish in the future to develop a greater role in the exercise of public control over the multinational corporations. At present there is an ambiguity in our attitude towards them; on the one hand, they are obvious generators of wealth, and very big generators of innovation. On the other, they are by their very multinationality able to play off against each other the governments of the countries in which they operate. As long as it is national governments which, in the last resort, take decisions on labour conditions, land-use planning, pollution controls, safety standards, infrastructure investments, regional grants, water charges, etc.,

etc., a company with the capital and the organisation to create production capacity where it likes is bound to seek the country where these decisions are most favourable to it, and national governments are bound in turn to be tempted to compete in offering favourable decisions. The result is by no means always to the good of a balanced West European economy, especially from the regional point of view.

II.9.14. It is true that standardisation and coordination in these matters would leave the Community as a whole still in a state of unregulated competition with the rest of the world, and thus liable to be "played off" against, say, Japan or Eastern Europe. But that is true of many other things as well, and we imagine that an end to investment snatching as between the member countries would be regarded as progress, and that attempts to achieve this will continue and in the end succeed.

II.9.15. So what should Europe Plus Thirty forecast about, and how, in the industrial field? To begin with, it will not be alone. There is already a great deal going on: technological forecasting, technology assessment, techno-economic forecasting. Most of it is done by firms and industrial research associations for their own purposes: forecasting about industry for the benefit of industry. Some is done by governments,including much forecasting about society for the benefit of industry. It is fortunate that organisations already exist which can help to provide the inputs for Europe Plus Thirty's activities, such as the European Industrial Research Management Association (EIRMA) and the yet more recently established Federation of European Industrial Cooperative Research Organisations (FEICRO). Both names are self-explanatory.

Recommendations

II.9.16. We would hold it impossible, or at least not cost-effective, for Europe Plus Thirty to attempt a detailed comprehensive model, whether conceptual as such or conceptualised onto a computer, for European industry as a whole. Its approach should be more problem-oriented,

more based on brainstorming and scenarios, though of course always in the presence of the biggest data-base practicable. In what follows by "vertical" we mean single industries; and by "horizontal" phenomena, information, and problems which affect several industries, or all.

II.9.17. Europe Plus Thirty should:

a) Produce guidelines (stemming from a generally informed view of the future of Europe as well as from the present long-term policies of the Community), and afford methodological control, for "vertical" strategic forecasting and assessment exercises concerning certain industrial sectors or group of sectors; particularly those where there is, or is likely to be a Community policy, or which are already somewhat integrated at Community or higher level;

b) Organise task forces, or repeated seminars, for such vertical exercises and take part in them to ensure high quality of forecasting and assessment work from the professional and methodological point of view;

c) Organise and direct task forces for dealing with horizontal issues. The issues should be carefully defined (by Europe Plus Thirty) and should be problem-oriented rather than sector-oriented;

d) Finally, the general forecasting and assessment output of Europe Plus Thirty, the "teleonomies", should include whatever material can usefully be put into them from the outputs of the studies mentioned above.

II.9.18. The "task forces" should include people from industry itself, who are concerned with TF and TA, and possibly from other bodies involved in the same activity. Both in the vertical and horizontal task forces, there should be people from the trade unions and, whenever they exist, from consumer associations. From their presence could come much mutual education.

II.9.19. Among the "vertical" sectors tackled(b) should be some of the high technology ones, such as electronics, informatics, and drugs, and

also some sectors from our present mainline industries (e.g. cars, chemicals, machine tools, food processing, textiles).

I.9.20. But the bulk of the work would probably fall on the "horizontal" task forces (c). We now list several issues from which some could be selected for analysis and forecasting in this way.

a) The problems of regional distribution of industry;

b) Labour, capital and energy intensiveness;

c) Technology transfer, particularly the question of what kind of technology, in view of the role that the Community can play in the development of the Third World.

d) World "division of labour". What are the present trends in the distribution of industrial innovation, high-technology industry, intermediate industry, low-technology industry, and menial drudgery, as between the U.S., Japan, the European Community, Eastern Europe, and various sectors of the "developing world"? What would be the consequences for West European and world society of their continuation, and of various alternative modifications? Could policies be adopted?

e) The problem of Mitbestimmung, thus bridging with social forecasting.

f) The relation between manufacturing industry and the service sector. What macro-economic trends are emerging, and what would be the consequences for society of their continuation or modification?

g) Forecasting and speculation about the dispersion of power in our midst; power for good or for ill, we do not say. The most obvious area is the rise of the multinational corporations. At the moment, as is very well known, some of them have bigger turnovers than the state revenues of middle-sized nations, and the trend appears to be continuing. What would or might be the political and social consequences for European society and for our external political and economic environment of its continuation or its reversal?

What would be the prerequisites and effects, social, political, and economic, of alternative policies in this field?

h) A perception well worth elucidating and deepening would be that which holds that it is enough for a government (or for the Community) to forecast, plan, and regulate only the development of bigger firms, since the smaller are conditioned and determined by what happens to the big ones. Is this true? If so, what are the conclusions to be drawn for policy formation?

i) Again,what is the relative role of large and small firms in innovation, both technological and social? Do small firms have a special role in jumping around trying out new things in the interstices between the industrial giants? What would happen if they were gradually squeezed out?

k) And, lastly, what might the future hold for the humanisation of industrial work? We are talking here of the movement, most advanced so far in Scandinavia, away from the inexorable production belt and towards a more craftsmanly organisation by work teams, and the opportunity for the individual worker to identify himself in a personal way with his product. This car was made by John, Henry, and Mary .....

II.9.21. Here are the "horizontal" industrial forecasting areas on which we think work might be useful. Taken with the "vertical" issues and with the contribution to the teleonomies, this would be a formidable work-load if everything were started at once. Naturally, that is not our suggestion; we offer this list (like others in this report) as description and illustration, not as a concrete work plan.

II.9.22. We recommend that industrial forecasting, partly through the task force system outlined above, should be carried out in Europe Plus Thirty by about 10 people having between them experience in the following fields:

European Commission industrial policy
Government research and development policy
General corporate management
Industrial research management

Industrial economics
Specialist study of technology transfer and diffusion
Work in interdisciplinary "think-tanks"
Trade unions, preferably international
Consumer associations

These people, or some of them, should expect to spend some of their time on the technology assessment function of Europe Plus Thirty, which we come to below, since industrial forecasting and technology assessment are so closely related. The problem of commercial secrecy is common to both forms of work, and can only be solved by sensible handling each time it comes up.

10. ENERGY

Introduction

II.10.1 The Community lives now and will live for a long while yet with permanent energy difficulties, because of the conjunction of three historical trends. The first is that industrial societies have become addicted to high levels of energy use. Industrialisation and the rising material standards that go with it have depended on the substitution of one form of capital resource - energy - for other forms, especially labour, time and land. This process accelerated sharply during 1950-70 on the back of ultra-cheap and assured oil supplies, with the result that most production and consumption patterns have become 'locked in' to patterns of high energy use that will not be at all easy to undo. Good examples are transport and settlement patterns, mechanisation and automation of both the manufacturing and service sectors, and the whole food production chain from the farmer to the urban house-wife with her desire for packaged convenience foods. The solidity of these patterns is shown by the many recent estimates that energy consumption in most production and consumption activities can be lowered by only 10% or so without making major structural changes or reforming highly ingrained attitudes.

II.10.2. The second trend is the growing difficulty of meeting this dependence. The escape from Middle East oil while also maintaining high levels of consumption inevitably calls for the massive expansion of very demanding technologies such as offshore oil, coal conversion, and nuclear power, with their formidable requirements for capital, skilled manpower, materials, public acceptance of risks and environmental impact, and, in the case of nuclear power, requirements for infallible people and unbreachable security measures. Other less demanding technologies such as natural gas, geothermal, solar and wind power tend either to be short life resources or low rate sources, creating their own set of difficulties. It is now increasingly recognised that the real limits to the level of energy supply and/or to its possible rate of increase will be set not by purely geological or technical considerations but by the combination of an extremely wide range of social, political, and environmental factors.

II.10.3. The third trend is the growing recognition of global inequities and the consequent pressures for a new and more just international economic order. The energy profligacy of the North and the crippling impact of higher fuel prices on many countries of the South are one major cause of these moves to forge a new global relationship. Another is the move within the industrialised nations themselves towards new paths of development which are more relevant to non-material needs, and which distribute material requirements more fairly. If these adjustments are to be realised, the present disparities in energy consumption - approximately 7-fold between the richest and poorest sectors in individual European countries, and approximately 10-fold between the averages for the EEC and the Third World - may have to be among the first fixtures to dissolve.

II.10.4. Given these trends, the wise management of energy will in future require an extremely broad and searching outlook. Clearly, the energy future is peculiarly uncertain. Both the constraints, and the opportunities over the longer term to escape those constraints by choosing other paths, are very large. The general management process involves many judgements between risks and benefits, costs and advantages of many different kinds - some quantifiable, others not. Energy policy also has innumerable interactions with nearly all other social areas and issues, including fundamental questions of ethics, preferences and ultimate goals. At this level of complexity, any process becomes political as well as, or more than, economic or technical.

At the deepest level, energy calls up far-reaching questions about the nature of industrial societies and their future directions of change: indeed, the radical transformations of the world energy/economic scene since the winter of 1973/74 have prompted widespread heart-seachings of this kind.

Priorities for Energy Forecasting

II.10.5. These introductory remarks point to the extreme difficulty of energy forecasting - at least of forecasting over a reasonably broad front with realism and credibility. Yet the attempt must be made: the energy future is too important to be left to trend extrapolation, as in the past. The rest of this chapter therefore reaches into this thicket of difficulties to pick out key priorities for energy forecasting. When these have been reviewed, the chapter ends by

drawing out their implications for Europe Plus Thirty, and for the place of the latter among other European energy initiatives.

A Total Approach

II.10.6. Since energy forecasts which cover a reasonably broad field must include a very wide range of social factors, they should be intimately related to large-scale social forecasts. Indeed, to an important extent energy forecasts are themselves social forecasts. For example, any projection which shows a large increase in electricity production implicitly assumes, because of economies of scale, the building of large power stations. If it assumes that power station waste heat will be used for industrial or domestic purposes, then it also supposes the development of large industrial-urban clusters around the power units, or the location of the latter in existing clusters. With 5-10,000 MW per unit, or more in the case of 'nuclear parks', this assumes an extreme degree of centralisation. (Conceivably the development of small-scale nuclear fusion stations could reverse this situation, but such stations are now merely conjectural.) Meanwhile, low energy demand scenarios, or those based on large-scale use of 'income energy' (solar, wind etc.) immediately lead to massive changes in settlement patterns, the organisation of work, and so forth - and are in fact usually based on the desirability of such changes for social rather than energy reasons.

II.10.7. This point may seem obvious but is normally ignored. The great bulk of energy projections and forecasts are (a) based on and confined to rather narrow technical and economic considerations, and (b) are extrapolatory rather than normative. For both reasons they tend to assume that the future will be much like the present, with some sectors 'bigger' and others 'smaller', and therefore see no reason for questioning the social assumptions behind either the present energy pattern or the future projection.

II.10.8. A first priority, then, is to relate energy forecasting to all other social considerations and sectors; to attempt fully integrated forecasting. This is easier said than done, but it is precisely because hardly anyone is taking this all-sector, multi-disciplinary approach to the longer-term future that the Europe Plus Thirty study was conceived.

A European Approach

II.10.9. One of the most striking facts about the European energy scene is the large differences between EEC nations of some rather basic parameters. Some of these are shown for the year 1970 in Table 1:

TABLE 1

	Energy per capita tce*	Energy growth per capita % p.a.**	Ratio GNP to energy ***	Import dependence % ****
France	4.2	4.9	678	71
W. Germany	5.6	4.3	557	48
Italy	3.0	8.6	580	82
UK	5.5	1.0	396	45

Source: EUROSTAT
* tonnes coal equivalent: 1 tce = 28.8 x 10^9 J
** average annual % growth 1960-70
*** 1970 US dollars per tonne coal equivalent
**** fuel imports minus exports as % of total consumption

These differences raise many important questions for the Community as a political entity, not least of which is the prospect of sharp divergencies in the energy policies and priorities of member countries with all that these imply for common standards, common research efforts, trading relations, and so forth. To reduce the risk of this a Community energy strategy - and hence Community energy forecasting - is a necessity.

Understanding the Past and Present

II.10.10. Useful forecasts and models of the energy sector must clearly be based on a proper understanding of past developments and the present patterns of energy usage. Yet such an understanding hardly exists for many important factors. For example there is no satisfactory causal explanation of the disparities in the first 3 columns of Table 1. There is no satisfactory causal explanation of past energy growth patterns. Why, for example, did total energy consumption increase by only 30% between 1900 and 1947 in the UK? On a per capita basis, the increase in the half century was a mere 2% - from 4.08 to 4.15 tons coal equivalent per year. The usual explanation - that coal was progressively used

more efficiently while other inherently more efficient fuels such as oil were substituted for coal - is not sufficient, since it ignores important factors such as the large-scale substitution of horses (and hence land) by machines. Without information of this kind, trends and saturation effects are not easy to estimate. Lacking information of this sort, extrapolations are usually based on correlations rather than causes: notably the correlation between GDP and available or net energy consumption. This relationship varies very widely for different countries, even at the same level of development (see Table 1). Very little has been done to explain this variation.

II.10.11. Similar doubts apply to changes in this relationship: that is, the percentage increase in net energy use for each percentage increase of GNP. This coefficient has been close to 1 for many years for nearly all developed countries and is therefore widely used as a basis for forecasting. Such a grossly aggregated figure, based on correlations and not on causes, is hardly an adequate basis for forecasting or planning. It is anyway likely to change considerably[1]. Little is known about the relationships (elasticities) between energy prices and both supply and demand. Much work on these factors is now under way, especially on monitoring the effects of the recent and dramatic price changes. And very little is known about precisely where, and why, energy is used when by 'use' one means both direct and indirect consumption. The indirect consumption (eg the requirements for making

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(1) In several countries the coefficient has fluctuated quite widely since the late 1960s. The sudden rise in oil prices has produced marked and probably permanent changes. Even without this intervention the coefficient could have been about to decline. This has been shown for the UK by an analysis of the total energy content of all purchases by households within 11 income ranges: energy per average £ spent fell from 92.3 kWh in the poorest sector to 55.7 kWh in the wealthiest group, suggesting that if energy intensities and spending patterns remain constant, as national wealth increases the coefficient will fall from about 1 to around 0.65 (P.C. Roberts and V E Outram, A Method of Projecting Energy Demand in the UK: Department of the Environment, London 1974). However, this conclusion has been challenged on the grounds that the energy intensity of manufacturing industries must increase in order to release labour to the expanding service sectors, which have relatively low or very low energy intensities and which account for much of the expenditure by the wealthiest sectors (L G Brookes, UK Atomic Energy Authority, personal communication). The existence of this as yet unresolved dispute further supports the main argument that forecasts should be based on causes and not on correlations.

machinery, or providing materials) is often a very large fraction of, and sometimes greatly exceeds, the direct consumption. Without this information it is impossible to evaluate the true energy costs of any good or service, any production or consumption activity, or any movement of these energy costs through technological changes, conservation measures, and so forth.

II.10.12. Fortunately, many of these important gaps are likely to be filled during the next year or so following the recent and phenomenal upsurge in energy studies, including energy analysis. How soon or fully this information can be incorporated into energy forecasting is another matter. An important role for an independent 'centre of excellence', such as Europe Plus Thirty, will be to see that it is fully used, whether by in-house or in contracted-out studies.

Resolving Present Conflicts

II.10.13. The energy scene is full of critical issues that are shrouded with uncertainty or are highly controversial, or both. In some cases expert opinion is sharply polarised, even inflamed. Among the more important of these conflict areas are several nuclear issues (safety, waste storage, plutonium containment, etc); the size of fuel reserves (including North Sea oil and gas); potentials for energy savings and the degree of disruption likely to be caused by vigorous conservation measures; and costs and timings of new supply technologies.

II.10.14. An early step in any forecasting programme must be to mount a systematic and aggressive assault on these disputed issues, starting with those of immediate relevance to policy makers. Means must be found to help experts resolve more clearly what they agree upon, where they differ, and what further research is needed to narrow areas of disagreement. Until this is done a large forecasting programme hardly seems possible, since it demands some kind of mutual agreement about constraints and other inputs, or at least about the range of contingencies which should be allowed for.

II.10.15. Nor is it possible in the meantime to begin a meaningful and informed debate on energy issues between non-experts, including concerned citizens, politicians, and even ministers and Commissioners. If the experts are fighting it out in the dark, what chance is there for the rest? Yet, as we saw above, energy digs so deep into society as a

whole and raises such fundamental questions of ethics, preferences and goals, that a widespread and informed debate on 'energy futures' is entirely necessary - at least for societies with any pretence at being democratic.

II.10.16. Mounting such an assault requires a concerted effort simply to speed up and facilitate communication between experts, who possess much valuable information which now circulates slowly and erratically (or not at all). But an even more valuable and practical approach would be to initiate a series of task forces or intensive seminars on critical issues, using experts with widely varying opinions, providing ample library, research assistant and computational back-up, and, as it were, locking them up until results are achieved. Previous experiences with this technique have proved remarkably effective both in establishing the areas of consensus and differences among experts and later in communicating these findings to the public at large(1).

Forecasts from the Present

II.10.17. With energy, the main strategic problems to be solved are (1) how to conserve energy, (2) how to increase indigenous supplies, (3) how to develop new supply technologies, (4) how to keep today's supply patterns going without economic collapse, and, more controversially, (5) how to make a strategic withdrawal from high energy dependence, perhaps at relatively short notice.

While each of these problems demands its own forecasting approach, most of what needs to be done falls under three main headings:

a) Supply Developments: identification and timing of fuel reserve appreciation/depletion and of global export/import patterns; identification, costs and timing of supply technologies, both new and existing; prices.

b) Demand Developments: by sectors and overall in response to changes in technologies, costs and prices, energy availability, deliberate energy-saving measures from simple technical, fiscal, or legislative

(1) Man's Impact on the Global Environment: Report of the Study of Critical Environmental Problems (MIT Press, 1970). And Inadvertent Climate Modification: Report on the Study of Man's Impact on Climate (MIT Press, 1971).

'fixes', to deeper structural changes. Study of wants, needs, necessities and unwanted consumption (eg planned obsolescence of goods, some private transport).

c) Interactions: changes in supply and their impact on other sectors (capital, balance of payments, skills, materials, land use, environment, safety, etc. etc). Impacts of demand changes on other sectors (labour, manufacturing output, capital, balance of payments, need for anticipatory planning, etc. etc). Identify feedback loops between all energy and social sectors, time delays, critical phases and 'gaps' (eg, over- or under- supply at future dates). Broader consequences of alternative supply technologies and demand patterns.

Even this incomplete list of target areas adds up to a formidable forecasting commitment. Nevertheless, while necessary, it is very far from being sufficient. The innumerable uncertainties of the energy future, the extreme openness of this future to change, and the tight connections between energy and all other social sectors, add up to a severe problem of credibility for any attempt to forecast from the present more than, say, 10 to 20 years ahead. Yet, as stated above, forecasts of this time scale or longer are urgently required now.

Scenarios of the Future

II.10.18. Here as elsewhere, extrapolation can only be the handmaid of forecasting. For the longer-term view we require leaps into the future. Here scenario techniques are supreme. Energy scenarios are easily quantified and hence can be 'back tracked' to the present. This allows trends and decision points for getting 'from here to there' to be identified. With energy demand scenarios one can distinguish futures requiring mere technical 'fixes' (with little or no change in life styles) through the spectrum to full-scale changes in social structures and attitudes. This helps to bring political judgement to bear on desirability, feasibility etc.

II.10.19. Implications for non-energy factors are normally easy to identify since they are often the starting point for constructing the energy scenario itself. For example, in transport, measures that save energy also advance many other social benefits (e.g. a switch from private cars to public transport in cities can reduce energy consumption and, by clearing the roads for public vehicles, help improve public services so that most people have access to a swift, flexible and convenient

transport service). Scenarios are much easier for non-experts to understand and to question, and less easily misinterpreted, than are complex dynamic models. This is especially important in the energy field where the wide-ranging debate has already begun.

II.10.20. Though much used, scenarios in the energy field mostly focus on the consequences of single 'events': for example, the impact of major technological developments (eg, a breakthrough in cheap solar or fusion power); the impact of major public or government actions (eg, heavy fuel taxation, a ban on nuclear breeders); or the impacts of extraneous forces (eg, an oil cut-off).

"Broader" ones are needed. For example, the 'extreme ecological' scenario of the Energy Policy Project of the Ford Foundation (USA) postulated a possible halving of energy use in the year 2000 from present levels[1]. Imaginative proposals for individual use-sectors (urban transport, food production, domestic heat, light and power) show potentials for savings of the same order. Such ideas need to be explored systematically and thoroughly, even though some may now seem eccentric, uneconomic, unlikely, or plain impossible - academic fantasies. The fact is that one cannot judge their value until they have been explored properly. Some possibilities may not seem at all uneconomic under broader cost-benefit accounting or different economic conditions. A full appreciation of all alternative options and their implications change our perceptions of what is realistic and desirable.

II.10.21. Above all, it seems premature to judge these alternative future possibilities until they have been matched with the deeper undercurrents of social change, motivation and behaviour now at work in all industrial societies, or, equally important, until they have been tested by exposure to public opinion - something that has never been done in a systematic way. It is very significant that many 'utopian' proposals for energy futures match rather closely some major undercurrents now

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(1) This scenario was abandoned in the final publications of the Project (eg, A Time to Choose: America's Energy Future, Ballinger Publishing Co., Cambridge, Mass., 1974). A less extreme 'zero energy growth' scenario nevertheless gave a 50% reduction in energy use in the year 2000 compared to a'historical growth' or 'business as usual' projection, and involved only minor changes in consumption patterns, life styles, etc.

being revealed by future-oriented social studies: for example, the Swedish 'To Choose a Future' programme.(1) These include the expectation of or desire for a greater integration of education, work and leisure; a dissolving of the tie between income from work and standard of living; substantial decentralisation of living patterns, organisation and decision-making processes; a stronger 'sense of community'; greater income redistribution combined with a slow-down of growth in the consumption of goods; greater solidarity with the poor world.

Economic Fundamentals

II.10.22. Some economic problems, pertinent to the energy and raw material sectors, will also have to be examined. Particularly:

a) When mineral resources are exploited down a decreasing quality gradient, outputs of residuals and inputs of capital, labour, energy and other resources normally rise. It is usually assumed that higher prices will cover these higher costs. Yet as all finite resource stocks are depleted, their scarcity value and market price also rises. At what point do these effects combine to produce rapid 'resource price inflation'? What are the implications for resource allocation over time; ie between the present and the future? What are the implications for poorer countries, where higher prices are already imposing intolerable strains?

b) Economists often answer these questions by saying that new technologies will increase 'efficiency' of resource stock conversion and use (eg, breeder reactors rather than uranium burner reactors), enlarge the stocks by new finds, or discover how to use new stocks (eg fusion reactors). The critical uncertainty is, of course, the rate at which these can be introduced successfully. But technical progress is not a free good: in fact it is very costly when one includes all components of research, all required substitutions of technology and capital, and all changes required by consumers. Very few of these costs are reflected in the accounting, though they do appear as an increase of GNP. What are the true costs? And what implications do they have for the main argument?

c) Economists are sharply divided on the 'optimum' rate for depleting a resource in the ground. Some have used theoretical arguments to

(1) "To choose a future - a basis for discussion and deliberations on future studies in Sweden" Royal Ministry for Foreign Affairs in cooperation with the Secretariat for Future Studies (1972)

show that present extraction rates are below the optimum: we are using resources, including oil, too slowly.(1) Others produce a strong theoretical case for conservation. Much depends on the number of factors considered (boundary conditions), the future discount rate, how one values present capital stocks of goods, knowledge etc. Can economists sort this out ? Should depletion strategies, which depend ultimately on the value placed on the options left open for future generations, be decided by economic means, or by political (ethical) judgements ?

The Task for Europe Plus Thirty

II.10.23. A vast amount of energy forecasting and modelling is now being done in Europe and around the world by commercial and industrial interests, by energy industries and institutions, by universities and by governments. The European Commission itself has major proposals for an energy research and development programme ('Energy for Europe')(2). These proposals include a fairly ambitious scheme for energy modelling/ forecasting which covers many, though not all, of the priorities set out in this chapter.

II.10.24. Most of this work is inevitably rather rough and tentative. Conditions have changed so abruptly since the winter of 1973/4 that old assumptions and methodologies, such as the former and never remotely justifiable reliance on single trend analysis, have had to be scrapped. Forecasting has had virtually to start afresh. At the same time there has been a wide recognition that the data base for forecasting is inadequate.

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(1) J.A. Kay and J.A. Mirlees, The Desirability of Natural Resource Depletion, paper to Environmental Economic Study Group/Institute of Environmental Science Joint Conference on Natural Resource Depletion (Royal Institution, London, January 1974).

(2) Energy for Europe: Research and Development (Lindner Report -SEC (74) 2592 final, 17 July 74); and Draft Proposals for a Common Research and Development Programme in the Fields of Solar Energy, Geothermal Energy, Hydrogen as a New Energy Vector, Systems Modelling on Energy (European Commission DG XII). The reports identify eight strategic areas, namely: (1) Collection and standardisation of basic data; inventory of energy R & D; (2) Conservation; (3) Fossil energy (coal, natural gas, oil); (4) Nuclear energy (fission and fusion); (5) Hydrogen economy; (6) New and renewable sources (solar, geothermal); (7) Environmental protection; (8) Systems modelling.

Nevertheless, one can expect a fairly rapid build up of competent forecasts and models on narrow fronts (sectors and sub-sector modelling etc) as the iterative process of model building, identification of weak data, improvement of data, and building of better models gets under way. Progress on wider fronts - as discussed in this chapter - is likely to be slower, but one might expect the emergence of some valuable models and scenarios and a rather more rapid emergence of important ideas and data for incorporation into them.

II.10.25. It is in this 'wider' work that a Europe Plus Thirty instrument has an extremely valuable - indeed, unique - role to play. It will have no need to get involved with narrowly technical research or forecasting; it should concentrate on broader techno-economic forecasting about alternative energy patterns and policies, and above all on forecasting about the possible relations between those alternative patterns and alternative patterns of change in the society, economy, and external relations of the Community as a whole. It goes without saying that the systems modelling work of the Commission's "Energy for Europe" programme should, in so far as it consists of long-term techno-economic analysis, be part of the work of Europe Plus Thirty.

II.10.26. The major contribution of Europe Plus Thirty to energy problems can perhaps best be summed up by three characteristics: integration, vision, and emphasis on longer term goals and alternatives. A major role should be to apply multi-disciplinary and generalist 'excellence' to checking, questioning, balancing, integrating and enlarging on longer-term and wide-ranging forecasts from an energy point of view. In other words, to concentrate on exploring the bridges between specialised sectors as they relate to energy: for example, by looking at the energy implications of forecasts and alternatives in transport or urban design on the one hand, and at the impact of existing energy forecasts on particular sectors of society, such as the poor. The work would partly involve the sifting and synthesis of studies produced outside, partly in-house studies to fill important gaps or to combine existing studies in fresh ways, partly through contracting work out to other institutions. The general aim should be to apply a specifically West European angle to the exploration of alternative options and goals: for example, to improve, to rework for Europe, and to extend, the

"first cut" alternative strategies of the kind that were produced for the USA by the Ford Foundation Energy Policy Programme and are now being developed for a range of countries by the Workshops on Alternative Energy Strategies (sponsored by the International Federation of Institutes for Advanced Study). It is here, in the design and verification of broad and long-term goals rather than in yet more detailed analysis of short-range problems, that energy forecasting is weakest, and that the policy-makers and people of Europe most require help.

Manpower Requirements

II.10.27. The "energy section" of Europe Plus Thirty would require 6-8 professional staff: say one highly experienced team leader, three experienced "energy generalists", and three research assistants at post-graduate level. Bearing in mind the inevitable spread of interests within the team and of expertise needed for the wide-ranging tasks it faces, this number is by no means excessive. It should be regarded as a minimum viable size for the team.

11. MATERIAL RESOURCES

Introduction

II.11.1. There can be no doubt about the necessity for forecasting in the materials sector [1] nor about the need for a common European forecasting effort.

II.11.2. In the broadest sense, the materials situation of the Community is similar to that for energy. Like other major consuming regions, the Community is perilously immersed, through its great dependence on many strategic materials, in a worldwide shift in the balance of who controls raw materials and reaps the benefit of ownership. This shift has deep historical roots and is likely to intensify rather than diminish.

II.11.3. At the same time, the Community is caught up in a second unforgiving historical trend: that of progressive resource depletion at a time of unprecedentedly high rates of consumption and dependence on these high rates. Regardless of who owns resources, the adequacy of many materials and the various costs of getting most materials from the ground and into useful products (including financial, energy, environmental and land-use costs) are likely to be constraining or disruptive forces of major and increasing magnitude.

II.11.4. There are, of course, substantial possibilities of damping these trends by reducing consumption of critical materials. Policies range from giving greater help and technical collaboration to developing (producer) countries, to increasing domestic production and applying a host of material-saving measures. However, many of these moves will cost money, take time, involve massive research and development programmes,

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(1) The materials considered in this chapter exclude water, energy and agricultural commodities. They include all metals; constructional materials such as stone, sand and gravel; and mineral fertilisers (phosphates and potash). Owing to shortage of space none of these materials can be considered individually in any depth but are used only as examples of more general issues.

and in many cases will lead to deep conflicts of interest. They certainly call for more purposive action than a mere reliance on automatic market price adjustments.

II.11.5. While it has not recently erupted with quite the violence of the 'energy crisis', the materials challenge nevertheless amounts to a major discontinuity and points to a new era of considerable instability and uncertainty. This alone is sufficient reason for intensive forecasting efforts and for these to be on a common European basis. But this argument gains extra force when one considers the Community's response to the challenge so far. Unlike other highly industrial and import-dependent regions such as the USA and Japan, the Community has not yet developed an overall strategy to cover immediate problems for its internal materials system or its relations to external suppliers. (No region has developed an adequate long-term strategy). Instead, member nations have acted alone - making their own investment decisions and agreements with producer countries - with all the known risks of distorting prices, international relations, and world trade generally.

Priorities for Forecasting

II.11.6. In most respects, the priorities for materials forecasting are the same as those for energy discussed in the previous chapter. We will recapitulate these later. In the meantime, we will stress here the differences between the energy and materials sectors and the consequent forecasting requirements.

General Points

II.11.7. In the most general sense, forecasting in the materials sector is more difficult than for energy. There are many more materials to consider than there are fuels. They have very different 'criticalities', dependencies, possibilities for substitution and recycling, and consumption growth rates. There are many more actors in the game, including producer countries and their 'monopolistic' organisations, mining and processing organisations, manufacturing and other corporate interests. Market speculation often plays havoc with prices, creating great instabilities. Compared with energy, there is a much more complex structure of manufacturing and end-uses, with subtle balances of supply and

demand, prices, technical suitability in both manufacture and use, consumer preferences, marketing, lobbying,and legislation controlling why some materials are favoured over alternatives, all having innumerable impacts within and without the materials sector. Finally, much forecasting work is already done by industrial and corporate interests and by institutions responsible for particular materials or groups of materials: collection, validation and integration of data from this motley crowd of interested and sometimes antagonistic parties is both more difficult and more necessary than it is for energy.

II.11.8. As a result of all this, it is perhaps as difficult to make a credible and comprehensive model for one material, such as lead or zinc, as it is for any major fuel, such as oil or coal. A general priority, then, is to begin with intensive studies of small sectors and intersectoral areas, building to a better understanding of the existing materials system, rather than attempt immediately large-scale, long-term dynamic modelling.

Reserves

II.11.9. For most minerals the spectre of geological exhaustion on a global scale seems fairly remote. One can reasonably suppose that, for the next few decades at least, technological improvements and price effects will continue to upgrade presently unknown or unproved or uneconomic resources into the proved, economic and workable category at a rate to match 'reasonable' increases in consumption. This cornucopia theory is almost certainly valid for iron, aluminium, magnesium (from sea water), chrome, nickel, limestone, sands, gravel, phosphates and potash. It is more disputable for other key materials - notably lead, zinc and copper - since reserve estimates of these 'igneous emplacement' metals are hard to make, and vary considerably.

II.11.10.But acute shortages within 20 to 40 years can be foreseen for some materials, notably helium, mercury, silver and perhaps tungsten. It is an open and much argued question whether these impending scarcities can be avoided (e.g. by substitution), at what cost, and with what impact on other sectors. In the longer-term there could be some very serious scarcities indeed, which would lead to vast upheavals (or the intervention of as yet unknown technological innovations). A good example is phosphates, on which all high yield agriculture critically depends. World phosphate consumption is some 20 million tonnes, rising

at 8 percent annually, and must increase about 2.7 times faster than agricultural yields due to inefficiency of uptake. In largely urban societies, it is progressively lost and, unlike nitrate, can be recovered only by very expensive tertiary sewage treatment, with a theoretical maximum efficiency of 90%. Assuming a future population of 10 billion is to be fed at adequate standards, annual phosphate consumption could be in the region of 100 million tonnes. Total known and potential world reserves are put by the U.S.Bureau of Mines at 45 billion tons, giving a 450 year supply. But most of these reserves are thought to be very low grade; known reserves are highly concentrated in the USA, Morocco and the USSR.

II.11.11. Apart from the need for more systematic and integrated studies of resource inventories, a major priority here is to respect the Law of the Minimum. This Law (which does not apply to energy, where all sources are theoretically substitutable) says that if you have less than the minimum amount needed of any essential, it does you no good whatever to have surpluses of every other essential. What essential will we run short of first ? And what materials are 'essential' ?

Supplies

II.11.12. There is a world of difference between material reserves and available supplies. First and most obviously, many reserves are concentrated in only a few nations. Availability and price are therefore dominated by political and socio-economic considerations and hence by the extent to which producer countries can and will exert monopolistic pressure in the manner of the OPEC oil producers. This has already occurred or is occurring with several commodities (notably phosphates, copper and bauxite) while producer cartels or looser associations have been formed for silver, mercury, and tin, and are expected for iron ore. Others may follow.

II.11.13. The outcomes of these forces are extremely hard to forecast. They depend on many complex and interacting factors to do with political determination and cohesion among producers, degree of monopoly supply and consumer dependence, possibilities for and time required for consumers to substitute or otherwise reduce consumption, stockpiling questions, dependence of producers on the consumer's advanced technologies, and so forth. Pressures may also take many forms, from a price or tax increase to nationalisation of foreign mining facilities and upgrading of ores in the producer countries (with heavy price penalties for consumers).

II.11.14. In this situation, the most valuable policy strategy and forecasting approach is the one already proposed to the Commission of the European Communities by the Science Policy Research Unit, Sussex University[1]. This is the application of risk analysis to identify critical dependencies. Risk analysis is specially designed to help choose the best out of several complex alternatives through estimates of the costs and probabilities of various events occurring. Critical dependencies are commodities for which the impact of scarcity or price disruption is sufficiently high to warrant an 'insurance strategy' that is, a package of policies to cushion consumer countries against later disruptions by paying a penalty immediately. Examples of penalties are a rapid introduction of substitute technologies at otherwise uneconomic levels, or dealing with several suppliers even if this means paying higher prices.

II.11.15. Hardly less important than these geopolitical supply questions are a wide range of other possible constraints and uncertainties on the supply side. The mining and production of materials, especially at lower and lower ore grades, can involve heavy costs in terms of pollution; land degradation (including wilderness; scenic areas; competition for recreation space and building land near cities, especially in the case of sand, stone, brick clays and gravel extraction); energy consumption[2]; and the disruption of communities and creation of depressed regions when short-lived mining operations are abandoned. Factors of this kind already create fierce conflicts in parts of Europe and could loom larger as basic value systems and perceptions change.

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(1) Implications of Some External Dependencies of Europe for Science and Technology Policy: final report on Phase 1 of Project EEC-SPRU Contract No. 058-73-7EC1UK.

(2) Energy costs rise sharply at lower grades: e.g. from 20,000 to 120,000 kwh per tonne of copper when going from 1.0 to 0.2% ore grade (P.F. Chapman, 'Energy Costs of Producing Copper and Aluminium from Primary and Secondary Sources' in Proceedings of the Conference on the Conservation of Materials, Harwell, U.K. March 1974). Energy costs appear to 'rule out' most ultra low grade sources, such as mining 'whole rock' or extraction from the sea (with the exception of magnesium). Technological innovations such as chemical leaching of metals may offset these costs somewhat.

II.11.16. While these factors are important, three others of a more general kind also deserve emphasis:

a) Costs. By and large, technological development and economies of scale have held constant the real costs of mineral production despite an overall trend toward the working of lower grade ores. It is is not at all clear - indeed, it is hotly disputed - how far this will apply in future. Some estimates show a very sharp cost increase with decreasing ore grade: for example, a rise from £1,000 to £7,000 per tonne of metal as one goes from 1.0 to 0.1% average ore grade for non-ferrous metals(1). Total accounting to include the social and environmental costs mentioned above might sharpen this trend appreciably. To make matters worse, it is not clear what effect such increases would have on our economies. One opinion is that they would be slight, since the cost of raw materials is a small percentage of GNP and of the price of most finished goods. Another view is that they can induce massive inflationary effects(2)

b) Rate and Magnitude Problems. Even with 'low growth' demand forecasts - that is, assuming an approach to saturation of per capita consumption in the developed world but increasing consumption in the developing world - annual production figures nevertheless rise steeply. These can lead to remarkable figures for the rates at which metals "must" be found, mined and processed, and the magnitude of these operations. For example, one such forecast for lead points to the need for a discovery rate rising from 9.5 million to 54 million tons per year between 1970 and 2020 and the need to find by the latter date 800 million tons in excess of present known reserves of 90 million tons(3).

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(1) B.F. Roberts 'Management Policies for Non-Rènewable Material Resources', in Proceedings of the Conference on the Conservation of Materials, Harwell, U.K. March 1974.

(2) Given that wages and salaries account typically for 80 percent or more of GNP, that manufacturers tend to pass on price increases rather than to absorb them by extra efficiency, and that employees have the power to match wages and salaries to retail prices, a 5 percent increase in retail prices resulting from a 50 percent increase in raw material costs can theoretically produce an inflation of 25 percent.

(3) Loc.Cit. in Footnote (1) above.

c) International Income Distribution. The present economic and political struggle for materials may benefit producers in the short- to medium-run but will continue to hit hard the many poor countries without raw materials to sell: the so-called Fourth World. If technologies are developed which allow mining of much lower quality (and hence more common) ores, these would give great advantages to the rich, industrial countries, since they are likely both to control the technologies and to have plentiful low grade ores for their own uses. All poorer countries, including today's producers, could be hit hard. If this does not happen, then the rich countries may well use more or less subtle economic measures to dominate the producers - or may even be tempted to revert to cruder military adventures. Even if they are not so tempted, they may well be believed by the producers to be about to do it, with political results which are not hard to foresee. A very wide range of scenarios can be built on arguments of this kind and with considerable utility to political and general forecasting, both as regards the adoption of optimum policies and as regards the avoidance of pessimum ones.

Consumption

II.11.17. Even if one neglects the vagaries of supply constraints, the growth of demand for materials is an exceedingly exacting and uncertain area of study. For example, the most comprehensive recent set of mineral demand forecasts (published by the U.S. Bureau of Mines[1]) shows a consistent upward trend for all non-energy minerals with world growth rates ranging from 3.8 to 5.6 percent per annum, but has high, medium and low estimates for the USA in the year 2000 spread by factors of up to three. Allowing for the development (or non-development) of the rest of the world gives a much greater range of uncertainties.

II.11.18. Similar problems afflict the study of other demand/growth parameters. As with energy, the consumption per capita of many metals varies widely even between countries at similar stages of development. It can also progress very erratically: for example, the former levelling off of per capita copper consumption in the USA and Germany has recently given way

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(1) Mineral Facts and Problems, 1970 (Government Printing Office) Washington D.C. 1970.

to sharp increases. Another important measure - the quantity of metal used per unit of GNP - also reveals wide variations between countries and over time. While intensity-of-use studies of this kind show a strong tendency as total GNP rises for consumption to slow down and flatten out per unit of GNP, longer-term forecasts of GNP are so uncertain that they are little help beyond the 10 year horizon. Nevertheless, these studies do show that many simple trend extrapolations are probably giving inflated figures for future demand(1).

II.11.19. Ideally, forecasts of demand should of course not be based on correlations of this kind but on causes; that is, on detailed scrutiny of where and why metals are used within particular production-consumption sectors. But even this is of little help in longer-term forecasting owing to uncertainties about future growth rates of sectors, possible substitutions, and other technology - or price-related effects.

Reducing Consumption

II.11.20. In principle, as we noted, there is large scope for reducing the consumption of materials or consumption growth rates. Among the chief approaches, which range from the technical to the broadly social, are:

More efficient use: e.g. less material per unit product; smaller products; better materials specification (corrosion resistance etc.); design for easier eventual recycling.

More efficient manufacturing processes: e.g. precision casting and forging instead of machining.

Longer product lifetime: design for greater durability, easier repair and maintenance to reduce 'throw away' syndrome; reduce cosmetic materials use and 'deliberate' obsolescence.

Increased re-use of products: e.g. through more efficient second-hand goods markets.

Increased recycling: that is, of materials now not recycled but disposed of 'finally' (dumping of domestic and trade rubbish, chemical wastes, phosphates and potash in sewage).

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(1) D.B. Brooks and P.W. Andrews, 'Mineral Resources, Economic Growth, and World Population', Science 185, 13-19 (July 1974).

Substitution by less critical materials: e.g. in U.K. production about 1.5m tons of metal are replaced each year by 0.5m tons of plastics.

Reduce non-essential uses: e.g. packaging.

Reduce number of useful products: e.g. through greater sharing or community ownership (launderettes, public rather than private transport, communal living patterns, etc.)

In practice, all this might be hard. By and large, the more technical design and reclamation measures are already used vigorously whenever they are profitable and/or do not undermine engineering standards. If they are not used, there are normally good reasons. These reasons are themselves compounded from very many complex factors, including the availability and costs of labour, alternative materials, capital equipment, sites for waste disposal, energy, and the like; and, not least, by consumer preferences.

II.11.21. How these will alter naturally under new conditions, or what effects deliberate policies would have, are both extremely intractable but extremely important questions. This is partly because the basic data and the general understanding of the materials system and its ramifications are still inadequate. For example:

- Extending product lifetimes clearly has enormous direct and indirect implications for employment and for the structure of manufacturing and service industries. Conversely, the 'throw away' syndrome is not merely an expression of senseless consumer prodigality but reflects perceptions about the value of time, 'convenience', novelty, desire for genuine product improvements, and the high cost and unreliability of equipment repair services. Interactions of these kinds are extremely hard to evaluate now, let alone forecast about.

- Recycling can obviously occur only when an artefact is finished with. Hence the level of recycling is mainly a function of previous consumption levels and the lifetimes of goods. For most materials and nations, time series on sales, the average and range for product lifetimes, penetration of the potential market, materials content of products, and the like are so poor that one cannot even say how efficient present recycling is, let along forecast about future efficiencies, or quantities of recycled materials available.

It is even less clear what effect recycling and longer product life will have in holding down resource consumption because of the unknown effects that will be exerted by 'first time' owners/consumers entering the materials acquisition-use-disposal-recycle chain.

II.11.22. But perhaps the largest area for uncertainty in materials forecasting or management lies at more fundamental levels. While all these techniques can clearly buy time in the face of a resource challenge, studying them does nothing to answer many deep, underlying questions. For example: if existing economic forces have led to "wrong" answers on materials by not providing incentives for conservation, what forces can ? Will they arise naturally (through price pressures etc.) ? And if not, by how much can, and may, they be deliberately engineered ? Whether natural or engineered, can they provide sufficient anticipation of future events, bearing in mind the long lead times and high inertia of the materials system ? More fundamentally still, given that Western economies and individual organisations within them have so far depended for stability on continued expansion (because of demands for profit, investment to meet competition, etc.) is it possible to make the transition to a resource-conservative economy without a major change in present economic systems and value structures ? How and when could these come about ? As a sharp example of this point, one might instance the 'throw away' syndrome. Many would say that eliminating it is impossible because of the dire employment implications. Many others would reply that it is dehumanising and dangerous to base a society on the premise that human effort should be used increasingly to produce things designed to be thrown away. How might external events or changing value structures affect these arguments - say over 30 years ?

The Task for Europe Plus Thirty

II.11.23. As with energy, forecasting in the material sector demands an extremely broad attack. On one flank, one finds that the most basic technical data are inadequate or inappropriate. On the other flank loom persistent questions about the ultimate goals and very survival of industrial societies. In the centre, there are great complexity and uncertainty, and few ground rules either for forecasting or making sensible policies under these conditions. What one can hope

to do in the present turmoil of events is to assess the options for, and the implications of, immediate strategies in a long-term 'options open' context, and reassess these longer-term options regularly, hoping for new trends and patterns to emerge following the recent discontinuity. Exploratory work on longer-term scenarios is also vital, as and when adequate data and broad agreement on assumptions is forthcoming.

II.11.24. The priorities for a forecasting unit such as Europe Plus Thirty are broadly similar to those set out for energy in the previous chapter, and indeed to those set out in several others. There is a poor understanding of the present materials system (materials accounting, etc.). Many pressing conflicts among experts need to be resolved (e.g. size of economic reserves, costs and timing of reserve exploitation). Bearing in mind the remarks above about starting small, there is a need both for system forecasting and for scenarios of alternative possible futures. Many fundamental economic and social factors have to be examined. Finally, it is important to have a specialist materials section in the unit not only to forecast about materials, but also to watch the implications for particular resources of forecasts in other sectors - for example, metals and road aggregates in the transportation sectors - and to watch the implication for those sectors of forecasts in their own: the usual integration.

II.11.25. For these reasons, the unique value of Europe Plus Thirty and its methods of work could be much the same for material resources as it would be for energy (see Chapter II.10.). The major difference is one of time scales for longer-term forecasting. While there is almost enough material now for constructing in the energy field the wide-ranging, integrative forecasts that are so urgently needed, in the materials sector this task might have to wait upon adequate sector and sub-sector analyses. Europe Plus Thirty could play a leading role in identifying what work of this kind is being done and in coordinating further work, so as to cut the delay. As soon as possible, it should feed the data which are 'adequate' into its general forecasting programme.

Manpower requirements

II.11.26. Because the materials system is rather more complex than the energy system, it might seem that more people are required for the former than for the latter. However, as we also remarked above, a great deal of data is already assembled, and forecasts made, on particular resources by a wide variety of institutions. It therefore seems reasonable to envisage the materials sector acting rather more than for energy as a listening post and contractor-out of studies.

We therefore suggest that within a unit of 75 professionals there should be 4-5 people in the material resources sector: a highly experienced team leader, backed by 2 experienced professionals with the same number of postgraduate level researchers.

12. THE ENVIRONMENT

Introduction

II.12.1. Of all the sectors treated in this part of our report, "the environment" is undoubtedly the most heterogeneous. The word itself, used in the way we now use it, is of recent adoption. In the European languages it only came to this immensely broad sense in the late 1960's, and reached administrative consecration in the Ministries of the Environment in several of our countries.

II.12.2. We divide the subject into four parts: (a) the physical environment, both land and sea, including pollution, (b) the biosphere including wildlife and flora, (c) the man-made environment, particularly cities, and land-use planning, and (d) society's 'response' to the challenge of the environmental change.

II.12.3. All these concern all the member states of the Community, but the Community has become concerned with them only gradually and pragmatically. Thus the ECSC Treaty produced legislation to protect workers against the emission of dangerous dust and gases. The Euratom Treaty devoted the whole of its Chapter III to the protection of population and workers against the dangers of ionizing radiation. Subsequently, action was taken to overcome the problems arising from the different laws controlling harmful and polluting substances, so as to minimise their effects on exchanges and conditions of competition (for instance: lead limits in petrol, carbon monoxide in vehicle exhaust, biodegradability of detergents).

II.12.4. The need to protect the environment and improve the quality of life increased with the rapid development of Europe's standard of living. It emerged with particular clarity in the Third Medium-Term Programme adopted in March 1971. The Community 'cannot simply pursue the joint aims of growth and stability', it said: because this growth 'makes sense only as a contribution to better conditions in general ... by raising the standard of living and improving the quality of life.'

It finally took real shape with the adoption, in July 1973, of the Programme of Action for the Environment. This made it possible to seek common policies, since the Community was emerging as a suitable geographical unit for resolving these problems.

II.12.5. We shall now briefly review some of the matters that could be the object of Community policies, leaving aside the matters which, while they occur with varying degrees of importance in each of the states, seem to lend themselves to treatment on a national, regional or local level, rather than a Community one. Clearly forecasting would be useful in both cases, but it will only be the concern of Europe Plus Thirty in the first.

II.12.6. We turn now to Categories a - d above, and list in each case matters about which we think forecasting might be useful. As usual, our listing is illustrative, not definitive.

II.12.7. <u>The Physical Environment</u>

a) Forecasting about the impact of new technological developments on the physical environment. This is closely related to the TA which should always accompany any major innovation, and to the elaboration of the schemes of technological development on the basis of which research decisions are taken in big industry and in public bodies.

b) Forecasting about the impact on the physical environment of the spread of productive techniques that are not new, but have been hitherto little applied, or not applied in this or that specific area.

c) Forecasting about the impact on the physical environment of the spread of new products or new habits of consumption (public or private, of goods and services) which sometimes derive from a technological innovation, but are in many cases based on traditional techniques.

d) Forecasting about the effects of new administrative arrangements, new laws, and new regulations, whether they are intended to affect the environment, or something else.

II.12.8. The Biosphere

a) Forecasting about the impact on the biosphere (wildlife and vegetation) of the increasing "rationalisation" of agriculture,

and,

b) the impact on the living environment and on the system of watercourses of the drift from the land and the abandonment of areas formerly used for agricultural purposes. Where this happens, the effects may be contrary to those of the changes taking place in the areas of modern and intensive agriculture; the depopulation of rural areas leads to an increase in formerly threatened animal species, while agricultural rationalisation leads to the disappearance of species, though the species affected are not the same in the two cases. Similarly the hydrogeological confusion brought about in many Mediterranean regions by the abandoning of agriculture leads to diverse and sometimes opposite effects.

In these fields forecasting must obviously concentrate on the effects of land use on the biosphere and on the drainage system. In the former field, the Council of Europe has so far been pre-eminent in Europe.

II.12.9. The Man-Made Environment

In the third group of problems, forecasting must cover the quality of life in the man-made environment: that is, it must seek to introduce an element of foreknowledge into the management of urban and regional planning. Forecasting about urban planning is not a job for Europe Plus Thirty; it is best done nationally, and city by city. Forecasting about regional land-use patterns and especially regional infrastructure investment could be a job for Europe Plus Thirty when the region in question crosses national frontiers.

The mobility of the European population will probably be extremely high in the next thirty years, and the growth of urban zones and changes in land use very rapid. Two problems exist here about which forecasting might usefully be done at Community level.

a) The impact of the redistribution of population densities and of land use on the physical environment destined to house new urban developments (air pollution, weather, sea coast, noise pollution etc.).

b) The impact on people's lives of the shape and size of the various alternative urban infrastructures (e.g. the ghettoization of the elderly, women etc.; school choice in poor areas, etc.) touches Transport(II.13.) and the Social Chapter II.6.

II.12.10. Society's Response to Environmental Change

a) Forecasting the socio-political impact of environmental change. Naturally, given that in this case we are talking about changes in society, this is really part of social and political forecasting, because it talks about the relationships between the balance of society and the balance of the natural environment.

b) Forecasting the impact on production and consumption(and thus again on ways of life) of changes in environmental conditions: This type of forecasting has so far always ended by showing the political and psychological bias of its author. When we are faced with the possibility of a given change in environmental conditions, we have to choose a priori between two hypotheses that can be made about society's way of reacting. The first assumes that the capacity for reaction is unable to go beyond what might be called the 'patching up' of an increasingly threatened environment. The second assumes society has some capacity to confront the risks and the cost of radical transformations in a timely and organic manner. The span of these hypotheses is naturally wide. But the idea that society is capable of rising to the challenge posed by environmental change can give rise to very different forecasts of the impact of the latter on the production and consumption systems and on ways of life.

Environmental Forecasting and Community policies in general

II.12.11. The already established long-term policies of the Communities may bring about changes in the way of life which influence land-use and sea-use, as well as the quality of the environment throughout

the Community. There is no doubt, for instance, that the Community would be interested in advance knowledge of the probable environmental impact of directives of the Commission of the European Communities about agriculture, about the free movement of workers, about regional development, and about the mobility of labour.

Some environmental changes have, in turn, a social impact which affects Community objectives favourably or unfavourably. The most obvious example is the efforts of the various member countries to update their national legislation on water pollution by industrial waste.

II.12.12. The lack of uniformity in controls, standards and rates of application of anti-pollution legislation bids fair to bring about not only distortion in international trade but also a threat that it may be exploited by one or other of the member states to produce 'pollution paradises', more or less camouflaged by the justification of regional development, which are already common enough in the "Third World". This lack of uniformity in Europe could lend itself to protectionist manoeuvres which run counter to Community aims, and the Community has therefore a strong interest in the present tendency towards the development of transnational rights where transfrontier pollution is concerned, of the concept of "additionality" where pollution havens are established, and of the principle that developing countries must be compensated if they are required to take environmental measures which put up the price of their exports.

In all these cases, it is the Community's interest not only to study the problems, but also to look into the future development of those which lend themselves to nationalistic exploitation.

II.12.13. Sometimes the Community has the opportunity to react to environmental change and the ensuing transformation in the modes of production, consumption or life in general, in a way different from that in which the single state might react, that is to say, in a more timely and organic way. When this happens (and here political judgement comes into play) the Community could intervene promptly with initiatives of its own. The following paragraphs are, once again, illustrative, not exhaustive or prescriptive.

The Great River Basins

II.12.14. The control of inland waters aims at protecting them against pollution, and at their regeneration so as to satisfy or reconcile the needs:

- of the conservation and flow of the water itself;
- of drinking water for the population at large;
- of river transport;
- of the biological life of the rivers, particularly fish;
- of recreation, sport and protection of natural beauty.

II.12.15. The uses of water are thus numerous and irreplaceable. Indeed, so crucial is water that any map of population or industry is mainly a map of river valleys; that is where people live. The interdependence of all elements of a river basin is its main feature. Optimal control cannot be achieved without an overall policy extending from upstream storage, for reserves and flow regulation, to purification downstream of built up areas or industries, passing through the distribution networks and discharge of waste water in the intermediate zones.

II.12.16. This interdependence, recognised by all states, naturally applies equally to the great river basins that cross frontiers, like the Rhine, and it is impossible for partial and national solutions to achieve proper control of these huge systems, whose banks house the greatest concentrations of population not only of the European Community, but also the whole of the European continent. They constitute a fundamental resource, as fundamental as coal and iron once were, when the Community was in its infancy.

The stakes for the future consist in forecasting the population of these basins, their economic development, and, from that, what developments are needed for the water to render maximum service to the peoples along its banks, and what form of regulation can be devised to share the costs of these developments justly among the countries which derive different benefits from the water.

The effects of energy on environment

II.12.17. The effects of energy production, transport and use, pose problems for the environment; among them are the pollution of the seas by oil, of the air by industry and domestic heating, and of both air and inland waters by water-cooling in power stations.

As far as pollution control is concerned, the most urgent problems are probably those caused by the peaceful use of atomic energy; that is the heating of fresh and sea water, and the stockpiling of radioactive waste in conditions which must be totally safe even in the extremely long term (up to 40,000 years). These, and the problems of ionizing radiation and accident risk, are obviously more justly and expediently solved on the Community level than nationally. And of course research into new forms of energy and new techniques of utilising energy (geothermal, wind, and above all solar) necessitates forecasting about their possible environmental effects (See II.10).

Use and management of the marine environment

II.12.18. In the last twenty years, there has been a revolution and a boom in the exploitation of the sea. It is now not only a means of communication but also an increasing source of biological and non-biological resources for the life of man. From the exploitation and organisation of the water surface, we proceeded to that of the water mass, and now to that of the resources on and under the seabed itself.

II.12.19. Moreover, the rapid development of technology has lessened and blurred the distinction between zones above and below sea level. This phenomenon can be seen not only in the identification of a 'continental shelf', a 'continental rise' and a 'continental slope' - zones of transition between land above sea level and the deep sea bed - but also in the extension of political organisation typical of dry land to the sea and its bed, with the consequent crisis in the law of the sea.

II.12.20 Today, the concept of coast (defined as that zone above sea level whose organisation and use is influenced by proximity to the sea, plus that part of the land below sea level, and its superjacent water, whose organisation and use is influenced by the nearby land)

has become a geographical reality in a state of dynamic balance. On the one hand the possible modes of exploitation of the submerged zone increase further, and faster, than do those of the land above sea level (thus making the marine influence on the organisation of space above sea level broader, more changeable and more complex) and on the other the 'frontier' between land and sea is blurred, and at the same time charged with increasing political and economic tension.

The coastal zone below sea level, some few of whose possibilities are only just being glimpsed, will probably be organised and exploited in the future not so much by the use of new technological developments, as by a new knowledge about the marine environment. Indeed, our knowledge of the lunar environment is more complete and systematic than our knowledge of the submerged portion of our own planet.

II.12.21. We have considered commercial fishing in II.4 above, and will not repeat ourselves. It interacts with everything else which may be done at sea. The desalination of sea water is today the main extractive activity which utilises the mass of the body of sea water, having long overtaken the traditional extraction of salt. The shortage of fresh water in dry Mediterranean countries makes it foreseeable that desalination will increase. It will probably be flanked by other exploitations like that of magnesium; the U.S. derives most of its magnesium from the sea water.

II.12.22. Mining as intense as that on dry land is conceivable on the sea bed (where vast reserves of certain minerals lie about, particularly manganese nodules) or below it. There is no reason to believe that the marine subsoil is any less rich than the dry land's subsoil. Although extraction promises to be costly, several large firms and governments are planning to start as soon as they can obtain some security of tenure in the international sea bed. Techniques of off-shore mineral extraction have so far been developed mainly for oil or for particularly valuable minerals; in South Africa there has been some extraction of off-shore diamonds. The resources under the sea bed can be exploited down to several thousand metres (in the case of oil). The technology for deep-sea oil drilling and extraction

is at the very limits of materials' strengths and of human endurance. It was developed in the Gulf of Mexico, refined in the Persian Gulf, and is now forced to take a quantum leap to withstand the howling gales and towering seas of the European North. The results are still far from clear. Sand and gravel, which have long been worked in the beds of rivers and in land that was once covered by water, are now being worked out to sea and causing coastal erosion.

II.12.23. Sea transport is no longer just a surface activity, but tends to be organised along 'traffic corridors' situated on the sea-bed, not only in the case of the transport of energy (or information) along cables, but also in the case of transport by pipeline. The planning of submarine space must therefore take into account this new network of submarine energy-ducts and systems of pipelines in general which carry not only natural gas (sometimes liquid) or other fluids but can transport several fluids without mixing them, or pumpable substance, like grain, or even solids like coal or iron ore mixed with a fluid (slurry). Despite some experiments, the possibility of the submarine transport of substances lighter than water contained in plastic bags with ballast and pulled by submarines still seems remote. In the near future it is therefore likely that transport will remain concentrated on the surface and on the sea-bed. On the surface, it is likely that the network of routes will become increasingly dense and intricate, while on the sea bed, which today is criss-crossed in all directions by transmission cables, an equally complex network of pipes may rapidly be formed, to the potential detriment of trawling. This will lead to a very high demand for access to the coast. Even today it is obvious that the coastal areas are the real bottlenecks in the transport and communication network of surface and sea-bed, to the point where the movement of ships, and particularly of fishing and pleasure craft, is obstructed in various ways.

II.12.24. In the future it is likely that the demand for forms of recreation which use the sea surface will increase more rapidly, putting further pressure on the navigable zones nearest the coast, as well as on ports whose size, frequency along the coast, physical structure and organisation will gradually have to change fundamentally given that,

unlike commercial shipping whose harbour time is low, pleasure craft, lying idle for most of the time, require enormous mooring areas.

II.12.25. All this competes with the use of the sea for refuse disposal. Both organic and inorganic liquid refuse is discharged from the sewage systems in the intensely populated and industrial zones surrounding Western Europe, except for a part of the French Atlantic coast, and for Britain, where it is mainly treated first. Some solid and liquid waste, because of its toxicity, is sometimes transported in lighters to very deep parts of the sea far from the coast. Oil is discharged from ships and from land; it amounts, in the Mediterranean alone, to between a million and a million and a half tons a year, of which more than two thirds are deposited in the open sea from tankers or other ships. Lastly, particularly between the mouth of the Seine and the Baltic, waste is carried down the rivers.

II.12.26. The sea is used not only to discharge heat, but also to dump dangerous substances. At present it still appears necessary, especially for high population-density countries like England and Wales, the Netherlands and Belgium, (which are the highest four in the world) to use the sea to get rid of part of the radioactive waste from nuclear power stations. It is still also the safest graveyard for surplus war stores that cannot be deloused. Floating or fixed oil storage tanks are beginning to appear, equipped with moorings, helipads, football pitches, etc. Sea space has already been used and may increasingly be used in future, for noisy airports and for burning refuse. Equally, civil aircraft only fly supersonic over the sea. Lastly, it is once again the sea which is already beginning to provide the space for tomorrow's gigantic power stations, especially where the coastline is already over-used, as it is in Italy for instance.

II.12.27. Naturally, in the face of all these demands on the sea, the need to protect the systems which permit animal life in water, and thus in the entire planet, has grown and will grow enormously. It is reflected in the demand now so clearly expressed in UNCLOS III for each coastal state to have an exclusive economic zone going out 200 nautical miles, as we discussed in II.4. above, under Fisheries.

II.12.28. There will obviously be conflicts. They pose problems of choice for regional planning, for the organisation of the surface, the water mass and the sea-bed, which must be solved, in a way conceptually like, even if technically unlike, the way problems of the dry part of the European continent are solved. The day of sea-use planning, of aménagement des mers, of Seeraumordnung, is already upon us. Like all planning, it will rely on, and be symbiotic with, forecasting.

The field is vast, pregnant with great gains and great losses, even great disasters, and the study of it is, in comparison with those potentialities, still derisory. That is why we have chosen to write about it at some length. The European Communities could move into this new policy field before, or as soon as, their member states.

II.12.29. We have now shortly reviewed some of the likely future developments and interactions in the division between Community and national environmental control, in river basin control, in the effects of energy production and transfer on the environment, and at greater length, the need for sea-use planning. We started by saying what a huge field this was, and we have striven to be comprehensible about a few things rather than present a dry list of many.

Recommendations

II.12.30. The choice of the areas of environmental forecasting in which Europe Plus Thirty should work, at least at first, is, by the same token, extremely difficult. The effects of different energy policies and patterns on urban form would straddle this and the energy section of Europe Plus Thirty's work. Forecasting for regional development policy would, we suppose, be more often to do with transport, industry, and the economy than with the content of this chapter. And many environmental fields, for instance housing form itself, and the development of land-use law and procedures, we regard as better tackled at the national level.

II.12.31. The Council Resolution under which our study was set up stated that "the study of the relevant problems" by Europe Plus Thirty "will be carried out in cooperation with the European Foundation for the Improvement of Living and Working Conditions which it is proposed to set up". The work we have been discussing in this chapter is one

field - there are several others in this report - where such cooperation could be established. It should be guided by the time-span principle which we recommended at the end of Chapter I.1. above.

II.12.32 Bearing this in mind, we would pick out two fields for the starting point for the work of Europe Plus Thirty. They are pollution control mechanisms, and sea-use; both these are clearly of interest to the Community as such. We suggest that Europe Plus Thirty should forecast about the economic and environmental effects of alternative systems of pollution regulation, since they will directly affect the economic competition among member states which lies so close to the heart of the Communities' purposes. For inland waters, for the air, and for land, what would be the economic, social and environmental effects of the general adoption of alternative systems based on 1) single emission-point or dumping-point licensing, 2) generally applicable body-standards, and 3) pollution charging ? And what would be the effects of different methods of enforcing and supervising their application ?

For sea-use, what would be the effects of alternative Community policies for the regulation of conflicting interests among economic sectors and among Member States, and how could such alternative Community policies be related to those likely to be followed by other nations and groups of nations in the world after UNCLOS III ?

II.12.33 For these two programmes, we suggest five people would be necessary; one expert each in pollution control structures for water, air and land, and two experts in the nascent discipline of sea-use planning.

II.12.34 Naturally Europe Plus Thirty should be ready to start work in other fields as they appeared appropriate, or might be demanded by the development of Community policy.

13. TRANSPORT

Introduction

II.13.1. Transport, in all its forms, directly and indirectly, absorbs about one-fifth of the economic resources and roughly one-quarter of the energy expended annually in the Community. The economic importance of its future development is therefore immense. But unlike some other industries, transport also has enormous consequences of a non-economic nature. It occupies a large, and increasing, part of people's spare time. It is the greatest menace to the environment, both in urban areas and in the countryside. It exercises a profound influence on the distribution of population and industry within cities (urban form), within countries (regional structure) and, to a lesser extent, within Europe as a whole. (See II.12.) In many subtle ways it dictates the style of life and the opportunities open to different social classes. It is one of the greatest causes of premature death (60,000 per year in the Community) and of serious injury.

During the last hundred years, and especially the last thirty years, the use of transport has grown at an extraordinary rate and has radically changed the life of Europe in many ways, both for the better and for the worse.

II.13.2. In this chapter we consider first the needs for long-term forecasting in the transport sector, then the forecasting methods which are or might be used; we then survey the way in which the forecasting effort in the sector is presently organised and, finally, we suggest what Europe Plus Thirty should do.

The Need for Long-term Forecasting in the Transport Sector

II.13.3. All industries need to look ahead, but usually not thirty years ahead. It is not necessary to look further than you think events will be affected by decisions which must be taken now. The long-acting decisions are usually investment decisions; even so, much investment has a life of less than ten years, or alternatively consists of equipment which can be readily disinvested if it becomes no longer required.

Of course, a thirty year forecast may be useful to an industry whose horizon of interest is limited to twenty-five or twenty years; and even to those with shorter horizons the first half of the forecast may be valuable if it gives the greater detail and accuracy that are normally required of short-term forecasts.

II.13.4. Unlike other industries, transport investment consists of two totally dissimilar parts: infrastructure and vehicles. No important vehicle has yet been invented that can operate without either major additional fixed plant such as roads, railways, canals, stations, locks, docks, airports, tunnels, and bridges. All these are extremely costly, long-lasting and inflexible, i.e. they can hardly ever be used for any purpose but that for which they were intended. Investment decisions in infrastructure are therefore very long-acting. The "lead time" in infrastructure investment, the time between the decision to build and the opening ceremony, is normally at least seven years, after which the new facility is likely to be a permanency. There are few examples of transport infrastructure being scrapped, and certainly not within thirty years. The normal time horizon for a major transport planning study is therefore twenty-five to thirty years, and it ought to be longer.

II.13.5. For the makers, buyers, and operators of vehicles the position is quite different. The life of most road vehicles and aircraft is rather short, ten years or less; the life of a ship is typically thirty years; the life of trams and railway rolling stock should be about twenty-five years but in practice is often much longer. But the main difference between vehicle and infrastructure is that vehicles, being mobile, are easily disposable on the second-hand market, which infrastructure is not. Vehicle operators, whether they be road hauliers, bus companies, airlines or shipping firms, consider at the moment that they have little economic interest - as distinct from academic interest - in long-term forecasting. Five years is their likely horizon, or ten at the outside. And their main interest will be, not the smooth trends during that period, but the cyclical fluctuations which are not the main interest of long-term forecasting.

II.13.6. Lastly, there are the suppliers of equipment, the motor, aircraft and shipbuilding industries and other engineering industries which manufacture rolling stock, new types of transport, earth moving, concrete, steel girders, road rollers and so on. (We do not consider

the energy industry in this chapter.) Some of the specialised activities of this great ramification of supporting industry need long-term forecasting: for instance, the construction of a new shipyard, or the approval of an aircraft prototype development. But most of it - including the motor industry - considers that it does not.

Forecasting methods

II.13.7. Greater long-term forecasting resources probably have been committed in the transport sector than anywhere else. The reason for this is simple. Transport planning in the last thirty years has been predominantly road planning, both in towns and between towns, and huge amounts of money have been available for road-building. The lead was set by the United States where motor revenues were hypothecated by law for road construction. In 1962 the Federal Highway Act made Federal grants for highway construction conditional upon elaborate "land use and transport studies" which consisted largely of long-term demand forecasting models. The first of these "scientific" studies were made in Detroit and Chicago in the late 1950s, since when every major city in the U.S. has followed suit. Studies of this kind were strongly encouraged by the U.K. Government (which in 1963 offered to pay half the cost) and also spread to other European countries. Normally these studies have been based on extensive surveys followed by computer analysis and projection, requiring about three years and the expenditure of one or two million dollars. The London Transportation Survey, completed in 1969, was the biggest up to that time, taking seven years and costing about 4 million dollars, but it has probably been exceeded since by New York.

II.13.8. There are few major cities in the non-communist world, including the developing world, which have not by now indulged in a large, long-term transport planning study of this kind. Similar methods have also been applied - with modifications - to regional transport planning, and to such well-known cases as the U.S. North East Corridor, London-Glasgow, Paris-Lyon and, currently, the European Intercity Transport Study which is being carried out by the OECD at the instigation of the European Commission. The unprecedented efforts put into this field have led to a highly sophisticated forecasting technology supported

by a large variety of computer programmes. A new profession of transport planning technicians has grown up.

II.13.9. In common with forecasters in other sectors, transport planners and policy makers have to base their forecasts upon forecasts about population, employment, trade and income. They have to know, for instance, not just the overall gorwth rate of population but its distribution, age and household structure; they have to know the type of employment, the reduction in working hours, the growth in holidays, the types of commodity traded, the distribution of income, and so on, just as forecasters in all those fields have to know something about transport. With international studies, there are difficult problems in defining and establishing real income as distinct from monetary income; varying costs of living and styles of living, and exchange rates that bear little relationship with purchasing power, make the measurement of real income a difficult task. On all these questions, which are fundamental to the demand for transport, the transport planner looks for help from outside the transport field. But he can seldom find it, even for the short-term, and practically never for the 30 year horizon. A major requirement for all long-term transport planning, therefore, is a reliable source from which the best possible forecasts about these non-transport variables can be obtained.

II.13.10. Special mention whould be made of car ownership. The future growth of car ownership and car purchase is obviously of crucial importance to transport planners and to the motor industry; it is also of interest to many other bodies. Many forecasting methods have been devised and innumerable forecasts made, both long and short-term. In the past the growth of car ownership was often grossly underestimated, but modern methods are more reliable. They are based on greater disaggregation of the market, requiring extensive survey work, as well as a more refined use of the aggregate methods formerly relied upon. Nevertheless there is still great uncertainty about the levels at which various markets will become saturated and car ownership will level off. Saturation will probably be reached in some parts of Europe within the next thirty years. The possible impact of transport policy on these saturation levels is also uncertain.

II.13.11. The lion's share of transport forecasting has been given to inland transport, and especially to urban transport. Quite a lot

has also been done in the aircraft and aviation industries but the depth of the research has been less and the results are of dubious quality.

Nor should inland waterways be forgotten, as they so often are. According to a study by TNO in 1974,(1) the comparative figures for energy consumption per kilometre/ton are: pipeline 60, waterway 75, rail 100, road 300. The additional advantages of inland waterway transport in safety and quietness are obvious.

In the shipping and shipbuilding industries the forecasting effort has been very much smaller. The methods appear to be limited to broad analysis of time series within a ten-year horizon. In shipping, and also in aviation to a large extent, one is involved with intercontinental transport, not confined to Europe, even less to the Community.

II.13.12. The main way in which the efforts of different organisations are brought together is through the consultancy profession. Much of the recent progress in transport forecasting is due to the research efforts of large firms of consultants, particularly in the U.S., and the U.K. and Canada. Important work has also been done in Germany, France, Switzerland and Holland. In these latter countries the Anglo-Saxon work is well known but unfortunately, due to language difficulties, the flow of knowledge from the Continent to England and America is weak, especially from Germany.

II.13.13. Most major transport planning studies have been commissioned from consultants by government authorities, local or central. Usually they have been regarded as single, ad hoc efforts requiring time and expertise not available within the department. But the need for continuing study with regular monitoring of trends, updating of forecasts and modification of plans, is increasingly recognised. Consultants are extremely expensive, and the trend is for major planning authorities to do the work in-house.

Community transport policy

II.13.14. We turn now to the particular needs of the Community. One of the original goals of the Community was to produce a common transport

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(1) The Energy Consumption of Means of Transport - A comparative survey. Institute for Road Vehicles - TNO (Ref.7/76/74) June 1974.

policy, but so far there is little to show for it, perhaps partly because the original Six countries did not constitute a very coherent area for transport planning. The absence of Switzerland and Austria was (and still is) one major gap. The presence of major corridors into the external areas of England and Spain was another. The absence of Europe's premier airport, London, was another, and differences of viewpoint have undoubtedly held up progress.

II.13.15. With the accession of the U.K., Ireland and Denmark the position is more favourable but still not satisfactory. The area which makes best sense for a common transport policy is the whole of Western Europe bounded by the Arctic snows to the north, the Atlantic Ocean to the west, the Mediterranean to the south and the Iron Curtain to the east: this is the natural transport area from which the physical links and the traffic flows with outside areas are minimal. The desirability of coordinating transport over this larger area was recognised nearly twenty years ago by the establishment of the permanent European Conference of Ministers of Transport, (E.C.M.T.) but this, too, did not lead to a European transport policy.

Organisation of transport forecasting

II.13.16. At present many branches of the transport industry engage in forecasting, according to their needs, either through their own staff or through consultants. In a few countries official forecasts of car ownership, i.e. forecasts adopted by government departments, are published and are widely used within the industry. But this seems to be the only way in which official forecasting is regularly made generally available. Nearly all other forecasting is carried out in a piecemeal way by small groups or individuals working independently and with little cooperation from others.

II.13.17. Hitherto the initiatives of the Community and the ECMT have been limited to matters of organisation and regulation, e.g. pricing policy, weight limits, standardisation, working conditions, etc. They have not entered into the planning of the infrastructure except by mutual consultation. But the joint establishment in 1973 of the European Intercity Passenger Transport Study (being carried out by the OECD for the EEC, the ECMT and twelve Member countries of OECD itself)

suggests that a more active policy may be followed in future.

II.13.18. The Commission is at present seeking to work progressively towards a "Community transport system" which would have the following essential characteristics: Community-level concertation on the provision of major transport infrastructure to meet foreseen needs coherently, taking account inter alia of environmental, regional development and energy requirements; and a much freer organisation of the transport services market, especially for goods transport between member states, with the public authorities intervening only to correct serious persistent disequilibria or lack of competition or to ensure the provision of essential public services. The system would be designed to encourage efficient transport at the lowest total cost to the Community. Effective forecasting of transport demand would be expected to make a major contribution towards good infrastructure decisions and sensible operating rules for the transport market, and ensuring that "lowest total cost to the Community" always includes external costs.

II.13.19. Year by year, transport in Europe is becoming more international. Trade, tourism and personal travel are growing faster across frontiers than within them. As the national barriers to movement gradually come down, the flows of people and goods across frontiers will continue to increase. As the efficiency of transport improves, and people's incomes grow, average travel distances will increase, adding further to the international character of the system. In thirty years, assuming that Europe continues on the path towards greater unification and prosperity, the need for a common transport policy will be greater than it is today.

The need for a Community or European policy grows out of the need for national transport policies. The growth of interregional movement within a country makes a national transport policy increasingly desirable; and the growth of international movement similarly calls for an international transport policy.

II.13.20. It is likely that if any such policy were adopted, it would adopt goals something like these:-

(a) to connect the national road, rail, air and waterway networks efficiently and to plan their future development in cooperation. (This is specially relevant to the creation of new systems of high-speed ground transport, if they emerge, and to the reorganisation of the European air network.)

(b) to facilitate the easy movement of passengers, goods and vehicles between the various national parts of the coordinated networks.

(c) to avoid, reduce or overcome the many undesirable side effects of nearly all transport systems, e.g. accidents, noise, pollution.

(d) to reduce the frustration and delay which affect the users of present transport systems, whether by better technology or better human management.

(e) to develop and manage the transport system in support of Community policies concerning regional aid and energy conservation.

(f) to find, by international cooperation, ways of spreading peak demands for transport so as to reduce congestion on roads and at airports.

(g) to coordinate and undertake research and development towards the foregoing objectives, especially (d).

Community objectives will presumably relate to long-distance intercity transport, and not to urban traffic, country roads, village bus services, or railway branch lines.

II.13.21. One may conclude simply that a need for a Community (or European) transport policy exists and has long been recognised, that this need relates to long-distance transport or passengers and goods by road, rail, air, and water, including ferry links, and concerns not only the management and control of the system but also the development of infrastructure. In all these areas long-term forecasting could be useful, and in the last it is essential.

Community policy towards transport research and development

II.13.22. In the preceding section we suggested that one of the desirable objectives of a Community transport policy was to coordinate research and development in order to promote the other transport policy objectives. Large resources are devoted to transport research and development, both by governments and by private industry. The field of study is enormous, ranging from hydrodynamics to traffic engineering, from supersonic aircraft to travelators, from hovertrains to skid resistant road surfaces. The high cost of aircraft development has already forced European manufacturers into international consortia for projects like Concorde, Airbus, and Europlane. In the railway field important new developments are taking place in at least five European countries, sometimes with rival projects under way within the same country. In both industries, air and rail, numerous and costly projects have been abandoned in recent years. There are no doubt some advantages in competitive research like this, but it can be overdone.

II.13.23. In transport more than in most of the fields we are considering, very costly research projects must be directed towards chosen goals, and this requires a study of long-term needs. They must be designed to overcome not only current problems but also those expected, in the light of long-term forecasts, to be important in the future.

Recommendations

II.13.24. Community transport policy is not yet far advanced, and long-term forecasting could (among other things) help it to get off the ground. The purpose here, as in the other fields where Europe Plus Thirty would be working, should be to indicate the magnitude of future problems and the likely impact of policies (and new technologies) designed to help solve the problems. A secondary purpose could be to provide an official source of forecasting for the many small forecasting units working independently in different branches of this vast industry.

II.13.25. The forecasting should concentrate on long-distance traffic and main line hauls, i.e. air links, intercity rail links, national and interregional highways, principal waterways, and ferries. The area studies will have, for some purposes, to include all "Western Europe" (including Yugoslavia, Greece and European Turkey) regardless of which

countries are or are not members of the Community.

II.13.26. A European forecasting model could not be simply the sum of component national forecasting models; the arguments of I.4. above apply with full force here. National models are not able to deal efficiently with international movements: the only way to do this would be to build a comprehensive international model, which would be the Community role. Hence the Community model would provide the external data needed by national models. In fact no national models yet exist, although several countries are moving towards them. On the European scale a passenger model now exists as a result of the European Intercity Transport Study, and the Commission is currently considering the launching of a similar freight study. This work would have to be very carefully related to Europe Plus Thirty; it might even become part of it.

Europe Plus Thirty should also work closely with the inland waterway forecasting undertaken by the U.N. Economic Commission for Europe in Geneva.

II.13.27. Three people experienced in this work should belong to Europe Plus Thirty.

14. COMMUNICATIONS

II.14.1. Europe, like every other region of the globe, is criss-crossed by the flow of world information and permeated by the ferment of its own.

Despite the search for economic and political unity, the European Community will try, we hope, to retain the diversity of its cultures. The maintenance and enjoyment of this variety will require great efforts of education and comprehension. The general system of communications between the members (individuals, societies, institutions) of the Community may well need to be even denser than in the more homogenous culture of the American 'melting pot'. We have already talked about this under the heading of education; the electronic demand could be large.

II.14.2. The energy crisis, which is just one aspect of our failure so far to manage planetary resources in the necessary double solidarity - geographical (all the continents) and temporal (including our descendants) - may force us to limit the growth of physical movements of people or objects and to supplement them by transfers without the movement of matter, which is the purest form of communication. Much communication between people could take place by the intermediary of electronics, in order to economise on time, money, energy and raw materials. Urban congestion points in the same direction. Why go to work? Why not work at home, with electronic communication, audial or audio-visual, to your colleagues, and with the papers & data? The advantages, and the disadvantages, are obvious.

The trends

II.14.3. The development of communication is prodigious: the numbers of messages transmitted, economy of energy, miniaturisation of components and lightening of materials, ease of dialogue between the human being and the technical network; all that is well-known. What is less well-known is the rapprochement of the sectors of data processing and of tele-communications, the techniques having increasingly numerous points in common, and industry tending to work in the two sectors simultaneously.

The growing use of communications satellites raises the question whether the geostationary orbit may become overcrowded. On the other hand the number of channels each satellite can carry will increase in the decades to come.

Recently acquired scientific knowledge opens the way to future techniques that one can already imagine, and whose utilisation can be programmed. Among them are transmissions through highly transparent optical fibres, use of phased light for data processing and telecommunications (laser and holograph for instance); and possible roles for superconductivity.

Current means of communications

II.14.4. To return to the humdrum; the postal service. The need to transmit documents seems likely to persist and to develop, despite the development of new techniques. The written word is important, and does not seem likely to become less so in the future. But the spectacular deterioration of Western Europe's postal service over the last twenty years is cast-iron evidence of incorrect development planning, and thus of bad forecasting in the past. Speculation about the future of the mails is dominated by the tension between man and machine. The work is boring, so people don't like to make a career of it. But magnetic coding of addresses, and automatic sorting at the other end, seems in practice to give, if anything, worse results. An area of study to open up would be research into what sort of work people will be willing to do without striking, going slow, etc, because it is so soul-destroying. Technological fixes could well be concentrated on the phases of the work where they are really needed.

The telephone

II.14.5. It works very badly in some countries but this fault is not congenital as its effectiveness under other administrations (especially the US, so far) shows. The main R and D effort must therefore go into bringing the worst parts of the European network up to the standard of the American one. This requires no forecasting. But two possible future applications of existing technology might do so.

Besides sound, the wire can transmit an image, a "facsimile"; there seems no reason why letters should not be sent visually by wire, and read in the original handwriting. Certainly the number of bits of information per page is considerable (in the order of a million, and even four times as much if one wants to transmit the details of a drawing or photograph). This is certainly a limitation, but it should not prevent this elegant means of instantaneously transmitting a perfectly personal letter from developing. One can imagine the use of terminals for the sending and receiving of such letters in post offices. Not only is the speed of the transmission ensured, but also the authenticity of the document received. (Could this mean the end of registered letters, or even of notification by the servants of the court?)

There also exists a simpler system, well-known and requiring little information, less than a tenth of what the previous system requires: the telex. It still requires considerable improvement but, if the costs of use can be reduced, it might well spread to the use of private individuals.

II.14.6. Hertzian technology has made possible the TV and radio. It is also used in telephonic transmissions, but the user cares little whether the message he receives is transmitted by wire, a carrier wave, or a satellite. The question for the future is the way the sending of messages to a large number of receivers will develop. Two possibilities are emerging:

Firstly, on the technical level: Hertzian space is near saturation, and the obstacles to radio waves in towns are numerous. Hence recourse to cable distribution.

Secondly, on the social level: a need is emerging for messages sent not to everyone, but to a more or less restricted group interested in a single category of messages. It is clear that one cannot occupy the TV screen, which is meant for everyone, with local information about a district or a town. Hence, also, recourse to cable television.

Television also lacks one important function: it is only a receiver. It is difficult to say how far the need for feedback from the viewer is felt; but we already know that it is urgent for educational TV, and it is easy to list cases where it would be convenient or pleasant, especially in the matter of public participation in politics.

II.14.7. In these technical areas, there is much forecasting in each country. The forecasters often meet at international conferences, and there seems little reason for Europe Plus Thirty to become involved in this technical sector.

II.14.8. Nevertheless, we cannot but remember that the Community has not succeeded in unifying its own TV standards. The lack of advance consideration here worries us. When we adopted the American definition scale, we ignored the difference in the frequencies of the current: 50 cycles in Europe, 60 in the US. This difference is enough to bring the mechanical interference vibrations which are produced in medium quality receivers into the spectrum of audible frequencies, at least for the young. If Europe Plus Thirty can play any role in preventing that sort of mistake arising again, it certainly should, though it would involve a dive into detail which would normally be outside its sphere.

II.14.9. The Commission, and other relevant bodies, are now working on various plans for European information and data handling networks. Furope Plus Thirty would have an interest in the way they were set up, since it would clearly be among the users. It is possible, though we are by no means sure about this, that Europe Plus Thirty might be able to undertake some useful forecasting about the alternative ways these networks might develop. We make no recommendation beyond saying that the possibility should be borne in mind.

All in all, we would emphasise that forecasting in this field is not so much a matter of technology forecasting, as of demand forecasting. What will people want? The question itself shows the obvious interdependency of this field with those of society, industry, education, transport and, on the data-handling side, health.

II.14.10. Conclusions

a) All the Community countries suffer or have suffered congestion, sometimes very severe, in their communications systems. Forecasting is indispensable if we are to avoid this happening again with tomorrow's technologies.

b) Such forecasting must not omit to consider the probable working conditions of those who will run future communications systems, in an attempt to foresee social or human conflicts which could degrade or paralyse them.

c) Forecasting about means of communication likely to be available in the future is well developed in technical circles, but the same cannot be said of forecasting about future demand.

d) Europe Plus Thirty should seek to discover the probable impact on communication needs of different industrial and commercial policies, data-processing and documentary policies, cultural and educational policies, and, not least, of different degrees of economic and political integration within the Community.

Recommendation

II.14.11. Communications is the last of the fields (the others having been climatology, demography, health, and education) where we recommend Europe Plus Thirty should rely almost entirely on the services of one or two outside correspondents or part-time members of its team. We think so much is going on anyhow that this will be the best approach. As in the other fields mentioned above, seminars should be called from time to time and the inputs of technical knowledge (extensive) and numerical data (rather small) should be arranged and secured on a continuing basis by the specialist correspondents of the central team.

15. ECONOMY AND FINANCE

Background

II.15.1. If we want to ask to what extent long-term forecasting is possible and desirable in the economic and financial fields, one way to do it - one that is methodologically tolerably legitimate - is to go back 20 or 30 years and try to see whether the economic and financial events that have since taken place could have been forecast. This kind of exercise is certainly not optimal as a test for our puspose; it might very well be that 20 or 30 years ago enough elements of the last 20 or 30 years were already present to allow us to predict their permanence over that period. To borrow a mathematical concept, we might already have had a base to span the field constituted by those 20 or 30 years. But it might equally be that, if we place ourselves at the beginning of the next 20 or 30 years, i.e. today, we do not possess enough elements, we do not possess a base to span the next two or three decades. If so, it would be because the present does not necessarily always contain the future. Discrete changes may divide historical periods: two twenty or thirty year periods, for instance, may have, as regards economic and financial structures, an equal base of essential features; a third such period, immediately before or after them, may be totally different from the other two.

Extrapolation of previously evidenced trends would, if we were extrapolating the third period from the preceding two, yield thoroughly indefensible results, while the same exercise, if used to forecast the second period using trends evidenced in the course of the first, would be very successful.

II.15.2. All this becomes extremely clear when we reflect on world economic and financial events over the last fifty years. The post-war years are radically different from the pre-war ones, particularly in some of the respects that can be considered "essential". Certainly one can detect several permanent trends throughout: the decline of the British economy, and the rise of the American economy, were well under way more than half a century ago. But how could one forecast that the "economic constitution"

of the western world, dictated by the US in 1944 - 45, would have been so successfully and quickly enforced in its vital parts, like currency convertibility, free trade, free capital movements, and the international division of labour? Had we extrapolated what had passed in the West starting in 1929, then autarky, rationing, planning, inconvertibility, etc. would have been more likely to be forecast.

II.15.3. The job would have been radically easier, and tremendously more successful, in the middle fifties. Then, a simple extrapolation of the previous ten years of US economic history and its projection onto Europe, for instance, would have missed very little of what actually happened. This would have been the "analysis by precursive events" described in Chapter I.3 above. Future production and consumption patterns could have been predicted very closely by looking at what they had been in the US in the relevant previous period; once it was proved that the "economic constitution" dictated by the US was enforceable, the phenomena of trade liberalisation, international capital movements, the spread of multinational corporations, could have all been correctly forecast.

II.15.4. What could not have been forecast were the relative places in the economic power scale that individual European countries have occupied. An ordinal scale could probably have been arrived at with respect, for instance, to GNP per capita, but not a cardinal one. The relative placing of Great Britain and France would have been an impossible job. It would have been equally difficult to assess the relative position, on such a scale, of countries like Belgium, Holland and Austria, even as late as 1958. One was sure that the US would remain on top, and equally sure that traditionally fast-growing countries like Germany, Japan and Italy would carry on growing fast. But who could have guessed that France, Belgium, the Netherlands, Austria, would become fast growers?

II.15.5. On the whole, however, forecasting world economic and financial trends would have been a successful exercise, especially if the people doing it had focussed on industries, products, trade flows, economic and financial institutions, rather than confined themselves to forecasting the relative growth rates of the various countries. The "automobile economy", with its

accompaniment of related industrial growth, motorway building and suburban sprawl, could have been forecast extremely easily in 1955, for the whole non-communist, developed world. That forecast would have entailed forecasting also the relative decline of railways and of the coal mining industry, the decadence of urban centres and the gradual disappearance of a commercial sector based on high labour intensity.

II.15.6. In general, once full employment and trade liberalisation were adopted as the basic policy objective in most developed countries, it was pretty clear that this would entail the gradual disappearance of most labour-intensive activities from the industrial sectors of those countries, and their removal to developing countries. If we interpret recent economic history in this light, most of its features appear to follow from this premise. What could not have been guessed was the temporary appearance, around 1960, of cheap energy that has made the replacement of labour as a means of production so much easier in the western economy. Once this was assured, however, the pattern of the last 15 years of growth, in Western countries, could have been inferred. We knew full employment and high wages were the norm, we knew low-cost energy was available; other things being equal, an economic structure based on substituting energy for labour could have been inferred.

II.15.7. If we now remove low-cost energy and maintain high wages and full employment, what can be substituted for what? We may be near a turning point; long-term forecasting may be very difficult if we start in one year, and much easier if we start the next year, if the corner is turned between these years, and the interpretative key for the next decade or two appears. This is a general proposition.

II.15.8. What we have said so far has been intended to serve as a quick reference to illustrate some of the issues that are of greater relevance, when we analyse the subject of long-range economic and financial forecasting.

Long-range forecasting in these fields is indeed possible. It can score a high percentage of hits if it is restricted to those aspects that can be considered "safe". With the considerable lengthening of the gestation period of most capital projects, both private and public, 10 to 15-year forecasts are becoming

increasingly possible. For instance, when a big motorway scheme or railway scheme is launched, the transport policy of a country is determined for the next two decades at least. Similarly, when capital projects are started in fields like chemicals, steel, or automobile production, fairly reliable estimates can be made of a country's growth pattern for at least a decade, and the probability of their being upset by "extraneous" events can be assessed. And the same can be said about important institutional changes, like new legislation concerning the financial institutions or the fiscal structure of a country.

II.15.9. Because of the vagaries of demand management, it is much more difficult to give appropriate time parameters to these structural trends. But, although the pace may be hard to forecast, direction is much easier to detect, and, fortunately, long-range forecasting is more about direction than about pace.

II.15.10. In no field does supranational long-term forecasting have greater advantage over national forecasting than in the economic and financial. When "supra-national" implies a forecasting agency of the EEC, this is very true indeed. The integrated economy of the EEC is quite capable, because of its sheer size, of making many of the economic variables, which a national economic forecaster must consider independent, dependent. It is not too much to say that EEC trade determines world trade in manufactures, EEC agricultural policy has a heavy influence on world agricultural production, EEC energy requirements and energy policy strongly influence world trade in energy products and even world energy production (the EEC countries put together are by far the largest importer of energy products).

II.15.11. It is also more and more clear that the EEC is the economic partner the Third World and the Socialist countries will most frequently have to deal with for political as well as economic reasons. Most socialist countries are in Europe, and this determines a "geographical premise" to intense economic relations. As to the Third World, it is the sheer importing power of the EEC that induces them to maximise economic relations with it.

Forecasting in the European Communities at present

II.15.12. But if we look at the economic forecasting and, more generally, economic research, which the Communities carry out at present, it strikes us that it is not conducted on the assumption (which would be a very realistic one) that the EEC is an integrated economy, nor has it as its main research target the identification and description of the mode of integration followed by the EEC economies since their inception.

II.15.13 The EEC input - output matrix, developed by the Community Statistical Office, is so far only a rationalisation and summation of the member countries' individual input-output tables. This is, of course, a necessary starting point, but a lot more must be done, in this field, in the direction we indicate in this chapter.

II.15.14 The European Commission also possesses two medium-term forecasting models, COMET and METEOR (we mentioned them at I.1. above). METEOR should in fact be a short-term forecasting model but, since it uses annual data as input, it can hardly be seen as serving that purpose. Both these models are based on the interaction of national models, more or less identically constructed along Keynesian lines even though price and volume developments are separately considered. The interaction takes place in only one dimension, the international trade dimension. In this fashion, the individual economies of the EEC are handled on the same level as other national economies like the US, Japan, and the Third World countries. The METEOR model consolidates the EEC countries into one block and links this block to other large ones: North America, Japan, the Third World. But the consolidation is obtained by summation of import demands and export supplies expressed by the national economies.

II.15.15. Neither model, because of its nature, contains a built-in mechanism of structural modification that is capable of affecting the representation of the individual member countries' economies, and reshaping them into a representation of an integrated EEC economy. In both COMET and METEOR the EEC countries interact all the time through trade flows, but these provide only a limited means of effecting changes in the representation of the structure of their economies. In addition, one

can say that, although interaction among the EEC economies is analysed in the trade dimension, it is not analysed in the factors of production dimension. But even the trade dimension remains in both models at too aggregated a level. What matters in economic integration is intra-industry specialisation, as Verdoorn proved in 1957 (1) and several other writers have reiterated more recently. Of intra-industry trade there is no analysis in either METEOR or COMET. But it would be scientifically incorrect to put this type of question to models like COMET and METEOR. We have dealt with them here only to show that entirely new instruments are needed if the Community wants to engage in long-term economic and financial forecasting.

II.15.16. Europe Plus Thirty, being an EEC long-term forecasting agency, with access to data collected by the national authorities of the member countries and by international organisations, would be in a unique position to forecast economic and financial trends. It would be based at the heart of a very homogeneous and integrated productive system, composed of countries whose economies are "mixed" and where planning is a respected tradition, especially if we consider this concept in "real" rather than "nominal" terms. Europe Plus Thirty, if it were to concern itself with forecasting in as many fields as are considered in this Report, would enjoy an extremely wide potential for economic and financial forecasting. But, in order to do so, it should equip itself with adequate instruments.

Cooperation with the Community Statistical Office

II.15.17. It should in particular work, together with the Community Statistical Office (CSO), to transform the EEC input-output matrix developed by the CSO as a summation of the member countries' individual input-output tables, into a more truly integrated European input-output matrix. This ought to be done, in our opinion, by having regard to the basic fact that, because of the process of integration, the European economy has already become divided into a productive "centre" and a "periphery". The "centre" must be geographically located, and so must the "periphery", so that we obtain a concept of "centre" and "periphery" that cuts across national boundaries. Moreover, it must be a concept based on production and exchange relations in the sense, for instance,

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(1) See his contribution to "The Economic Consequences of the Size of Nations" ed. by E.A.G. Robinson, London 1957.

that the "centre" expresses most of the demand for, and supply of, investment goods; this means that, if individual modern industrial activities are located in geographically peripheral areas, like Sicily or Scotland or Brittany, these activities are still part of our definition of "centre". The "periphery", on the other hand, is characterised by the fact that it neither demands nor supplies investment goods. It demands finished consumer goods, and it mostly imports them from the "centre", and pays for them with the proceeds of the sale of primary commodities and agricultural goods, by the remittances of its emigrants, and by the proceeds of tourism.

II.15.18. In addition, the CSO, in conjunction with European Central Banks and Finance Ministries,should proceed to construct a matrix of European financial flows.

Priorities for Forecasting

II.15.19. We are aware of the difficulties that both these jobs present. Nevertheless, if both the economic and the financial matrices became available, the economists of Europe Plus Thirty would have at their disposal an enormous quantity of material to be used for long-term forecasting. The matrices would, moreover, provide an invaluable instrument to be used in the shaping of the EEC industrial, financial, energy, and regional policies, and in progress towards economic and monetary union. All the inputs to the matrices would have, in fact, not only quantitative and qualitative dimensions, but also a locational dimension. The matrices would, signally, make it possible to study the intersectoral shifts that have taken place in the EEC economy in the last two decades, and the changes in the inner structure of each sector, and to forecast the nature and the breadth of future changes. Moreover, a careful analysis of the information contained in those matrices would greatly improve our knowledge of the nature of technological change in the various sectors of the EEC economy.

II.15.20. Quite apart from its forecasting merits, which we have just indicated, this activity, which the economists of Europe Plus Thirty should assist the CSO in conducting, would have an important by-product: it would show the actual levels which European integration has reached in the economic and financial fields, which are very high but perhaps

not very well known by the public and even by the governments of the member countries. As we have said, it is a hard job, but it is a pre-requisite for the achievement of factually based forecasts and realistic policy decisions.

II.15.21. Thus far, the Community has lacked a complete view of its economic life, taken as a whole. Its statistics are the summation of national statistics, often not homogeneous. What is missing is a structurally interdependent approach, an interrelated analysis of products, markets, inputs, and of the financial activities that correspond to economic activities.

II.15.22. If this type of activity were to be initiated by the economic and financial section of the proposed Europe Plus Thirty, it would yield very interesting results without great delay and without engaging an excessive amount of human and financial resources. Most of the "Census and Assessment" jobs just outlined could be done by competent "task forces". The construction of the economic and financial matrices, and the analysis of the structure of trade within the Community and between the Community and other economic areas, for instance, could be accomplished in a relatively short time by sub-groups composed of no more than 3 - 5 research workers each, who had computer time and computer experts at their disposal.

II.15.23. Similarly, a task force could study the basic problems of trends in relative price structures. This essential field of analysis was sadly overlooked until macro-events like the recent rise in raw material prices brought its more lurid aspects to everybody's attention. A spate of research has been initiated, but it does not look as if its results will do much more than scratch the surface of the relative price problem.

II.15.24. Under this heading, the study of the inflationary process would find an appropriate and theoretically sound location. Studies of inflation have tended to look, at least recently, at this phenomenon as if it were exclusively determined by monetary causes, or by wage pressures, or by the incontinence of public finance.

We therefore propose that inflation be studied by Europe Plus Thirty mainly in its proper relative price context. Nor, conversely, must it be forgotten that inflation is more than just an aspect of relative forces.

II.15.25. Equally important is the study of trends in relative wages, and of the whole subject of the modes in which production is organised, i.e. of the legal, social and technological modalities of the organisation of production, which combine to change the relative uses and relative prices of productive forces. Tendencies toward concentration as well as de-concentration can be detected, and must be studied and explained. We have already mentioned this in Chapter II.9. above.

II.15.26. The study of trends in relative prices and wages, in the structure and technology of production, and in the concentration and diffusion of productive processes in the EEC, should be accompanied by a related study of the trends in the placing of the EEC economy within the world economy. This would involve a deep enquiry into the path of development of economic relations between the EEC and its associated countries, the Socialist countries, the USA and Canada, Japan, the other developed countries, the oil producing countries and the "poor countries". As "economic relations" one should understand not only visible trade, but also invisible trade and investment flows, technology transfers, and the administration of "aid". It is through this enquiry that Europe Plus Thirty should make its contribution, which we think could be considerable, to the development of Community aid policy.

II.15.27. The modes of "international division of labour", should be closely analysed so that the formation of "hierarchies" and dependence patterns could be detected and their future developments forecast. (We touched on this also in II.9. above.) Similarly, the process of "internationalisation" of capital, labour, and production should be given detailed attention, in order to see whether any "European" pattern becomes evident or, if not, to enquire why. The same type of analysis should be conducted at the intra-Community level, in order to detect the appearance of centripetal or centrifugal forces, and intra-regional specialisation and dependence patterns, within the EEC.

II.15.28. Europe Plus Thirty should also seek to forecast about the mode of development of financial and monetary structures. This would involve a study of the structural development of European financial institutions and policies. Here, a straight extrapolation of previous US financial history on European data would have yielded, throughout the post-war period, extremely poor results, while it is quite probable that doing it the other way round, i.e. extrapolating previous continental European trends on US and UK data, would have proved more successful. This is simply because the continental European financial systems had to face both before and after the Second World War the two basic problems of capital scarcity and inflationary financing, which the US and the UK, with their low rates of inflation and of real investment, were spared until the mid sixties.

II.15.29. Unfortunately most analyses of continental European financial systems have started from the premise that the US and the UK financial systems were the models that should be imitated. This has condemned their results to irrelevance, which justifies a reconsideration of the whole problem of the style of European integration in the financial and monetary fields. Especially important, when this exercise is taken up by Europe Plus Thirty, will be to make public finance the lynchpin of financial analysis; and this is again the opposite of what Anglo-American financial analysis has traditionally done. The activities of the state (in its widest sense) as a financial intermediary could well be the point of departure of any European financial forecasting.

II.15.30. If this point of departure were chosen, the relevance of European financial forecasting would be tremendously enhanced, especially to forecasts of the structure of European monetary integration, of the activities of non-European multinational corporations in Europe, and of European multinational corporations in Europe and elsewhere. Moreover, trends in banking, private and social insurance and pension systems, housing finance, consumer credit, and thus consumption, would be much easier to forecast, as well as the relative weight and patterns of activity of nationalised industry within the European economy.

A European Welfare Accounting System

II.15.31. More generally, Europe Plus Thirty would be well advised to combine all its findings in the economic and financial fields with the findings of its other sections in an attempt to construct a progressively less naive "Welfare Accounting System" for the Community as a whole and for its component parts. The greatest difficulty to be faced, when constructing such a system, is that social indicators (like environmental decay or rehabilitation, the number of pupils in secondary schools, the extent of educational recycling, crime rates, wealth and income distribution) cannot without drastic recourse to value judgements be expressed in a common standard of value and aggregated to form a sum that can be added to or subtracted from the money GNP. But it would be just as useful to know, for instance, that production of such and such goods and services has been, in any one year, so much, and that the index of atmospheric pollution, in the same year, was so much in such and such places, and to compare both figures to previous years or to other countries, or extrapolate them into the future. What can usefully be done, moreover, is to calculate trade-offs, i.e. of the relative cost to a community of reducing pollution, increasing education or raising health standards by certain amounts.

II.15.32. The same reasons that militate against putting excessive faith in the GNP indicator also advise against attempting to pyramid all welfare indicators into a portmanteau figure for "Gross National Welfare," or some such phrase. What is of paramount importance is to convey to the citizens of the Community and to their representatives the notion that the socio-economic system, in its general functioning, produces this conglomerate of goods, services, processes, social and environmental phenomena as its output, and that this production process cannot simply be reformed by eliminating its negative outputs because, if that is done, the positive outputs will be affected as well. The inner structure of this complex production process must therefore be elucidated, so that the mutual relations between its components can be identified.

II.15.33. The problems involved in this type of social accounting are enormous, but once again this does not mean that the job cannot be contemplated. The identification of the variables that enter the system will be made harder by differing national standards, and the weighting problems associated with those of reducing quality into quantity do not decrease because of the fact that the exercise is conducted on a Community basis. But it is certain that only if an attempt is made to construct this type of accounting system can we know the direction the Community is going, understand what rewards national and Community efforts are reaping, and begin to assess and compare the aims it might rationally reach for.

Recommendations

II.15.34. In chapter 1 above we spoke of the need for coordination of all the forecasting work, and research relevant to forecasting, which is done by and for the Commission. The days of partial analysis, if they ever existed, must be gone forever. Nowhere is this truer than in the economic field. The facets of economic and financial forecasting we have suggested in this chapter are, in our opinion, among the most interesting and fruitful. But it is clear that the team of 10 to 15 highly qualified economists, which we recommend Europe Plus Thirty should employ, could not reasonably take up all the forecasting jobs we have suggested at the same time. In this last section we stress the importance of indicating a list of forecasting priorities. If we were asked to express our own, it should be clear to the reader of this chapter that it would definitely be the forecast of the constellation of relative prices that will prevail in the European economy, as a result of the effects of the energy crisis and of the crisis in the concept of "growth for its own sake". This aspect of long-term forecasting would be the most relevant, in our opinion, to the other forecasting sections of Europe Plus Thirty.

II.15.35. Apart from in-house cross-fertilisation, we must stress that the economists of Europe Plus Thirty would be able to accomplish little if they could not rely on intense collaboration from the Community Statistical Office and the proposed European Institute for Economic Research and Analysis, if it is set up. Most of the forecasting

activities indicated in this chapter only make sense if the processing of data is accomplished, to the specification of Europe Plus Thirty, by the CSO. This would not involve, in the majority of cases, more than processing in a different way data that the CSO already possesses or regularly receives from member countries. Where we have spoken of "small task forces" to accomplish certain forecasting jobs, we had in mind that our economists would "design" those jobs and specify the data-processing modes they required; they would then ask the CSO to do the processing. It is clear that this would involve a most intimate degree of mutual acquaintance and cooperation between the CSO and Europe Plus Thirty.

II.15.36. Finally, we think it is necessary to express a caveat against a tendency that frequently develops when long-term research and forecasting programmes are discussed, namely the tendency to spell out in minute detail the scope and method of long-term research and forecasting programmes. A long-term forecasting programme embraces a span of 4 to 30 years. In such a time span things change profoundly, new problems arise, corners are turned. It is therefore most unwise to crystallise a forecasting programme from the start. We have suggested some starting points above, but those are only what seem right to us at the moment. We want Europe Plus Thirty to be capable of responding quickly (though not superficially) to changing events and insights.

II.15.37. In this chapter we have been perhaps less specific about what should be done than has been the case in some others, and we are going to be less specific also about the qualifications of the 10 to 15 economists who we recommend should do it. In the economic field, the question of the division of work between Europe Plus Thirty and other organisations will be more complicated than in some others. There is the Economic Policy Committee, there is the Community Statistical Office; there may be the European Institute for Economic Research and Analysis; there are METEOR and COMET; there are the services of DG II itself. We suggested at I.1. above how overlap and confusion could be avoided by the adoption of certain simple guidelines, but that

will still leave much to be settled. For that reason we deliberately abstain here from anything like job specifications. We confine ourselves to saying that, whatever pattern of work is adopted, staff should be found with the skills and experience needed for that pattern, and also for the economic inputs which will be needed for the other sectors of Europe Plus Thirty's forecasting and its technology assessment.

16. DEFENCE AND DISARMAMENT

II.16.1. As the European Communities are at present constituted under the Rome Treaty, defence and disarmament are not among its responsibilities. It would therefore be understandable if Europe Plus Thirty were to devote no more than passing attention to them. But this would not necessarily be desirable. Its role will be to explore possible futures, using the techniques of forecasting and technology assessment; and it is certainly possible to consider a future in which the Community could find itself more directly concerned with defence; indeed, it would be hard to look thirty years ahead without doing so. Nor would it be possible for Europe Plus Thirty to forecast about the European economy or about European technology without at least being aware of the impact of defence or about European politics and external relations without considering disarmament.

II.16.2. There is no way of decoupling defence, deterrence and disarmament from the other great issues of our time, any more than there was in the past. We can list them: political and trade relationships with our Eastern neighbours, and with America; the maintenance of a sound economic base; the provision of food and other resources at a time when a century of unprecedented growth shows every sign of overstraining the world economy; our relations with the Third and Fourth worlds nearer home; the growing sense of disorientation, the lack of cohesion and purpose which has begun to affect industrial society, and the disbelief, perhaps growing, in the need for any defence at all; the general direction of our technological innovation, and, last and most important, the relations between the member states of the Community itself.

II.16.3. We do not think Europe Plus Thirty should go so far as studies of the mechanics of defence; that ground belongs to NATO and the national defence industries. There is no point in redoing within the Community what is already being done elsewhere. We can therefore eliminate such large specialist fields as:

- weapons specification and developments (as opposed to the policy and machinery for integrated defence production);
- targeting and other operational aspects of strategic deterrence;
- the mechanisms of command and control;
- "size and shape of armed forces";
- intelligence;
- logistics.

Occasionally, of course, even in this NATO territory, points will be found which are essential to the understanding of wider political issues.

II.16.4. But there are other important matters, impinging directly on the growth of common Community policies in the fields of foreign affairs, technology and economics, which cannot be tucked away into the defence "black box", and which will have to enter into Europe Plus Thirty's general forecasting if it is to be realistic. They include:

(a) The impact on national economies of devoting different levels of resources to defence, including

(i) the economic and technological impact of defence technology and defence production on the European industrial base;

(ii) the possibility of greater international sharing of defence industrial effort; and the form such sharing could take.

(b) Possible changes of the military - political pattern in Europe and the rest of the world, including

(i) the general nature of the arguments about disarmament, nuclear proliferation, and deterrence;

(ii) scenarios of European politics, and of moves towards East-West detente.

(iii) the political circumstances in which the Community might begin to acquire defence and disarmament responsibilities, or at least take defence and disarmament more explicitly into account;

(iv) the effect of (ii) and (iii) on the future of NATO, and hence on the Warsaw Pact;

(v) the problem of ensuring continuing supplies of essential resources, and the use to that end of defence expertise and material as bargaining counters outside Europe.

II.16.5. A great deal of this ground can be examined in considerable depth without using classified information; there is no shortage of published data. Defence is served now - as it has been throughout history - by very strong intellectual forces, drawn in by the fascination of watching "real power" at work, or by the challenge of solving difficult problems, or simply by patriotism. There is also a substantial extra-governmental group of specialists - historians, political commentators, economists - who contribute serious academic studies, and who help in this way to maintain the standards and objectivity of governmental work. But, as always, the way in which the arguments are assembled, and the weight given to conflicting considerations, depend on who is writing, and who for. Besides being a necessary part of its general forecasting, work in this field by Europe Plus Thirty would help develop a specifically European analysis of the fields we are discussing, and this we think is to be desired.

II.16.6. Military-political scenario writing needs to be undertaken in order to spell out the range of possibilities which could confront the Community. To be useful, scenarios need to be in some detail: unless sufficient colour is given to the picture, it will not stimulate thought, and so eventually action. The effort required for this kind of work is not large but it needs to be of high quality. Those undertaking it will have to understand West European, Russian, and

American political realities, trends in strategic deterrents, the use of nuclear and conventional weaponry as local deterrents, the long-term political economic implications of the "limits to growth" debate, etc.

II.16.7. The time at which Europe could become more responsible for its own defence is obviously relevant to any future defence studies. As already noted, the Treaty ignores the issue. But a more unified West Europe (if one is eventually created) which consciously planned on looking in perpetuity to another power of comparable population and wealth for its defence, is not among the most likely future developments. If the Community were to involve itself with defence, that would be bound to have an effect on the future of NATO. Already, indeed, some movement in this direction can be discerned, through the creation and recent extension of the Euro-Group of Defence Ministers.

II.16.8. The existence of this Group is relevant to the forecasting about defence which might be undertaken by Europe Plus Thirty. It started in 1968, very informally, as a kind of dining club for European Ministers of Defence when they happened to be together for meetings of the NATO Council. Its membership is smaller than that of NATO; the United States and Canada are not members, and nor are Iceland, France[1], and Portugal (which had been preoccupied with colonial problems). It also differs from that of the Community, Ireland being neutral. Norway, Greece and Turkey are in NATO but not in the Community. The Euro-Group has met so far in the NATO building in Brussels. Germany and Britain tend to take the leading roles. The chairmanship rotates, and Britain provides a small secretariat.

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(1) France is not a member of the Euro-Group, though she remains a member of NATO Committee of Armament Directors. In order to associate France in some way with a European defence initiative, the idea has been floated of reviving the Western European Union, WEU. But its membership is even more limited than that of the Community (Britain, France, Germany, Netherlands, Belgium,Luxembourg and Italy); and Germany, for well-known historical reasons, does not regard it as the most useful organ for policy decisions.

II.16.9. The Group was originally intended to work on the improvement of the European end of NATO in general. In practice it was concerned at first mainly with armaments and the defence industry (see below), but it has recently made a tentative start on a study of longer-term issues. This involves entering sensitive territory which cannot be usefully explored without making judgements about the likely future of European defence and disarmament, and hence about Atlantic relationships and progress towards detente.

II.16.10. The importance of the Eurogroup in relation to the work of Europe Plus Thirty is, clearly, that a great deal of defence forecasting on behalf of Europe could develop naturally out of its efforts. It is not immediately obvious that there would then be much need for an additional contribution from Europe Plus Thirty. But we have already mentioned the desirability of Europe Plus Thirty undertaking defence studies as a part of its own integrated forecasting. That need would not be removed by whatever forecasting was undertaken by the Eurogroup of NATO - it would only be made easier to meet, because there would be some possibility of shared effort.

II.16.11. At this point it may be convenient if we give an impressionistic account of the way long-term defence forecasting is done in NATO and in several of its member countries. It is often done under four headings:

(a) Firstly, <u>economic</u>, that is: the likely growth in national resources, both absolutely and compared to that of allies and potential enemies; the likely proportion of those resources which will be available in the public sector; and the share of that sector which defence might get. Realistic assumptions have to be made about the cost of equipment and manpower, and such things as the likelihood of burden-sharing and collaboration with allies. The economic contribution of the defence sector to other sectors can also be estimated; e.g., the training of airmen, engineers and craftsmen, and the development of the "non-economic" technologies, like exotic fuels, which later have a civilian application ("Fall-out").

(b) Secondly, the possible future political and military environment is examined. In doing so, possible developments in international relationships which might have a substantial effect on the size, plans, structure, equipment, deployment and mobility of the Armed Forces are identified: in superpower relationships, the American commitment to Europe and the possible emergence of a more integrated Europe in the Western Alliance; likely progress on arms control; the possible development of China and Japan as military powers; the stability or otherwise of the Third World and of national or European interests outside Europe; and the threat of civil disturbance in Europe and elsewhere.

(c) Thirdly, forecasts are made about demographic and educational developments and changes in social attitudes which may affect recruiting, manpower structure and manpower costs of the Armed Forces, and perhaps act as a major constraint on future defence planning. The Armed Services may have to face over the next decade or so changes in their social environment and in their own social function at least as fundamental as have occurred in any previous period in history.

(d) Fourthly, an analysis of the possible longer-term trends in technological developments, and their significance for defence. The objectives and capabilities of the relevant areas of Soviet and Western technology are compared; and trends of promising research wherever these may occur are identified. In particular, an attempt is made to identify developments which could upset or change the current offensive/defensive balance or which would offer wholly new concepts of weapons systems or military activity; and those which would entail the elimination of particular classes of weapons or military activity.

II.16.12. The issue of deterrence is nowhere of greater significance than on the European mainland, since only there do the two super-powers face each other in an embattled posture. As weapon technology moves ahead (and there is no sign of its letting up) the theories underlying our concept of deterrence will need periodical re-examination. The history of the past 15 years includes a number of examples of how the informed commentaries of persons close to, but not wholly engaged in, military matters have added greatly to our understanding of what needs to be done, and of the various dangers which threaten, depending on which options we choose. Since there is no reason to believe that the need for such independent thinking has passed, Europe Plus Thirty should aim to master the arguments. In the not very distant future it is possible that the need for political thinking on this issue may be sharply increased, through foreseeable developments leading to the increased proliferation of nuclear weaponry, an ever-increasing danger of nuclear war by accident, and fresh risks, in this age of subversion and guerilla organisations, of nuclear or other blackmail. And most important of all will be the possibilities of disarmament and detente. A future containing an unrestricted arms race for evermore would not be the same as a future containing even limited disarmament, and the difference would have considerable consequences for the economy, and major ones for the society and politics, of Europe.

II.16.13. The points mentioned in sub-paragraph (a) of the listing on page 2 have a more strongly economic flavour: the impact of defence technology on industry and on the economy; the possibilities of economies through international collaboration; and the industrial form such collaboration should take. The bill for European defence - not counting the American contribution - runs at about 3.2% of the gross domestic products of the Nine (excluding Eire). In money terms this amounts to around $35,000 million in total (1974 prices). Industrially the significance is even greater than this already very large figure would suggest. Defence is a

major consumer of the Community's technical effort: it can for instance, account for 25% or more of a country's industrial technology. It is, moreover, the most advanced 25% and it captures the imagination and allegiance of some of the best recruits but makes little direct contribution to the health of the civilian economy. Some such lop-sidedness is unavoidable as long as we have defence; but the economic side-effects need to be assessed and brought out into the open, for the Community just as for an individual country. The commitment of defence technologists on the present scale is more than a peripheral issue, and a more planned distribution of defence resources might be expected to play an important role in the future economic policies of the Community. Quite apart from technological implications, defence ties up, in a necessary but largely unproductive activity, many of the best of each nation's young people, so that the opportunity cost of lost productive employment has to be added to the direct cost if the true effort is to be fully appreciated. All of these factors merit regular economic appraisal in the light of forecasts of 'possible futures'.

II.16.14. The formation of the Eurogroup bears witness to a general acceptance of the view that there is room for economies of all kinds in the organisation of the European defence. In following up this approach, the Eurogroup has set up a number of sub-groups, dealing with medical problems, training, logistics, and (potentially by far the most important) armaments. A June 1974 meeting of Eurogroup at ministerial level, "discussed the role of European industry in procuring equipment for NATO forces, and agreed that, in the interests of the Alliance, there was a need to maintain a highly developed technological, scientific and industrial base in Europe, while also seeking to achieve the closest possible co-operation in arms production and procurement between the countries of North America and Europe". Such phrases have of course been uttered often before. So have principles such as that which states that "no development will be sanctioned by national Ministries of Defence without a prior check of the possibilities of international co-operation". Doubts exist as to whether this will be sufficient to bring about a shift of the present balance between the two halves of the NATO alliance.

II.16.15. The more European joint production agreements that are set up, and the more trans-European companies that are formed to carry them out, the more natural will the process of European collaborative arms production seem. Already there are a dozen or more good examples of what can be achieved. By, say, 1990 it would be surprising if Western Europe were not physically able to provide the industrial base for a defence and deterrent effort of its own. By then it could certainly create its own satellite reconnaissance system, and so avoid remaining dependent for some kinds of information on America, as was the case during the 1973 Israel-Arab war, information, moreover, which would be of critical importance in any disarmament or arms control process. All these possibilities would be proper elements of scenario writing in Europe Plus Thirty.

II.16.16. For such reasons we believe that Europe Plus Thirty should not arbitrarily exclude anything from its purview simply because it has to do with defence or disarmament, and because these matters do not figure in the Treaty of Rome. They must be part of its forecasting work because they are part of European life: politically, industrially, and above all economically part of it. Nor, on the purely formalistic level, do we think that an absence of specific mention in the Treaty should worry anyone. Many of the things we talk about in this report are not specifically mentioned in the Treaty. Lack of mention in the Treaty has not prevented the Community at all levels, up to and including summit meetings, from talking about this matter or that, and from laying plans for Community action. It should be abundantly clear from the whole of this report that the inclusion of a given topic in the forecasting to be done by Europe Plus Thirty would not mean that any particular development is either more or less likely to happen.

Recommendations

II.16.17. We recommend therefore that defence and disarmament should be part of the normal work of Europe Plus Thirty, like anything else, and staffed accordingly, with an allowance of perhaps 3 professionals. Data and scenarios concerning defence and disarmament should be integrated with the normal inputs of the economic, industrial, technological,

social, environmental, materials and educational forecasting which Europe Plus Thirty undertakes. And it goes without saying that its technology assessment should not create artificial frontiers between the defence and civil applications of a given technology, product or process.

17. POLITICS AND INSTITUTIONS

The nature of Political Institutions

II.17.1. Of all the areas dealt with in Part II of this report, the political and institutional is the least amenable to forecasting; the nature and function of political institutions themselves make this the case. Every social system nourishes a number of institutions, whose function it is authoritatively to regulate the demands and conflicts which arise within it and, in the case of national systems, to monopolise the use of force. These institutions we call political because it is their purpose sometimes to be, and sometimes to develop and provide, decision-making mechanisms. We have to distinguish between institutions in the economic sphere (e.g. firms, trade unions), the socio-cultural sphere (e.g. churches, mass media, etc.) and the politico-administrative sphere (government institutions themselves). Here we will be concentrating on institutions in the politico-administrative sphere; they are set above the others because they regulate and control them. But we have to keep in mind that political institutions are always interdependent with the other spheres: they can never be examined outside the context of other institutions. It is the purpose of politico-administrative institutions to prepare and bring forth decisions which are important to the order and shape of the whole of the social system, as well as to the development of individual sub-systems.

II.17.2. All political systems have to solve one basic problem, namely how to adjust political order to changing social demands. It is typical of political institutions in the West, to which the countries of the European Community belong, that they do this by balancing conflicting interests within the framework of regulated and more or less accepted procedures. The criteria by which we judge such institutions are legitimacy and efficiency. By legitimacy we mean consensus; acceptance of the legality of institutions, and a consequent readiness to submit oneself to their authority. By efficiency we mean the ability of institutions adequately to fulfil the role assigned to them.

II.17.3. There is only a limited typology of political institutions in the modern history of the West; institutional innovation has not been especially noteworthy in recent times. So, while the basic forms of political institutions have remained rather constant, their relationship

with each other and with society in general, their tasks and their internal structure, fluctuate according to the particular problems which come up, when the need for order has to be reconciled with changing social demands. We are here considering institutions that either influence the political "input", by which we mean the demands of social forces which arise in problem situations, or are on the other hand concerned with handling input in order to create legislative and administrative "output". While all political systems have these two characteristics- input-oriented structures (parties, pressure-groups) and output-oriented institutions (government, civil service) - the relationship between them is constantly changing. On the one hand there can be quite a strong executive and administration facing a "weak" parliament and on the other a "strong" parliament facing a government that is nearly unable to act. And there can be institutions in the economic and social sphere that have such a dominating influence on the politico-administrative system that it is unable to make decisions which would go against their wishes.

II.17.4. The above is necessarily a somewhat schematic and simplified account of the matter, and in practical experience its outlines are no doubt often hard to perceive through the dust and heat generated by the conflicts between entrenched power systems. This is particularly the case where an institution (for instance among great companies, or trade unions, or in the press and television),having acquired the power necessary for the exercise of a function to which there is general consent, uses it to exercise another function, to which general consent is lacking.

Political Institutions as Variables

II.17.5. The development of political institutions and their capacity to meet the demands on them is determined less by the logic of their own internal development than by the tasks and problems which are imposed upon them from the socio-economic and cultural spheres. An internal dynamic of political institutions about which we might forecast thus exists only to a very limited degree; we cannot say much about the future development of political institutions "as a separate subject". Forecasting institutional change presupposes a knowledge of the problems and developments in other spheres of the social system, to which the political system always has to react: that is, to find an adequate response.

II.17.6. Let us take an example. If critical developments occur in an area which is of prime importance for the existence or further development of a society - energy scarcity, high unemployment, a lack of skilled workers - it is the duty of the politico-administrative institutions to cope with the matter. They must adapt themselves to fresh exigencies. This process can lead to the internal re-organisation of a political institution (administrative reforms). Sometimes an institution which serves a particular purpose begins to serve a different one. Sometimes it is itself supplanted as the chief servant of its own purpose. Institutional change is determined partly by the nature of the problem, and partly by the will of those in charge of the institution. Institutions are partly secondary phenomena which relate to primary causes, so that their internal logic or inherent laws are of secondary importance compared with those of the economy, or population dynamics, and partly instruments for the exercise of power which can be guided and manoeuvred by each succeeding generation of persons in charge of them. It is obvious that the task of forecasting as it attaches to each of these two aspects of political institutions is different.

Political Forecasting

II.17.7. Political predictions have mostly been wrong. Some sociologists and philosophers at the turn of the 19th and 20th Centuries predicted new forms of government based on the domination of scientists and technocrats. This was the spectre of the technocratic state, which is still with us today, and still only a spectre. Marxists predicted the breakdown of capitalism and with it the bourgeois state. They denied that capitalism in the course of its development could become flexible enough to resolve most of the contradictions which were supposed to bring it down. In Germany many liberal intellectuals and politicians didn't give Hitler a chance; conversely those who believed in him were unable to foresee his early ruin. Authors such as George Orwell foresaw, against the background of contemporary experience, a totally technological society in the hands of unscrupulous power fanatics; but this was less a prediction than a device to warn humanity against a frightening political possibility. Orwell did not repeat Cassandra's mistake; his warning of doom was believed and has, so far, been accordingly falsified. At the beginning of the 1950's many social scientists and even more politicians in Europe were convinced that a federal Europe could be created within a few years.

II.17.8. The Treaty of Rome was signed in the hope that a European political community would come about as a by-product of economic integration. General expectations and forecasts always tend to be based upon an evaluation of present conditions; they influence one's own assessment and interpretation of the future. Such forecasts often tell us more about the present and its appraisal than about the probable future. "Every forecast is the projection into the future of a certain understanding of present reality. This shapes its structure, direction and results".(1)

Different forms of Political Forecasting

II.17.9. We must distinguish between forecasting the development of political events and institutions, which is not very fruitful, and the postulation or drafting of new political institutions as part of hypothetical alternative futures, the problems of which may require new or adapted institutions as tools for their solution. Political theory and practice are full of examples of how to construct new political institutions; whenever we have to reorganise things, or feel the need for new political forms, there is no lack of such designs. In this very report, we sketch the outline of an institution to cope with the tasks we have been asked to report on, and we take into account the reality of the present political scene. In what follows, we are talking about the construction of new institutions at Community level. The corresponding activity at national level, where the ground is thick with instruments of entrenched power grown up over centuries, would be different.

II.17.10. If you want to achieve a political goal, such as a united Europe, or a European economic and monetary union, you must necessarily presuppose the establishment of certain institutions. Their function would be to achieve the chosen goals through institutional mechanisms. Theoretically, it is rather easy to answer the basic questions when setting up institutions; you always need a body to elect, appoint, or delegate members to an institution; every institution that has powers of decision needs a controlling institution; every new institution needs to be sensibly integrated into the network of existing ones, and so on. In theory, therefore, it is not difficult to design institutional structures. But practical questions remain: how do we achieve desirable

(1) Klaus Scholder : Grenzen der Zukunft, Stuttgart 1973, page 71.

institutions ? Has historical experience been taken into account ? Has the relationship between existing institutions been correctly gauged ? It is not very useful to sketch an institutional model of, for instance, a federal Europe, if it is not accompanied by a realistic assessment of the present political situation from which one can deduce whether within a foreseeable period it is in fact possible to reach that goal. Political forecasting in this sense, namely, dreaming up institutions and constitutions, must be accompanied by a practical analysis of the real power relations which would either facilitate or hinder their location. Quantitative methods are of only limited use in political and institutional forecasting. In this area the "simple methods" and "intuitive methods" mentioned in Chapter I.3. above are of most use. They can be supplemented by analytical methods such as rough cost-benefit analysis, so that one can estimate quantitatively some of the advantages of a particular political strategy. But above all, it is important that the people working in this area should understand the functioning of political institutions.

Tasks of Europe Plus Thirty

II.17.11. There are a few political problems which could usefully be dealt with by a forecasting institution such as Europe Plus Thirty. It could be among the tasks of Europe Plus Thirty to ask what institutions and practices would best respond to problems and developments as they appear in the social and economic sphere. Thinking about the formulation of political strategies involves the following:

a) Examining the extent to which political institutions within the European Community are capable of responding appropriately to any given problem, considering the powers and information available to them.

b) Asking whether new institutional arrangements should be made, and what changes might be initiated, to meet a particular situation better than existing arrangements can, and comparing various alternative changes.

c) If it should be found, or urged, that we do need new institutional provisions, asking what pre-conditions would enable existing centres of political decision-making to produce or permit an institutional solution to the problem in question.

II.17.12. One can well imagine the development of scenarios in the field of political institutions. Their purpose would be to canvass alternative institutional designs for appropriateness, and for ability to solve problems. In most cases, one can think of alternative institutional possibilities, whose advantages and disadvantages can be discerned by testing them against specific questions. An examination of the conditions under which such possibilities have a chance of success is just as important as thinking them up in the first place. When Frederick the Great had read "Perpetual Peace" by the Abbé Castel de Saint-Pierre, he wrote in a letter to Voltaire: "The thing is most practicable; all that is lacking for its success is the consent of Europe, and a few similar trifles".(1)

II.17.13. Designing institutional arrangements always implies a realistic assessment of the chance of success. This means that those who will be working on this for Europe Plus Thirty should have not only a fertile imagination, but also a good background in history and a wide knowledge of current affairs.

We can imagine the following areas of work:-

II.17.14. A general and diffuse task for Europe Plus Thirty could be to canvass different pictures and institutional forms for possible political alternatives. This is a matter of tangible Utopias (Konkrete Utopien in the sense of Ernst Bloch)(2); tangible, in that they align themselves on, and arise from, existing reality. Tangible Utopias belong to identifiable moments in the chain of possibility. By starting from given technological, economic and political possibilities, one could offer specific scenarios for future European policies in certain areas. If one has a picture of a possible future, or the possible future development of a sector, one can try to sketch what institutional conditions would be necessary to reach it, what institutional shape such a trajectory would imply, and thus what institutional changes and innovations would be necessary.

II.17.15. A particular task of this nature could concentrate on the problems of human rights and freedoms. If this aspect is neglected or left out there is the real danger of looking at politics and institutions in the European framework as being somehow independent from the basic

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(1) Quoted from F.H. Hinsley: Power and the Pursuit of Peace, Cambridge, 1963, p.45.

(2) Ernst Bloch, Das Prinzip-Hoffnung, Stuttgart, 1959

liberal and democratic values to which they should be committed. In the terms of this report, one might say that our most compelling scenario should be a forecast of the future of Europe in which all members are bound by the same laws to respect in an equal manner the rights and freedoms of their citizens; a Community human rights policy. Realising that we are at present very far from that desirable state, and that present disparities would place a real obstacle in the way of advance towards any form of political union, it would be a worthwhile activity of Europe Plus Thirty to stimulate research relevant to the fundamental aim of securing human rights and freedoms equally to all the peoples of the Community.

The question of human rights and freedoms also has a strong bearing on possible future enlargements of the Community, and speculation about the way they might develop in various countries which might desire to join the Community would be a useful concomitant to political debate.

II.17.16. It is an important task to consider alternative institutional responses to emerging problems. Take, for example, education or transport. If we want to bring about a particular line of development in Europe, we look first for emerging trends. Then we examine the present political situation, and then think how the institutions which we have could best produce the necessary policies. If we think they could not, then we think of more appropriate institutional structures. Sea-use planning, as we argued in II.12 above, is a field where institutions are almost entirely lacking, are required, and should be devised.

II.17.17. Europe Plus Thirty will come into being, if it does, at the time of the most profound political change in the institutions of the Community since they came into existence. We refer to the decision of the European Parliament at long last to apply the Treaty of Rome and proceed to direct elections, by national electoral law in 1978, and by a single Community electoral law a few years later. The institutional upheavals caused by this decision will (unless the decision is overridden by force majeure, and probably even so) create a demand for fertile and informed speculation about the forms and effects of new arrangements within the Community. So will the moves towards Economic

and Monetary Union and even a "European Government" which are now being canvassed in the Tindemans Report and elsewhere. If it is ready in time, Europe Plus Thirty could meet a large share of that demand.

II.17.18. The "political" people in Europe Plus Thirty should be mainly responsible for keeping all the other work in touch with political reality. They must keep a sharp look-out for any postulated development, which may be held to be physically or economically possible, but which would entail a political impossibility; for instance, the prolonged acceptance of subjugation by a population able to fight, or the infinite prolongation of the inability of a population to fight. (This concerns the world outside the Community).

II.17.19. The political forecasting of Europe Plus Thirty should in general by no means be confined to the Community as such. We think it should look, as it were, downwards, to the member states, outwards to other international organisations, and upwards to the United Nations. It would obviously not be appropriate for Europe Plus Thirty to develop scenarios for the internal political development of single member countries; that would be politically counter-productive. But it will be impossible for it to develop scenarios for the Community as a whole without making some assumptions about the internal development of single countries, and those assumptions must be both well-informed and explicit. This will perhaps be the most politically tricky area of its work, and will require tact and skill. It will be necessary, indeed it will be the main-stream of its work, for Europe Plus Thirty to produce scenarios for the Community as such and, as we have said earlier, we think these should range over a spectrum the width of which is determined only by political possibility, not by political aspirations. For instance, we are sure that besides "a little more, a little less" scenarios about European integration, the spectrum should encompass extreme ones too, from a unitary federal state within thirty years (which one cannot say is impossible) to the total disappearance of the Community as a political and economic entity, and a reversion to the unmitigated singularity of nine sovereign states, within less time than that (which one cannot say is impossible either). Economic and other forecasting will

also be needed about the addition of new member countries, and the departure of existing ones; the choice of scenarios here is a political one. Scenarios will be needed in the political field, no less than in the economic, for relations with the rest of the world. The forecasting imagination must range freely over possible developments in the Soviet Union and Eastern Europe, in China, in the U.S., in the structure and role of OECD, of OPEC, of an international ocean regime, in the use of terrorism as such, and so on and so on.

Most important of all, though no doubt not most immediate, it must range over possible developments in the United Nations. We touched on this in our General Introduction, and we think that no part of the work of Europe Plus Thirty is likely to be more useful than its speculations about how the European Community will fit into a shrinking world.

II.17.20. It goes without saying that Europe Plus Thirty should also review and assess its own political use and efficiency.

Recommendations.

II.17.21. It is important that Europe Plus Thirty, in this area more than any other, should never urge particular policies on the Community as such or on its member states.

II.17.22. Competence in the field of political forecasting is not so much a matter of handling scientific forecasting techniques as a skilful combination of knowledge about the nature and functioning of political institutions, and about history as the background of all development, linked with practical experience and mature political judgement. The small number of "political forecasters" should include people with a high degree of practical political experience; they should be or have been politicians, or political journalists.(1) The "political" team of Europe Plus Thirty should contain a minimum staff of three people, since the complex subject matter requires the combination of different forms of expertise and experience. Five would be better. Brainstorming seminars are especially indicated in this field.

(1) At Annex 2 we append an account of an interaction session between some European parliamentarians and the Mesarovic-Pestel world model. It was on the whole encouraging, and suggests that direct communication between decision makers and forecasting models and modellers should be pursued.

TECHNOLOGY ASSESSMENT

INTRODUCTION

TA.1. In Part II above we considered the various fields in which forecasting will have to be undertaken or assessed if Europe Plus Thirty is to achieve the integrated forecasting described in Part I. Together, they provide answers to the greater part of the first question in the Resolution of the Council of Ministers which instituted our study, the question about forecasting. Before continuing to provide the answer to the last part concerning the creation of a new forecasting instrument, we now turn to the second question in that Resolution, concerning technology assessment. We do so because we think that technology assessment and forecasting, especially technological, industrial, social, and environmental forecasting, are so closely related that they cannot be considered as separate subjects.

TA.2. In the present part of our Report, therefore, we shall say what we mean by technology assessment, and where and how it is done now, and how we think it ought to be done for the European Communities. The section of this Part which deals with existing capacity for technological assessment is supplemented by Annex 3, which stands in the same relation to that section as Annex 1 stands to Chapter I.2., on forecasting capacity.

In Part IV we draw together the threads of forecasting and technology assessment in a series of organisational proposals designed to secure the fulfilment of both functions at Community level.

1. The social assessment of technology

TA.3. Science and technology have contributed greatly to the shaping of the kind of world in which we now live - for better and for worse. The last few decades have seen a tremendous expansion in industrial research and development in all industrialised countries and, despite the fact that the main justifications for providing the resources have been defence, national prestige and economic growth, the expansion period has been one of somewhat unquestioning euphoria for science. This has now come to an end and both legislators and the public at large are questioning not only the costs and benefits of technology but the very objectives which have induced its expansion. It is clear there now exists a tension between the uses of technology and the aims of society.

TA.4. The concept of technology assessment (TA) arose as part of our generation's attempt to resolve this tension. It is not an entirely new idea, nor is it one which struggles for want of written definitions. A dozen or so, some vague, some incoherent, some naive, most far too long, are available. To define emerging ideas briefly is not easy. For the purpose of this report, however, we adopt the following definition:

> "Technology assessment is the advance evaluation of potential and unintended social, environmental and other effects of the application of existing or foreseen technologies."

Ideally, the assessment of a technology should anticipate and evaluate the impacts of a new technology on all sectors of society. So far, however, only a few such full-fledged technology assessments have been conducted. Instead, there is a long history of partial assessments, generally limited to impacts on the economy and, more recently, the environment.

TA.5. Technology assessment emphasises the secondary or tertiary effects of new technology rather than the primary (intended) effects, because:

- in the long run, the unintended and indirect effects may be the most significant;

undesirable secondary consequences are often unnecessary and may be prevented by proper planning; first-order impacts are usually subject to extensive study in the planning stage. In building a bridge, dredging a canal, introducing enzyme detergents, or electrifying a railroad, the first order effects - those intended as the primary goal of the effort - are generally explicitly planned for, and costed out in the initial plan.

Technology Assessment focuses on the question of what else may happen when the technology is introduced.

Technology and Society

TA-6. Technology has both positive and negative effects, usually at the same time and in virtue of each other.

The tension between technology and society can be divided into three headings:

i. side effects
ii. increasing complexity, and
iii. need for public concern.

i. The unwanted and often unforeseen side effects of technology are clearly manifest; some of these are direct, such as the obvious pollution and general environmental deterioration, and a loss of work satisfaction in repetitive industrial manufacture. Others are more subtle and indirect, including the increasing frustrations and difficulties of urban life, increase in crime and violence and a growing sense of irrelevance in contemporary education. All of them are too easily attributed to technology or to the type of world which technology has built.

At the fundamental level, and that is the level of definitions, technology was until recently seen as the method by which man can diminish the hazards and uncertainties of his struggle with nature (the view of the Age of Reason). Largely successful in the industrialised world in removing these uncertainties, technology now

appears to be rivalling nature, its former adversary, in the range of ills it imposes upon man. What is more, many of these effects are insidious and not immediately apparent in the short or even the medium-term. The impact of these "extra effects" (extra to the ends motivating the economic exploitation of innovation) is, in addition, unevenly distributed across society. Since the future must always be unknown, risks have to be incurred in innovation; the problem is to "calculate" them, and as far as possible distribute them equitably. We require, if possible, to foresee these effects and to reduce the damage they can do. If they may be irreversible, the need is that much greater.

ii. The ramifications into other areas of choice which are made in one area of technological decision, are increasing. No longer can the introduction of a particular product, process or technique be assumed to affect, in a simple manner, only the initially felt need for it.

iii. All this calls for more public control and participation. Technology is not "out of control". What is true is that political institutions have been slower to advance than technology, since a certain inertia hampers institutional innovation. The public is in the dark, and it is rather afraid. More people probably now fear what more technology might do to them, than want more technology to do things for them. One result has been the rise of the TA movement, and official moves to institutionalise it.

TA.7. The gist of what we have been saying so far could perhaps be expressed in economist's language as follows: TA is concerned with identifying external costs in advance, so that the public power can take whatever measures are open to it to see that they are re-internalised, in the form of on-cost expenditure necessary for the avoidance of harm, and thus fall on the direct beneficiaries (producers and consumers) of the goods or service produced, and not on society at large. If the external costs are of a kind that cannot be reinternalised, the question of outright prohibition of the venture arises.

What can be done?

TA.8. Different groups,(i) technologists, (ii) officials and politicians, and (iii) the public, have different responses. Their unification, if it can be achieved, will represent a solution of the problem.

TA.9. The "rational scientific" approach is the socially concerned technologist's recipe.

TA, from this viewpoint, can be seen to be the latest in the succession of attempts to systematise, for the public good, decision-making in government and industry. These attempts often have a large measure of mathematical reasoning behind them. They derive from the natural scientist's view of the world.

The development line through operations research, PPBS, and cost-benefit analysis, has now resulted in TA. But TA is not a single method drawn from either the natural or the social sciences; it uses the full armoury of methods discussed in I.3 above, but uses them to concentrate on particular and circumscribed problems. To this it adds a concentration on the search for linkages between sectoral forecasts. The macro-level composite forecast may miss the specific and unintended changes produced at the micro-level.

In an ideal world a comprehensive forecast of something or other might be expected to take all its impacts into account. For some time to come, however, the seenarios produced will be less than perfect. If they were to become "perfect", they would be comprehensive "systems analyses" in the widest possible sense; this as opposed to"muddling through" or "piecemeal social engineering". It is certainly not true, however, that the systems view at the present time offers anything other than a hope that a truly comprehensive view of change can be developed. Systems experts claim that by the time systems are finally well understood it will not be necessary to separate too strictly primary and secondary effects. It seems likely that political decision-making bodies will for the moment want to look to TA as an instrument for more immediate use.

TA.10. What then, does the politician or decision-maker get from the use of the TA concept, faced on Monday morning, with the need to act ?

It has been said often enough that any organisation, and this includes governments, exists as an effective unit only within limits set by its communications. TA can be usefully seen as a method of increasing the information available to political decision-makers, in a logical sequence.

For the transmitter of information, the technology assessor, the message is all; for the receiver, for the decision-maker, it is but one part of his input. To illustrate this, we quote and endorse some words from a T.A. report made under the auspices of the U.S. National Academy of Sciences on a proposal to extend New York's Kennedy Airport into Jamaica Bay.(1)

> "The members of the study group are not decision-makers; they serve only in an advisory role. The decision as to the disposition of the Bay is necessarily in the hands of others.
>
> Scientists alone cannot make the choices concerning alternative solutions to problems of this kind, which must ultimately depend on competing values and the weight governments assign them in arriving at a decision.
>
> Scientists can, however, isolate and consider objectively the issues involved, lay out and evaluate the effects on the physical and human ecology that may be expected to follow particular actions, and suggest and examine the various alternatives and their implications. However we recognise that scientists are not value-free and that their concerns and predispositions will have some effect on their conclusions and recommendations. But, whatever decision is ultimately arrived at, it will be a public one made by people whose actions must be acceptable to their constituencies."

TA.11. Will TA reassure the public because of its claim to disinterestedness and neutrality ? There appears to be a confusion which arises in connection with public discussion of the TA process. This is that it somehow ensures such "neutrality" or "objectivity". The above quotation shows we make no such claim for it. Some more extreme views of the sociology of science would go so far as to deny the objectivity of any scientific knowledge. The principal difficulties in the way of public knowledge about and influence on technological policy formation are more mundane. They arise in two areas at least:

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(1) Steven Ebbin: Jamaica Bay/Kennedy Airport - Anatomy of a technology assessment. Technology Assessment Vol. I. no. 1 pages 23 - 40.

economic competition, which may prevent disclosure of essential information, and political relevance. Experience has shown that where the outcome of a TA may have considerable influence on the decisions of interest groups (management, unions, pressure groups etc.) these may withdraw from the discussion of the technical details because of the uncertainty of outcome. The outcome could tie their hands later.

TA.12. Open government cannot function by completely exposing all information; but all TA's must aim at the widest possible sharing of it. One cannot judge the merits of a technology except in the context of the alternative technological options, present and future. The investigation of alternative technological responses to a given need should be included in the TA process. A strong link is clearly visible here between forecasting and TA. Sectoral forecasts and overall scenarios will reveal potential needs and demands. Scanning of technological forecasts may match need with possibility. The use of TA to make a choice of technologies to meet a social need, existing or emerging, can be coupled with the more usual and routine use of TA to assess the benefits and costs of a given new technology.

TA.13. The maximisation of benefits and minimisation of costs in any given application of technology must be the aim, but it is still a distant one. The control of deleterious effects is more readily attainable and is clearly acceptable to the public at large. The history of control legislation is relatively long. It is, however, rarely possible to maximise benefits and minimise costs at the same time. An assessment procedure or institution which concentrates on the minimisation of risk will perhaps in the first instance be more easily designed and accepted than one which attempts too soon the comprehensive approach, and this, we think, should apply to Europe Plus Thirty.

TA.14. The unique advantage of a Community instrument of TA in the future could be just this linking of the regulatory function with the anticipatory function, through the forecasting function.

2. Technology Assessment as it is done at present

Where is it done ? What is done ? How is it done ?

TA.15. TA in the Legislature The idea of Technology Assessment emanated in the second half of the 1960's from the USA, and it is there that the theory, methodology and practice of TA is most developed. The USA is also the only country in which the efforts to create a specific TA institution within the Legislature have so far been successful. After 5 years discussion in Congress, the President of the United States was able to sign the Technology Assessment Act in October 1972, by which an Office of Technology Assessment (OTA) was set up under Congress, with a governing council - the TA Board - made up half of Senators and half of Representatives. Its aim is "to provide early indications of the probable beneficial and adverse impacts of the applications of technology and to develop other coordinate information which may assist Congress" (TA Act, Section 3c).

In the meantime, the OTA has started its activities and let its first TA contracts. Teething troubles are not yet, as we write, all overcome. The budget requested for 1974-75 was 5 million dollars, mostly for contract work.

TA.16. In various countries, e.g. Sweden, the Netherlands and Germany, there have been - so far unsuccessful - initiatives to imitate the American example. In the Federal Republic of Germany a proposal put forward, in April 1975, by the CDU/CSU opposition faction was rejected by the government majority in the research and technology committee.

TA in the U.S.A.

TA.17. Even after the establishment of the OTA, most governmental TA in the US remains in the executive. Many government agencies undertake or finance TA and TA-like activities; for instance, the Department of Transportation, the Department of Commerce and its National Bureau of Standards, the Department of Health, Education and Welfare and the Public Health Service, the Department of Agriculture, and the National Science Foundation. The number of groups and institutes with contracts is increasing inside and outside the government.

TA.18. The National Science Foundation (NSF) funds much TA under its programme "Research Applied to National Needs"(RANN). At the beginning of 1973 the TA programme of the NSF consisted of 28 completed or running projects; by January 1974 the Office of Exploratory Research and Problem Assessment of the NSF had let 10 more TA studies at a total cost of $2.1 million. By dispersing contracts as widely as possible the NSF hopes to discover the suitability of institutions for given project areas. So far, university groups have been preferred. Universities got more than half the contracts let by the beginning of 1974; the rest went to commercial or non-profit organisations. But the NSF's preference for universities is not the rule in the USA.

TA.19. According to the National Environment Policy Act of 1969 all federal agencies have to include Environmental Impact Statements in their own proposals, and report on those bills and other federal measures from which significant environmental effects are expected. They should contain, among other things, information on the environmental impact of proposed actions, on any adverse environmental effects which cannot be avoided should the proposal be implemented, and on possible alternatives to the proposed measures; they can be regarded as partial TA analyses. They are reviewed by the Council of Environmental Quality (CEQ) which monitors controversial actions and identifies problem areas; several thousands of Environmental Impact Statements have been received by the CEQ. After environment, energy and transport are the next most important subjects for TA.

TA.20. In the course programmes of many American universities, TA and related subjects are coming to be recognised. For example, the George Washington University has offered a master's degree programme in "science, technology, and public policy" since 1970, and more recently a special one-year course on TA.

TA in other countries outside the European Community

TA.21. In Japan, TA has developed in the executive. This is mainly due to the striking environmental deterioration which followed the forced pace of industrialisation. The main organisations supporting these efforts are the Science & Technology Agency (STA), a coordinating group under the Prime Minister and the Ministry of Trade & Industry (MITI). Since 1971, STA has had a rapidly increasing budget for TA. By 1973 studies had been undertaken among others on the following subjects; agricultural chemicals, high rise buildings, computer aided instruction, technical systems

in a new town, synthetic paper, off-shore atomic power plants and earthquake alarm systems. The studies on technical systems in a new town and on off-shore atomic power plants, as well as the compilation of a TA manual, were commissioned from the private Nomura Research Institute of Technology and Economics.

TA.22. MITI announced its industrial and technology policy for the 1970s in May 1971 and recommended the inclusion of TA as an instrument of government policy to guide and watch over industrial technologies. Also in 1971 MITI (through its Agency of Industrial Science and Technology - AIST) itself started a TA study programme, which was to provide basic information for the application of TA to technological development in industry. It includes atomic powered steel making, the fuel cell, technology for traffic control, automatic vending systems, and micro-wave ovens. Like the STA, MITI uses not only an in-house capacity but also outside contractors and consultants.

TA.23. In Sweden, the idea of TA is largely determined by national environmental awareness. At the beginning of 1973 the Secretariat for Future Studies (which we have mentioned in I.2 above) was created provisionally. In July 1973 the Secretariat published a report on nine studies with a TA character, that had been worked out according to a recommendation of the Advisory Group on Control & Management of Technology of the Committee for Scientific and Technological Policy of the OECD. Four of the nine studies were environmental. Typically the studies were undertaken with the cooperation of several, mostly governmental, institutions.

TA inside the European Community

TA.24. In the Federal Republic of Germany, the research and technology policy authorities, e.g. the Ministry for Research and Technology (Bundesministerium für Forschung und Technologie - BMFT) have for years formulated recommendations and performed tasks which bear great resemblance to TA, even though the words themselves are rarely used. For instance it is government policy that projects which are competing for government money should also be compared with respect to their probable effects on society and that projects which could profoundly change the environment or living conditions should be examined and continuously assessed from the viewpoint of social science and, if necessary, be suspended. The efforts of the

Opposition to create a parliamentary TA institution are not supported by the Government. But the BMFT has offered to submit its TA studies to the Bundestag, and also, before contracting studies out, to give the Bundestag the opportunity of expanding the subject matter.

TA.25. Certain systems studies on the development and use of nuclear energy can be seen as preliminaries to TA activities. These were encouraged in the middle of the '60s by the Ministry, then called Education & Science. They were carried out mainly in the nuclear research centres at Karlsruhe and Jülich. These studies are today being continued within the programme of "Applied Systems Analysis" of the Arbeitsgemeinschaft der Grossforschungszentren (AGF). They comprise four projects; 1. Man - energy - environment; 2. resource exploitation and resource safeguards; 3. communications and society; 4. transport - the economy - living space.

TA.26. Transport and communications have also been starting points for TA and TA-type activities in Germany. Among the most important research and development institutions in this sphere are those of certain major industrial firms which maintain a large systems analysis capability. Some of these are increasingly involved in the development of new systems for city and intercity transport, and are undertaking studies which are not only limited to technical and economic aspects, although the profit motive is still in the foreground.

TA.27. In the non-profit sector the Institut für Systemtechnik und Innovationsforschung (ISI) of the Frauenhofer-Gesellschaft for the Promotion of Applied Research in Karlsruhe, the Studiengruppe für Systemforschung e.V. (SfS) in Heidelberg and the Battelle Institute e.V. in Frankfurt deserve mention. The ISI is doing a TA of a planned refinery extension in North Baden. The SfS has prepared a report, commissioned by the German Bundestag, on problems and methods of TA and on possibilities of institutionalising TA in the Bundestag.

TA.28. In France, in connection with "Planification" there has been, for quite a while, intensive government activity in evaluating projects and their consequences. Emphasis has been upon environmental protection and land-use. As far as environmental protection is concerned one can mention, for instance, the Reports of the Agences

Financieres de Bassin, which wer set up to look after the six great hydrographic areas of France; we can regard these as technology assessments for water supply policies. As to TA in the stricter sense, it is dealt with by the working group "Evolution des Techniques et Techniques nouvelles a regard de l'Environnement" (Group D) of the Inter-Ministerial Project Group for Environment Problems, founded in 1972 (Groupe Interministeriel d'Evaluation de l'Environnement). In 1973 it took stock of TA activities in several countries. Among other things it found out that, out of the 490 French studies reviewed (of which only a very modest number were "real" TA studies) pollution was the topic in 18.4%, followed by transport and town planning, each with around 13%.

TA.29. TA and TA-like activities in land-use planning (amenagement du territoire) are mainly concentrated in the Delegation a l'Amenagement du Territoire et a l'Action Regionale (DATAR). In 1968 DATAR founded the long-term project "SESAME" (Systeme d'Etude pour l'Elaboration du Schema d'Amenagement de la France), which was to prepare an overall master plan of French land-use policy, and to which is attached a sub-group on technological forecasting. This technological forecasting group was charged with the three-fold task: to identify technological innovation that could be important for "Amenagement du Territoire, to study criteria to judge technological innovations from the angle of land-use, and lastly to make detailed studies on some specific innovations. The Centre d'Etudes et de Recherches sur l'Amenagement Urbain (CERAU), the Bureau d'Informations et de Previsions Economiques (BIPE) and the Bureau Central d'Etudes pour les Equipements d'Outre-Mer (BCEOM) have all made contributions on these topics. Particularly remarkable are the technical papers (Fiches Techniques) drawn up by the BCEOM. These include systematic evaluations of the consequences of new transport and communication systems on land and water, and of new water supply technologies.

TA.30. In Great Britain, there is a TA capacity in the executive - the Programmes Analysis Unit (PAU). PAU, which has existed since 1967, is financed jointly by the Department of Industry and the

Atomic Energy Authority. It has a staff of around 30 scientists and had undertaken by the end of 1970 about 80 studies; they are generally confidential. Some Public Inquiries can be termed British TAs sui generis; these have been held since the middle of the 1960's on the initiative of the responsible ministries, and deal with technological failures (ex post TA) or, more often, proposals (ex ante TA). Best known is the Public Inquiry on the siting of the third London Airport. Its recommendation was not accepted, and no third London airport is now to be built in any case.

TA.31. In the government sector the following institutions, whose activities partly fall within TA or at least touch upon it, are worthy of mention: the Select Committee on Science and Technology of the

- the Select Committee on Science and Technology of the House of Commons: This Committee formulates opinions on current science and technology policy. In its work it frequently takes outside advice.
- the Central Policy Review Staff (CPRS) under the Cabinet, whose tasks embrace the study of central political issues such as the energy supply, regional policy etc. Its reports are published.
- the National Research Development Corporation (NRDC), a public institution founded in 1948, which deals with the transfer of research results of the public sector to the industrial sector. According to its own estimation, it is continually concerned with TA.

TA.32. Within the university sector, the Science Policy Research Unit (SPRU) of the University of Sussex and the Technology Assessment Consumerism Centre (TACC) of the University of Manchester deserve mention. TACC had undertaken a TA of the British bread industry and plans further studies; among the subject matters are: insect pest control technology, recycling, carcinogens in the factory environment, dietary fats, and coronary heart disease.

TA.33. There is not much information on the - certainly few - TA studies and TA capacities in the other European Community countries. The TA activities of large industrial corporations like Montedison in Italy and Novo Industri in Denmark have become well known. Montedison has a special department of technology assessment which, in informal cooperation with national and international organisations and working groups, is concerned with TA activities in the areas of materials substitution, non-conventional protein sources, resources of the sea, and chemicals and health. Novo Industri has set up an analysis group, which is undertaking TA activities in the development of enzyme products systems and processes. In the Netherlands it is expected that TNO (Centrale Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek) will shortly have funds for TA analyses, especially for off-shore developments.

TA approaches and methods in use

TA.34. From the methodological viewpoint two levels have to be distinguished:

- The work plans for TA itself. They divide up problems into their parts, and suggest a certain temporal sequence (with iterations) for the solution of these component problems.

TA.35. Among the best known TA work plans is that developed by the American MITRE Corporation.(1) It goes as follows:

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(1) The MITRE Corporation, A Technology Assessment Methodology, project summary and 6 vols., Washington, D.C., 1971.

SEVEN MAJOR STEPS IN MAKING A TECHNOLOGY ASSESSMENT

STEP 1	DEFINE THE ASSESSMENT TASK Discuss relevant issues and any major problems Establish scope (breadth and depth) of inquiry Develop project ground rules
STEP 2	DESCRIBE RELEVANT TECHNOLOGIES Describe major technology being assessed Describe other technologies supporting the major technology Describe technologies competitive to the major and supporting technologies
STEP 3	DEVELOP STATE-OF-SOCIETY ASSUMPTIONS Identify and describe major nontechnological factors influencing the application of the relevant technologies
STEP 4	IDENTIFY IMPACT AREAS Ascertain those societal characteristics that will be most influenced by the application of the assessed technology
STEP 5	MAKE PRELIMINARY IMPACT ANALYSIS Trace and integrate the process by which the assessed technology makes its societal influence felt
STEP 6	IDENTIFY POSSIBLE ACTION OPTIONS Develop and analyze various programmes for obtaining maximum public advantage from the assessed technologies
STEP 7	COMPLETE IMPACT ANALYSIS Analyze the degree to which each action option would alter the specific societal impacts of the assessed technology discussed in Step 5

Some of these steps are further sub-divided and have been supplemented by "checklists".

TA.36. Techniques should clearly be built into TA only according to their appropriateness. In the TAs which have been carried out so far (since the end of the 1960's) a whole series of methods have been used, for instance:

- Cost benefit analysis
- (Computer) simulation
- Trend projection
- Operational research
- Group consensus procedures, including Delphi
- Behavioural experiments and observations
- Historical analogy
- Cross-impact analysis
- Morphology
- Scenario writing
- Relevance tree procedures, and analytic methods of evaluation based on the relevance tree
- Participation techniques; for instance, procedures working with the aid of television and computers.

TA.37. All these are well known in the social and economic sciences, and are used in policy planning; they were not developed for TA, and it is unlikely that a standard tool-kit will ever emerge.

Most of these methods have already been described in Part I.3.

3. TA in Europe Plus Thirty

A. International Assessment

TA.38. The impacts of technology often cross national borders. The understanding that one nation's technology may affect another, and that liabilities flow therefrom, goes back at least to 1941 and the US-Canadian case of the Trail Smelter, where gaseous effluent from Canada caused damage to U.S. fruit trees. The Canadians were held legally responsible. The damming or pollution of international rivers, pollution of the seas, cloud seeding and weather modification in general; all these exemplify

international effects. Satellites and supersonic transport are vigorously objected to for different reasons by neighbours who did not make them and, as to agricultural innovation, it has already been suggested that trade patterns are being distorted by the "green revolution".

The exploitation of resources for energy, the exploitation of the ocean and the ocean floor (II.12.),and of the air and space itself, are clearly enterprises where the indirect effects have to be examined internationally.

TA.39. The question of whether the European Community as a whole should abstain from, or regulate, certain technological developments, will require consideration of the secondary effects as attempted in TA studies. It is a subject of intense scientific debate now whether the increase of the CO_2 content of the atmosphere will alter the biosphere's temperature. (See II.2.) National decisions on energy production may be affected by the outcome of these studies.

The Function of TA in Aiding Community Decisions

TA.40. What should be the function of Community TA in relation to national TA, and to the activities of the other international organisations in this field? If there a risk of duplicating the activities of national systems on the one hand, and those of world agencies on the other?

TA.41. The role of TA in Europe Plus Thirty should be creative, as well as responsive, but it can only be so to the extent that its work is tied in with the decision-making process of the Communities. One of the most important purposes of the social assessment of technology is to examine a much wider range of options than is usually the case in the narrowly defined functional framework of present national and Community mechanisms.

TA.42. Developing such a function at Community level would have several advantages. The most obvious, as we have seen above, derives from the fact that many technologies are simply too international in impact to evaluate only from the national standpoint. Another is that since member countries have their present primary commitment to greater economic cooperation, they might benefit from the use of this cooperative tool to produce a more truly balanced social development of the Community as a whole. And a third is that there is economy of scale and avoidance of duplication in doing the work once, at Community level, and not several times over, at national level.

There is no danger of duplicating the activities of world-wide organisations, since they do not exist yet. But, in this matter as in others, liaison should be maintained with OECD.

The Aims of the Treaty of Rome and TA

TA.43. The question must now be asked what TA Europe Plus Thirty could and should do.

The goals of the Community must be the starting point. For example, the Community aims to develop its own poor regions. Technological initiatives in particular sectors might adversely affect the balance between regions, and that should be avoided. It is particularly in this context that we have examined the role of the European Investment Bank. It is described by Article 129 and 130 of the Treaty of Rome. Article 130 reads:

> "The task of the European Investment Bank shall be to contribute, by having recourse to the capital market and utilising its own resources, to the balanced and steady development of the common market in the interest of the Community. For this purpose the Bank shall, operating on a non-profit-making basis, grant loans and give guarantees which facilitate the financing of the following projects in all sectors of the economy:
>
> a) projects for developing less developed regions;

b) projects for modernising or converting undertakings or for developing fresh activities called for by the progressive establishment of the common market where these projects are of such a size or nature that they cannot be entirely financed by the various means available in the individual Member States;

c) projects of common interest to several Member States which are of such a size or nature that they cannot be entirely financed by the various means available in the individual Member States."

TA.44. To evaluate applications for loans, the majority of which in the technological areas are for "infrastructure" - transport, power distribution, civil works etc., - the Bank has an internal staff including seven engineers with support staff, as well as bankers and economists. The project evaluations, in number perhaps eighty major and some two hundred minor ones per annum for a total loan value of around 1000 million UAs, are in many cases minor or partial TAs. They may be performed to a greater or lesser degree by the Bank or by the applicant, and the amount of assessment done by the Bank itself will also vary depending on whether a member nation or an associated country is involved. A wide range of activities is supported, from rubber plantation in the Ivory Coast to the production of synthetic rubber in Turkey, hotel building in Gabon to large-scale support of electrical production and transmission, and transport and infrastructure in general, within the Nine themselves. Not many of them are in the advanced technology sphere; perhaps the most advanced was a synthetic protein plant in Sardinia, but even that was the second of its kind.

TA.45. As with the World Bank, the impacts most often considered in the assessment process (other than the economic) are environmental. Improvement of the physical environment is directly supported, for example, in depollution projects for the Rhine. Assessment often takes the form of comment and answer, technical modifications then being agreed. In contrast to the World Bank, however, the assessment staff does not include sociologists, or technologists other than engineers.

TA.46. The evaluation process may take as much as 18 months to 2 years to complete for a major proposal, but on average 2-6 months

suffices. One engineer and one assistant are assigned to each project. The assessment probably always stops short of a full technology assessment, but it contains an element of continuous monitoring. During the loan pay-back period the engineer is involved in the continuing evaluation. Projects may be rejected because of unacceptable impacts.

TA.47. The search for alternative technological solutions to particular problems is not a function of the Bank, nor is research and development funded on any major scale. The period of first application of advanced technologies is the stage where Bank support will be most frequently sought. Of late, energy saving has become a more important element in project evaluation. This responsiveness to policy changes within the EC suggests that, with a wider concern for all aspects of the impact of technical change, there will come a greater need for fully comprehensive TAs within or for the benefit of the Bank.

TA.48. Accordingly we recommend that Europe Plus Thirty be able to offer a TA service to the European Investment Bank. It could be offered either direct to the Bank, especially in areas where there is no Commission policy, or it could be offered to the Commission, which has to approve all EIB projects over 2m UAs, including credit lines to intermediate institutions for the financing of smaller projects down line.

TA.49. Another Community institution which could possibly make use of TA is the European Court of Justice.

If the Court becomes more involved in industrial and commercial litigation with a high technological content, it is conceivable that cases might arise where the issues of fact to be determined could involve a consideration of the long-term effects of a particular application of technology. In such cases the parties, or failing them the Court, might seek an expert report from or through Europe Plus Thirty.

TA.50. We now give a list of some of the other Community aims and powers which might be furthered by the comparative examination of technological initiatives and their indirect effects. The Directorates of the Commission have expertise and supporting data in fairly narrowly defined areas, and are inevitably concerned with nearer rather than further horizons . They often lack the means, more than the will, to perform broadly based "horizontal" technological assessments. There are indeed places within the Commission where parts of the assessment process have been fairly well developed, but a focus would certainly help.

TA.51. Harmonisation of national regulations is pursued for the promotion of trade, but the function might also be interpreted as covering the incidental disbenefits of industry and trade. In the context of the full social assessment of technology, both aspects are relevant. Community harmonisation of the axle loading of lorries and of the level of noxious exhaust emissions, has, after considerable public discussion, been proposed by the Commission and is awaiting approval by the Council. Both these could with advantage have been the object of advance TA.

TA.52. The increasing public and political demand for environmental protection in recent years has given rise to national regulations which risk, unless they are "harmonised" out of it, distorting trade by the imposition of higher burdens on industry in some countries than in others. The main purpose of the Common Market being to avoid such distortions of trade, it is clear the Commission will need increasing research and analysis in fulfilling its harmonisation function. This research and analysis will be, in effect, TA. Article 92 of the Treaty of Rome is no doubt the main provision governing this case, but Article 36 also bears on it. This allows exceptions to be made to the aim of promoting reduction of quantitative restrictions on trade flow (as set out in Articles 30 to 34).

Article 36 states:

"The provisions of Articles 30 to 34 shall not preclude prohibitions or restrictions on imports, exports or goods in transit justified on grounds of public morality, public policy and public security; the protection of health and life of humans, animals or plants; the protection of

national treasures possessing artistic, historic or archaeological value; or the protection of industrial and commercial property. Such prohibitions or restrictions shall not, however, constitute a means of arbitrary discrimination or a disguised restriction on trade between Member States."

In deciding whether a claim by a member country that a certain prohibition or restriction is or is not permitted under this article, the Commission is already in fact undertaking some sort of rudimentary TA. The systematisation and development of the necessary analysis could be useful.

TA.53. Article 118 on social cooperation is another where implementation could be assisted by TA. In this field, since it largely concerns working conditions, Europe Plus Thirty should work closely with the proposed Foundation for the Improvement of Living and Working Conditions.

B. TA and Forecasting

TA.54. Reference has been made above to the advantages of coupling forecasting and assessment within the same institution. Here we expand the idea, as the linkage will be vital in obtaining the maximum utility of the Europe Plus Thirty instrument for decision-makers.

TA.55 Technology Assessments should be carried out by the Director and staff of Europe Plus Thirty. They will be producing forecasts in sectors such as economics, education, health, etc. and in technology itself. Meanwhile, new technologies will be emerging, e.g. computer aided instruction, cable television, pharmaceuticals, health delivery systems. It would be the task of the assessors to derive from the forecasts, the technological trends, and from policy considerations, comparisons and conclusions which can be useful for policy. A possible example can be used here; that is, the already forecast possibility of producing cheap and acceptable synthetic protein. If it happened, it would alter farming, transport, and world population through improved nutrition. Such impacts on agriculture and possibly population distribution would have consequent impacts and implications for agricultural (and education, regional and transport) policies, both in member and in associated countries.

TA.56. This example is apt as illustrating at least two Community-relevant TA characteristics - implication in several areas of EC policy-making, and the relatively long time span over which the effects might develop.

TA 57. In the initial stages, until assessment becomes more accepted and widely used, TA can be based to a considerable extent on a careful and thorough documentation and evaluation (as to relevancy, authenticity, acceptability, and the like) of data presently available. The intent would be not only to supply a greater amount of information to policy-makers, but also to improve the quality, pertinence and completeness of what they get. In many cases, a painstaking analysis of existing information sources would be adequate for spelling out incipient dangers and drawbacks posed by emerging technological developments. But it is also clear that if technology assessment is to probe the future in order to fulfil many of the wider objectives - if it is to act not just as a screening device for eliminating potential hazards, but also as an early warning system and as a means for systematically evaluating secondary and indirect consequences and allocating limited technological resources with minimum waste - then the act of assessment demands more than just a documentation of existing information dealing only with present technology.

TA.58. Here we come back to the starting point of this section. Study will be required, too, of where emerging technological developments are likely to lead, and of their possible impact on other areas of technology, as well as on society as a whole, and its environment. Hence the forecasting of technology is essential, both to uncover otherwise unexpected or unforeseen problems and to disclose unappreciated or unexpected opportunities, options, and alternatives. This is especially true because assessment, if it is to be effective, should be triggered as early as possible, before a new technology has become well entrenched or has developed a momentum of its own.

Who and What

TA.59. Arguments have been advanced for the necessity of an assessment function within Europe Plus Thirty, and Community institutions, powers, and functions that can benefit from its use have been mentioned. We now turn to the question how to choose what TA to do.

TA.60 Appropriate parties to request TA studies would include the Commission and the European Parliament, and we have also mentioned the Court of Justice and the European Investment Bank. A choice would then have to be made among the candidates proposed, according to some criteria.

TA.61. The successful completion and the reception of a TA will be influenced by both extrinsic (why does this need assessing?) and intrinsic (why us?) considerations. It is apparent that since these factors are themselves the subject of policy decisions, there must be flexibility in setting up criteria. For example, initial investigation of a problem may reveal the absence or the abundance of information, and may show that it is relevant or irrelevant to the powers of the Community. This will affect the choice.

TA.62. Flexibility will be important. Community policies will be evolving over the years, so will technology. Groups affected by this technology or that will alter in their composition and their size. Public opinion and public reactions are usually volatile with respect to technology, but they are highly pertinent to the choice of assessment subjects, and to the way the assessment is done. It is therefore important to frame the selection criteria in such a way as to allow adaptation to take place, and not to set up too rigid a sieve.

C. TA and Industry

TA.63. From the international discussion on TA we can learn that many business people fear that TA will stifle innovation. In American polemics, the letters TA have been alleged to stand for "technology arrestment". Recently, however, there is a growing consensus in business circles that higher priority must be given to social problems and the broad effects of technology.

TA.64. Although legislation usually lags behind technical developments, various branches of industry are already required by national law to investigate the external effects of their activities and products. Recent court decisions (e.g. in Germany) indicate that producers carry the responsibility for their products and have to show proof that their products are "harmless". Such decisions will lead to more careful analysis of production processes and products and this might stimulate the use of TA in industry. There is a clear possibility that a company that assesses its own business goals and technology not only in terms of traditional economic cost-benefit and market analysis, but also in terms of social costs and environmental consequences, in a word, of externalities, might even get an advantage in the market place.

4. Choosing the assessment subjects

TA.65. The discussion of TA above has had a strong (and intentional) bias towards the measurement, or at least the delineation, of the environmental and social costs of innovations.

TA.66. The characteristics relevant to choice for assessment of a particular technology, product or process and its impacts are relatively easy to enumerate but difficult to define precisely in terms of limits and thresholds. Criteria for choice related both to forecasting and to relevance to Community objectives, can be derived from the following questions:

i) Is the subject proposed for TA being researched, being developed, being applied . . . on the point of submerging us all? Another way of putting the question would be: How much is known about it? There is here a direct relationship between known data and likelihood of implementation. The nearer to use, the greater the chance of successful prognostication of the impacts, but the less the chance of affecting events.

ii) Is the innovation or technology need-oriented, and how was the need determined? Is it a market-expressed need, or was it expressed in a more conscious manner - perhaps derived from trends or changes perceived in a statistical time series? Is it publicly or privately promoted or sponsored? Is the enterprise European? Is the market European?

iii) What possibilities exist, and at what point in the invention - development - use chain, for modifying or controlling the application? This is clearly related to several of the above criteria and is important in terms of judging the cost-effectiveness of a TA.

iv) Will the impacts (and these should be, and frequently can be, estimated roughly in advance) be mainly political, economic, social, or environmental? There is a dilemma here, similar to that posed under i). If the impacts can be roughly outlined ahead of the TA, is this a reason for doing a full study? If they cannot, is that a better reason?

v) Are the impacts likely to be latent socially, environmentally, geographically, over time? Are they likely to be severe? Short, medium or long-term?

vi) Are the effects reversible? If so,at what level? What are the costs of attempting reversal at different times? This point has been developed many times in relation to environmental or more strictly ecological impacts. It is clear that where changes are irreversible they should be made only if the benefit is major and unobtainable by other means. The extreme ends of such scales are easily handled; disastrous impacts have their immediate responses, both public and official, and trivial ones have none. In general TA will have to deal with the less clearly defined middle ground.

TA.67. Little technological progress will be made without some risk being taken. The two major risks would seem to be magnitude and irreversibility. It is finally a value judgement as to whether, if the choice is possible, greater weight is given to the numbers affected, or to the irreversibility. In many cases the distinction cannot be clearly presented. Certainly no mathematical procedure can be devised to arbitrate between the two. We suggest that where the possibility of irreversible damage exists, it should be a strong criterion for assessing the subject.

TA.68. Besides the characteristics of the technology itself and of its impacts, we must consider the methods which can be used in the assessment. Many techniques have been proposed or used - cost benefit analysis, cost effectiveness, games theory, relevance trees, systems analysis, and so forth, as above. An indication, from a first examination of the subject, that well tried techniques existed to deal with the problem, would be a favourable indication. Conversely, many of the more important and interesting problems presented will have no obvious path to their solution. Some of the effort of the assessors must be reserved for problems less amenable to quick results but giving useful basic insights into methodology.

TA.69. The TA function of Europe Plus Thirty could also coordinate and even improve the TA of member countries. In this it might follow the arrangements made for national R & D programmes, which, beginning in 1976, are to be automatically communicated to the Commission from their moment of conception, and then by the latter to sectoral coordination committees and to CREST. Such a procedure could only be built up slowly and tentatively. There is an enormous amount of TA done in the member countries, and an over-ambitious programme could completely swamp Europe Plus Thirty. But we think if things were encouraged to develop in this direction it would surely lead in time to the avoidance of duplication and economies of scale.

Conclusion

TA.70. The link between forecasting and technology assessment is both clear and strong. The tie is, in fact, so close that as the concept of technology assessment wins wider acceptance, technological forecasting and planning studies are not infrequently equated with assessments, despite the latter's focus on secondary and indirect impacts of technology on the environment and society at large, as well as on technology itself. The formulation of economic programmes would be hamstrung without some understanding of likely future economic trends. Similarly,the development of policy for controlling technological change - and that is what technology assessment is all about - would be much more difficult if lacking a sense of future trends in technology. It would be tempting to believe that a

unique set of strict rules could be promulgated by which subjects could be chosen for assessment. Experience indicates, however, that in the final analysis any such set will be no more than a checklist relating to feasibility and cost on the one hand and opportuneness and magnitude of the work on the other. It is as important to see that such lists do not exclude major issues, as to see that they are ordered in correct priority. The main difficulty of criterion listing is that in using such a list you may find you have done the TA while you are trying to decide whether to do it.

TA.71. The difficulties posed in the above discussion are real. In the initial stages Europe Plus Thirty must deal with current and prospective impacts of technology large enough to be important, yet of a size which is capable of being dealt with so as to produce an outcome usable for policy formation. The medium to long-term is suggested as being the correct time span. The probable impacts should fall in the field of interest of a number of institutions. The assessment should use the knowledge existing within these institutions. It should join with this inputs from external groups. Europe Plus Thirty should tackle several areas, possibly interlinked, and deal with those impacts which lie beyond the concerns of existing policy. Only by experience can the conflicting interests be reconciled in the first years of Europe Plus Thirty's TA work.

TA.72. About seven people within Europe Plus Thirty should, we think, be engaged at any one time on TA.

We give more detailed recommendations in Part IV below.

EUROPE PLUS THIRTY

The Questions

IV.1. It is now time to draw the threads of our report together and to make a concrete recommendation about what should be done. We have been asked two questions.

IV.2. The first is: "Should the European Communities undertake a study entitled 'Europe Plus Thirty' concerning the foreseeable or possible developments over the next thirty years which are likely to affect the progress of Europe; and, if so, will this study make it possible in particular to create a forecasting instrument which can be constantly updated?"

To this we answer yes. We recommend that a forecasting instrument should be created, and we describe it below.

Our terms of reference continue by asking for "definitions" of certain other matters, "if the answer were yes". These matters are: "The method or methods to be used;" and "the characteristics which define the content, i.e.: the limiting conditions; the areas to be included; the structure of the study; the implementing procedures." Parts I and II of this report have sought to provide all these "definitions" except the last, to which we turn below.

IV.3. The second question we were asked was: "Should the European Communities create their own Technology Assessment Office . . .?" To this we answer: no, for the reasons given in Part III of this report. Since we answer no, we are asked "to determine what other possibilities" are "available to the Community for carrying out the task of technology assessment".

We think that technology assessment, or assessments, should be carried out by the continuing instrument Europe Plus Thirty, as an integral part of its work. The ingredients of good technology

assessment are technological, social, and economic forecasting and analysis, and they will be going on in Europe Plus Thirty anyhow. To a large extent, the same people should do both.

IV.4. The new instrument must belong to the Community, and be peculiar to it. There are at the moment proposals for forecasting or forward-looking instruments in various wider international organisations to which the nations of the Community belong: in the U.N. family of organisations, including the World Bank, and especially in OECD. These, and perhaps particularly the last, are valuable initiatives. But it would not do if the Community had to rely on them alone. It must not be condemned to look into its own future solely through, for instance, OECD spectacles, since they will inevitably have North American and Japanese tints. OECD is an organisation for the developed world as a whole, of which the European Community is only a part; and although West European interests largely coincide with American and Japanese interests, they do not always and entirely do so. Thus the Community, especially since it is a public power constituted under national and international law, and the other organisations are not, must have its own forecasting instrument, serving its own purposes.

Terms of Reference for Europe Plus Thirty

IV.5. We propose the following terms of reference for the continuing instrument Europe Plus Thirty.

1. To provide the European Communities with a comprehensive capability for long-term forecasting and other ways of thinking about the future as a basis for examining alternative policies and strategies for the Community, including:

   a) a continuous output of long-term forecasting related to the planning needs of the Communities;

   b) a scanning, look-out, or early warning system with regard to impending dangers, conflicts or new potentialities;

   c) an information centre available for use by the institutions of the Community, by its member governments, by other organisations, and, through its publications, by the general public;

   d) a monitoring system for social and other developments, aimed at obtaining a satisfactory data base.

2. To create world-wide links with other organisations carrying out related work.

3. To carry out research relevant to the acquisition of this capability, including
   - methodological development;
   - post hoc policy evaluations.

4. To carry out specific policy-oriented studies or request from the institutions of the Community, member governments, or other appropriate agencies or organisations.

5. To undertake technology assessments exploring as far as necessary the social, economic, environmental and other consequences which contemplated technological policies or developments might have, and comparing alternative policies or developments.

6. To undertake these functions not only on request, but also as the Board of Europe Plus Thirty[1] considers necessary.

Structure

IV.6. The job of Europe Plus Thirty has been described above under the headings of methodology and of sectoral content: and in the proposed Terms of Reference. It will be a job of enquiry, reflexion, and synthesis; that is to say, a certain number of people will have to find things out, think about them, and put their thoughts together. And when that has been done, the whole will have to be put in a form which does in fact help policy makers to make policy, as opposed to burdening them with yet more kilos of free-standing knowledge.

IV.7. The proposed Terms of Reference carry implications for the structure of the organisation. Many things must be reconciled. Europe Plus Thirty must have both adequate resources "in house" and a flexible method of drawing in outside resources as required. It must also create working conditions in which people of ability and experience will be willing to spend part of their lives; people who will neither be prepared to bombinate in a vacuum, far removed from the reality of planning, nor wish on the other hand to be absorbed into the day-to-day machinery

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(1) See below.

of the Commission. It must ensure that what the Community gets is a clear-cut, custom-built account of the various possibilities and strategies open to it, related to one another in a consistent and comprehensive way, and not a mere catalogue of what various other people in other places have thought possible or desirable.

IV.8. To meet these needs, three elements will be necessary for the management structure of the continuing instrument Europe Plus Thirty. We call them the passive network, the active network, and the central team.

The Passive Network

IV.9. In the passive network, the central team would simply keep track of what was going on elsewhere, and would reflect upon, and as far as possible synthesise, the work of others. It would keep itself informed of the work of all relevant forecasting and analysis institutions and teams; they would include the services and dependent institutions of the Commission of the European Communities, other international organisations, government departments, university departments, independent research institutes and workers, and firms, both inside and outside the Community.

IV.10. This way of working is necessary but not sufficient. Neither the primary work nor the purposes for which it was done would be under the control, or even open to the influence of, Europe Plus Thirty as an instrument of the Community. The questions asked would be chosen by other social entities (national governments, firms, academic research boards, etc.) and the answers would be provided within the limits of vision of the primary producers (national, industrial, academic, etc.). Europe Plus Thirty would only come in when the important part was over. It would be like someone listening to conversations between other people about things which might or might not be of interest. Europe Plus Thirty would be able only to report the conversations, and comment on them; it would not be free to take part in them. Moreover, wholly passive work attracts passive people.

The Active Network

IV.11. In the active network, a small central team would itself formulate the questions to be asked, or the research programmes to be undertaken. It would then let contracts to existing organisations (research institutes, university departments, member government units, and so on) and would keep closely in touch with the contractors during the work. It would call together groups of outsiders to grapple with ad hoc problems. The close links with the external world so created would be essential if Europe Plus Thirty is to know what is going on elsewhere and to exploit for the benefit of the Community the great corpus of knowledge and experience existing inside and outside Europe.

IV.12. But this too is not enough, for it could provide neither the continuity of experience, nor the crucial ability to adapt and present difficult and complex arguments year after year in a consistent manner which Europe Plus Thirty would need if it is to serve the needs of the Community's policy makers. In other words, it would provide the professional authority which is essential if the advice offered is to be heeded, but the advice needs to be adapted very carefully to the needs of the recipient and no organisation relying entirely on advice from outside, no matter how high its quality, can be effective. It has to have a precisely tailored capability for doing work itself. We therefore regard it as essential to combine the network concept (both passive and active) with that of a strong central team.

The Central Team

IV.13. It will not be enough if the central team merely formulates its own questions and designs its own research programmes. It must also answer some of the questions and carry out some of the research itself. Especially it must carry out much of the integrated forecasting described in I.4. above. This would be an "in-house" operation; the members of the team would work together in one place, an arrangement which would secure the advantages of cross-fertilisation and of multiple employment of individuals. Forecasting and technology assessment could be pursued side by side, by the same people. A given member of the unit could be working on more than one question at the same time and, in an

operation which we are convinced should indeed be interdisciplinary and "cross-sectoral", that is a big advantage. The people would meet not only across the work table but also in private life, and professional collaboration would be fortified by personal knowledge and understanding. The resulting humus of shared perception and common working methods would be fertile for conceptual breakthrough and methodological innovation.

IV.14. If the Community were to decide to limit Europe Plus Thirty to an extended network structure, it would be able to point to the small number of people in the central team: "Look, only ten professionals." In a time of retrenchment and of scepticism about new instruments (and we report in such a time) that is attractive. But "only ten professionals" would imply many and costly outside contracts. A larger number of in-house professionals would imply fewer and cheaper outside contracts. It evens out.

IV.15. Moreover, the Commission and Council of the Community are not alone in the world in favouring retrenchment. The greater its dependence on outside institutions, the greater the risk that the work of Europe Plus Thirty will be interrupted by someone else's retrenchment, over which the Community would have no control. Research institutes and departments do sometimes collapse. This is a reason to favour in-house work.

IV.16. So we think the right solution is a mixture of all three ways of working: passive network; active network; and central, in-house, team. It is a question of proportion. We think that in terms of cost these three parts should, <u>when Europe Plus Thirty is operating at full strength</u> (see below on "build-up") compare roughly as follows:

Passive network:	10%
Active network:	30%
In-house	60%

We should repeat for clarity's sake: these proportions are proportions of <u>cost</u>, not of man hours. As we emphasised in I.4., much of the raw material of forecasting lies in time series and many other sorts of statistical data. Most of what will be necessary as statistical input is collected already by the services of member governments, of the Commission, and of other international organisations. The labour involved

in that is many times what would be involved in Europe Plus Thirty. But it is already done for existing purposes, and the extra demands made upon these services by Europe Plus Thirty will be relatively very small. The cost of all those man-hours to Europe Plus Thirty will therefore be small in any case (though of course it will have to devote some resources to specifying its requirements for statistical inputs, and to digesting the statistics it obtains).

Constitution

The Board

IV.17. Any sizeable team of research workers needs a governing board to help to determine its general direction of work in accordance with broad priorities and horizons, to protect it from political attack, and to sift the demands which may be made on it. A research team needs a compass, a lightning-conductor, and an umbrella; and these three functions can be combined in one governing body, provided its members are rightly chosen.

IV.18. We suggest then that Europe Plus Thirty should have a Governing Board, consisting of perhaps ten members, plus a Chairman, plus the Director, making 12 in all. The Board should meet perhaps twice a year. The Chairman should expect to work certainly half-time, though perhaps not full-time. Between meetings he should attend especially to the external relations of Europe Plus Thirty: with the Commission, the Parliament and member governments (as discussed below), and with the public.

IV.19. There should also be two Vice-Chairmen, who would expect to do some work for Europe Plus Thirty between Board meetings, and to deputise for the Chairman as necessary. The Chairman and the two Vice-Chairmen should together form an Executive Committee of the Board, which the Director should also attend as appropriate. It might also have a personnel committee (see below).

IV.20. The responsibilities of the Board should be to settle the broad programme of work a few years ahead, and the budgetary and staff allocations for different projects. It would approve contracts for work to be done for Europe Plus Thirty by other institutions and it would screen,

with the advice of the Director, requests from the Commission, the Parliament, and member governments for pieces of work to be done. This last will perhaps be particularly arduous in the field of technology assessment; there may be far more work requested than can be done with the money, and the Director should not have to carry the political burden of saying no. Nor should he have to carry alone the burden of formulating, making known, and defending the criteria by which particular requests for work are accepted, rejected, or deferred.

IV.21. Three qualities have to be present among members of the Board. It must include people who understand forecasting and technology assessment, people who understand the fields in which forecasting is done, and people with political experience. If there were not enough understanding of forecasting and technology assessment, the programmes and research policies might become shortsighted, too analytical, not synthetic enough. If there were a lack of sectoral expertise, they might neglect the need for hard and valid inputs. If there were a lack of political experience, they might become too academic, and not so useful to decision-makers.

IV.22. We think therefore that the total membership of the Board - eleven without the Director - should be split roughly three ways between 1) general expertise in forecasting and technology assessment, 2) sectoral expertise in the fields for forecasting and technology assessment, and 3) political experience.

IV.23. To fulfil the function we assigned to him above, the Chairman of the Board should be strong in general political experience of the world around. One of the Vice-Chairmen, then, should be strong in forecasting and technology assessment in general. The second Vice-Chairman should have experience of budgeting and financial management. Of the remaining eight members, we think two should be strong in forecasting and technology assessment in general (making three with the first Vice-Chairman), two should be strong in political experience (making three with the Chairman), and,of the remaining four, one should be strong in each of the following fields or groups of fields in which forecasting and technology assessment will be done:

1. Social, political, educational
2. Resources, energy and environment
3. Science, Technology and Industry
4. Economics and finance

Naturally, a reasonable balance should be observed among the nationalities of the Community.

IV.24. We recommend that the Board of Europe Plus Thirty should be appointed by the Commission of the European Communities. The proposal is open to criticism in that it might be held to make Europe Plus Thirty too much an instrument of one of the institutions of the Community. But after much thought we have concluded that this disadvantage is outweighed by the advantage of convenience and simplicity. The Commission would no doubt take appropriate soundings before making its choice.

IV.25. We recommend that the Chairman and members of the Board should be appointed initially for four years in order to provide stability during the build-up of EuropePlus Thirty. (See below.) After that there should be a scheme whereby, say, one quarter of the membership resigned every year. This scheme should be worked out jointly by the Board of Europe Plus Thirty and the Commission during the initial four-year period.

Members of the Board should be appointed as individuals, and there should be no alternates, the latter being appropriate only where a Council or Board consists of delegates or representatives.

The Director

IV.26. The Director should be appointed by the Board. He should work full time, and should be the professional and academic head of Europe Plus Thirty. He should sit with the Board and with the Executive Committee. We think he should not have a vote in the Board (and this is perhaps the place to say that we hope the Board will not often have to vote at all). The Board should be able to dismiss the Director. If the question of his dismissal arises, he should be informed of the reasons and should be able to discuss them in person at a full meeting of the Board . If the matter is proceeded with, he should not have the right to be present at the Board meeting when the decision is taken. We include these rather grim remarks not because we fear Europe Plus Thirty may be the sort of institution where crises occur, but because of the need for clear provisions about what is to happen if they do.

IV.27. The Director should, under the Board , hire and fire staff members. The Board should consider whether it would be helpful to establish a small personnel committee,to which the Director would refer his proposals. This would avoid his having to take sole responsibility for decisions, some of which may be painful.

IV.28. The Director should be assisted by two Deputy Directors and by an Administrator. They should be the professional and academic adjutants of the Director, and their professional skills should be complementary to those of the Director. The Administrator should be responsible for personnel, pay and logistic matters. It might be necessary for there to be an Accounting Officer as well; we are not qualified to make a recommendation about this.

The staff of Europe Plus Thirty

IV.29. While in principle the right size for the central team of Europe Plus Thirty must be determined by the tasks which are laid on it, there are also professional considerations. Given terms of reference approximating to those suggested above, the size must be sufficient to guarantee good links with the existing professional networks, and to allow a level of internal debate high enough to maintain the quality of output needed by the institutions of the Community. These two considerations jointly set a lower limit. Though there are examples of teams of microscopic size which perform wonders, they often have narrow tasks, and do not need to maintain competence over the years. We believe that the concept of a minimum viable size is applicable to work of the kind we have been describing and that for Europe Plus Thirty it is around 30 professionals.

There is also an upper limit, less sharply defined, but nevertheless real enough, at which control of the quality of output begins to overload the directing staff. We think it lies at about 100 graduates.

IV.30. We have naturally given most careful consideration to the figure, between these upper and lower limits, which we should recommend for Europe Plus Thirty. In giving our view, we use, as a convenient shorthand, numbers of graduate professionals. In our discussions we considered three bands, namely 30-50; 50-75; and 75-100. All these

are figures to be reached at the end of the five-year build-up (see below).

The band 30 - 50 is acceptable. We are agreed that if economy dictates the adoption of some figure in this band as the target to be reached after five years, it would be worth launching Europe Plus Thirty, but preferably on the understanding that the final figure should be regularly reviewed, and should be raised as soon as financial considerations could be held to permit it,

Over 50, we are confident the thing is worth doing. We think the results would be better as the figure approached 100, but the returns, though real, would then be diminishing. Over 100, we consider unnecessary and unduly cumbrous.

Our conclusion therefore is:

Less than 30:	probably not worth it.
30 - 50:	worth it, but likely to lead to rather sketchy outputs.
50 - 75:	good
75 - 100:	better, but not all that much better.
Over 100:	not necessary.

IV.31. The team needs to be a mixture of specialists and of people, perhaps more extrovert, who are skilled in organising the knowledge of others, as well as having specialist knowledge of their own to contribute. Such people usually identify themselves quite early in their careers.

IV.32 Many of the people recruited will be academics and civil servants. But industry and finance both need to be represented in Europe Plus Thirty, so that it can include some direct knowledge of how that world ticks. The point applies to all parts of industry: management, research and unions. A system which will attract people from these important non-academic fields into the life and work of Europe Plus Thirty needs to be evolved, perhaps through special "industrial fellowships", well-remunerated, and tenable for a limited period on terms which provide a return ticket to the person's own organisation.

IV.33. Throughout our report we have stressed the need for "task forces" of outside people, brought together by Europe Plus Thirty for various

lengths of time and at various frequencies, to identify problems, to analyse them, to discuss methodology, to find factual inputs, to concoct scenarios, for brainstorming, and so on. This way of work should be a regular part of life, and there should be budgetary and logistic provision for it. Some of these task forces might with advantage be composed mainly or even wholly of member state officials, whether seconded or part-time.

IV.34. We have also, in certain fields, implied reliance on part-time people, whose main work would be outside Europe Plus Thirty, but who would be Europe Plus Thirty's established contacts in those fields. They too must be provided for.

IV.35. There must be scanning and scouting. Members of the central team must travel to see what is going on in other forecasting centres, both inside and outside the Community. And they must also travel outside the Community so that their work on relations between the Community and the rest of the world should never become unrealistic or academic. There should also be much attention paid (as we mentioned in I.3 above) to maintaining a broad and up-to-date knowledge of world political trends. The sources for this are not hard to come by, but it requires thought, and a little money.

IV.36. As many as possible of the team members should be skilled in expressing themselves in writing, at least in their own language. This ability does not always accompany originality of thought. Some specialists undoubtedly have difficulty in expressing what they have to say clearly and concisely, and too many such people would be a handicap to Europe Plus Thirty. This would be true even in a national organisation, speaking one language. In a multilingual organisation it is even truer, since a poor translation of an infelicitous text can easily carry work backwards.

IV.37. The terms of employment to be offered to the staff should encourage the best to come forward. But life should not be made too cosy, or else Europe Plus Thirty would be in danger of passing through the same life cycle as we have seen in so many other organisations: a splendid start, with a young and vigorous staff, declining into stale mediocrity within 15 - 20 years. There is only one way to prevent this : setting time limits to the contracts of the professional staff members. A few will be so outstanding that they should be encouraged to stay as long as they will. Others who have become part of the "corporate memory"

of the group should also stay to maintain that function. Most should be on limited contracts, say of 4 to 6 years, though this could clearly not become the rule until Europe Plus Thirty had been built up to its intended strength. The details are less important than the principle that the organisation, right from the start, should be automatically self-renewing.

If this is to be the pattern, there must be flexible pension provisions, so that when each worker goes back to his own country his future security has not been jeopardised.

IV.38. The main output of Europe Plus Thirty will be ideas written and printed on paper. Single-nation organisations, broadly similar, find that if all this paper, and other aspects of the work and administration, are to be handled efficiently, about 1.2 to 1.5 support staff members are required for every professional. Given the multinational nature of Europe Plus Thirty and the consequent load of translation, it would be as well to budget a little above this: perhaps 1.5 - 2.0 persons per graduate professional. If it were decided that some services could be provided from outside, a corresponding reduction in numbers could be made. But we are against pressing a search for economies through sharing of services too far, because we suspect that Europe Plus Thirty may sometimes have to react quickly, which is easiest if everything lies ready to hand and is operated by staff whose main motivation is the good repute of the team, even when it means working against the clock.

Periodical turnover of staff is less necessary in the case of support staff. Indeed, since the services they provide will largely be part of the collective memory of Europe Plus Thirty, it would be as well to opt in their case for a pattern of more permanent employment.

IV.39. It would be desirable for a staffing inspection to be carried out, say every two years, so that the provisions are kept at an efficient level, neither over-generous, nor too parsimonious. This could be done by inspectors, commissioned by the Council of Europe Plus Thirty, who would be professionals with relevant experience.

IV.40. As to the internal structure of Europe Plus Thirty, we suppose

it is inevitable that the staff will be organized into "divisions" of some kind or other. These could be arranged by professions (eg technologists, sociologists, economists, etc.) or by study areas (eg energy, environment). Cross-working between divisions will, of course, be essential. The work programme will never follow a particularly tidy pattern. Indeed, it is not desirable that it should do so, since following the by-ways of thought can lead to useful insights. The Director should be given freedom by the Board in this respect.

IV.41. The staff of Europe Plus Thirty, if they are of the right quality, will wish to take part in the development of forecasting technique. But (depending on the recruitment of one or two really outstanding individual workers) it might be valuable to underline a commitment to methodology by setting up a small Methods Group, to act as a focus for such studies.

IV.42. If Europe Plus Thirty becomes a source of useful inputs to the Commission and the Parliament, it is also likely to be regarded, from time to time, as a possible source of unintended embarrassment, even as an object of suspicion. This is a problem which does not confront a purely academic research organisation, but one which needs to be faced up to, given the policy-oriented nature of so much of Europe Plus Thirty's work. The practical solution to the difficulty has been found elsewhere to be complete openness between those carrying out studies and those who devise and administer the policies to which they are relevant.

Publication

IV.43. The arguments for Europe Plus Thirty's publishing all its work are strong. They are that Europe Plus Thirty will be dealing with matters of public concern, about which the public has a right to be informed, that open publication provides a safeguard against error or prejudice, and that publication can be a bait to attract good workers.

IV.44. The arguments against publishing everything are equally clear: much of the information used will have come from government or Commission sources, and some of it may be privileged; mutual confidence between Europe Plus Thirty and the institutions of the Community would be forfeited if disclosures were made which afterwards proved embarrassing; some of the reports made by Europe Plus Thirty will be no more than a step on a long road to policy-making.

IV.45. It is clear that the main output of Europe Plus Thirty's work would be of substantial public interest, as well as of scientific interest to other professionals. It would comprise a series of forecasting exercises expressed in terms of alternative futures and goals for West European society: teleonomies, to use the language of this report. It would also comprise a number of long-term studies of social and other developments within the Community, "impact assessments" of technological and other aspects of Community policy, and studies of the relationships between the Community and the rest of the world. The publications should be explicit regarding assumptions and value judgments built into the analysis, and the details of the technical approaches that are used. We would expect to see a regular series of books, annual or biennial, together with occasional papers reflecting the changing priorities of the programme. We would also expect, subject to their contracts, some more specialised books and papers from the individual team members, as in any other healthy research organisation. Publication should be in as many Community languages as possible.

IV.46. We recommend that publication should be the rule, but that unpublished studies should not be excluded if there is good reason for non-publication. The decision should be taken by the Board of Europe Plus Thirty.

Relations of Europe Plus Thirty with the Institutions of the European Communities, and with their member governments

IV.47. None of the questions we have asked ourselves is more important that that of the relationship between the continuing instrument of Europe Plus Thirty and the institutions of the Community: the Commission, the Parliament, the Council, and the Court. It is important because, no matter how good the forecasting and technology assessment Europe Plus Thirty does, if that work is not available to the right people at the right time, it will be wasted. Equally, if the needs of those people are not met by Europe Plus Thirty, the instrument itself will have no justification.

IV.48. Contacts with the Institutions of the Community should be rather close and continuous, but they should not be so close as to deprive Europe Plus Thirty of the intellectual independence which will be its justification, or to prevent it getting on with its job.

IV.49. We think that the relations between a professional body and the executive or legislature it exists to serve are best regulated by close attention to what happens at the top. If that is rightly conceived, things will probably come right lower down. So the Chairman (and/or Director) of the Board of Europe Plus Thirty should have access to the President of the Commission, and to each of the Commissioners severally. He would thus be able to lay before each Commissioner results which concerned the latter's particular field of work, and before the President results which concerned the work of the Commission as a whole. This would not, of course, imply that Europe Plus Thirty had any right to policy recommendation.

Conversely, the President of the Commission, and each Commissioner severally, should have the right to send for the Chairman or Director of Europe Plus Thirty.

IV.50. Individual staff members of Europe Plus Thirty would have their own contacts with those Commission officials who were most nearly concerned with their work, bearing in mind the complementary needs on the one hand for a free flow of information, and on the other for the academic and professional independence of Europe Plus Thirty. It might be desirable to formalise these relationships by having one official or section in each Directorate-General responsible for maintaining contact with Europe Plus Thirty. But that would risk carrying into Europe Plus Thirty the compartmentalisation which already afflicts the Commission, and on the whole we would rather see the growth of one centralised <u>planning</u> unit within the Commission, which could be Europe Plus Thirty's main place of contact.

IV.51. So much for the working relationship we hope will develop; there remains the administrative relationship. We think such a broad and generalised instrument as Europe Plus Thirty should depend from the Commission as a whole, and should thus be the responsibility of the President of the Commission.

IV.52. No less important than the relationship of Europe Plus Thirty with the Commission will be its relationship with the Parliament. If the European Parliament is to develop over the years to become a more influential assembly for general policy debate, and a fortiori if it is to assume, following the direct elections planned for 1978, some of the functions of a true legislature, then it and its committees should have the same access to what is going on in Europe Plus Thirty, and the same right to affect what goes on in Europe Plus Thirty, as the Commission has. Indeed, this should be so even if there is no increase in the powers of the Parliament.

IV.53. The relations should therefore follow the same pattern as that recommended above for the Commission. The Chairman of Europe Plus Thirty should have access to the President and Secretary General of the Parliament and they, conversely, should have the right to send for him. But the European Parliament works mainly through its committees, and most of the major debates in its plenary take place upon a report from a committee. It may be that the Committees would in due course feel the need to develop with Europe Plus Thirty a system of hearings, following that which is already growing up with other institutions.

IV.54. We come now to the Council of Ministers. Relations between the Council and the Commission are quite likely to change in the coming decades. The whole matter is subject to continuing debate, and it is no part of our task to become involved in that debate. We must take the situation as we find it. If there is no change, we imagine that Europe Plus Thirty would lay before the Commission the sort of teleonomies we have outlined in earlier sections of this report, and its technology assessments, and whatever special problem-oriented studies had been done. There would then be discussions between the Commission and Europe Plus Thirty, and the Commission would draw its deductions for policy; for instance that such and such a possible goal or strategy should be adopted, and the alternatives should be rejected. The Commission would then lay its conclusions before the Council in the form of proposals, including also the teleonomy or other backing material which had been provided by Europe Plus Thirty. If the Council wanted to have clarifying discussions,

those discussions would be with the Commission, and the Chairman or Director of Europe Plus Thirty should take part in them as part of the Commission's team. If the Council wanted any particular future-oriented studies undertaken, then it could no doubt instruct the Commission to procure them from Europe Plus Thirty, and the Commission would set about this in the usual way, by approaching the Board of Europe Plus Thirty.

Accordingly, we recommend that relations between the Council of Ministers and Europe Plus Thirty should not be formally regulated. If either wanted personal contact with the other, we hope it could be arranged, but there seems no need to establish reciprocal rights and duties.

IV.55. We make this recommendation in today's situation. If there is a change in the relations between the Council and the Commission, or if the Council makes a major change in its method of work, or if it acquires a powerful secretariat of its own, or if yet further-reaching institutional changes come about as a result of moves towards European union, then the matter should be re-examined. We think the Board of Europe Plus Thirty should, as part of its normal work, keep all this constantly under review. Europe Plus Thirty may, in any case, have a contribution to make to the studies which will have to precede any constitutional changes.

IV.56. We discussed in Part III above the possibility that Europe Plus Thirty might be or become useful to the European Court of Justice. In this case, the initiative would naturally come from the Court, which could ask for studies or advice from Europe Plus Thirty through its Board as the need arose.

IV.57. The extent and form of the linkage between Europe Plus Thirty and the long-term planning and forecasting institutions of member governments is something we do not wish to be categorical about. These links should clearly be as intense and habitual as they can be without changing the nature of Europe Plus Thirty as a Community instrument. They will obviously differ from country to country, since the national structures themselves differ. The purpose should be to achieve benefits both ways, with Europe Plus Thirty doing work which is useful to member governments, and member governments providing the inputs which are useful to Europe Plus Thirty. It might be useful for member governments each to designate one office or official to handle their contacts with Europe Plus Thirty, and it would clearly be useful for these national officials to meet from time to time at the premises of Europe Plus Thirty. Whether these meetings should be formalised into a committee of national representatives advisory to the Board of Europe Plus Thirty is a matter which requires

further thought and discussion among those who would be concerned.

IV.58. But we would certainly like to see Europe Plus Thirty develop a subsidiary function as a forum where national long-term planners and forecasters can meet and informally discuss matters of common interest on the Community level; we are aware that such a forum is lacking at present.

Responsibility for Funding

IV.59 The question who pays for Europe Plus Thirty is bound up with the question who has the right to ask it to undertake work. We will consider the latter first.

Although all sorts of people and institutions would, we hope, suggest work to Europe Plus Thirty and find its output useful, yet the need for it has been expressed specifically by the Council and Commission of the European Communities, and our own study was set up by the Commission on a decision of the Council. Europe Plus Thirty, as we see it, will be the Commission's baby, and we hope the Commission will always consider it legitimate offspring. We have already described how the Board of Europe Plus Thirty ought to decide what work is done, and to act as a filter for requests for work. First and foremost, it should entertain requests from the Commission, the Parliament and the Court.

IV.60. We think it should also entertain requests from certain other bodies, and the qualifications for the right to suggest work should be reviewed by the Board of Europe Plus Thirty from time to time. To start with, we think that (as soon as there is staff enough) suggestions should be entertained from member governments of the Community and from the European Investment Bank (as we discussed in Part III above). Later they could also be entertained from other organisations and associations so long as they were the European association or grouping of whatever it was. For instance, a European industrial association, or a European association of trade unions, should have this right, but a particular firm, a particular trade union, or a national association of firms or unions, should probably not. We also envisage joint projects between Europe Plus Thirty and other international organisations.

When Europe Plus Thirty is well and truly under way, and its use is established beyond doubt, then it might be possible to consider widening the list of organisations having this right.

IV.61. All this, though, ought to be subject to an overriding rule of financial proportion. We are sure that the continuity and the vitality of Europe Plus Thirty will depend on its having absolutely assured funding for a reasonable period of time, from one source, and on its never accepting more than a certain amount above that from all other sources put together. We think it should never be allowed to depend for more than a quarter of its income on sources other than the European Community itself, and we think that the greater part of that quarter should come from member governments. Only by the imposition of such a ceiling will it be possible to ensure staff security, an orderly workload, and the avoidance of financial anxieties and dangers.

IV.62. We recommend that Europe Plus Thirty should have as much financial and administrative independence as possible, since only thus can it achieve the necessary academic and professional independence. The money it receives from the Commission should come to it in a quantity negotiated and settled (with an inflation/deflation clause) for a reasonable number of years, so as to permit the development of long-term forecasting programmes in an atmosphere of confidence. We particularly recommend that its funds should be transferred to it as a bloc vote, and that the allocation of expenditure for this or that particular part of its work should be the responsibility of the Board of Europe Plus Thirty and, under it, of the Director assisted by the Administrator. We also recommend that the payments of salaries, allowances, expenses and contract fees should be administered by the Director and Administrator of Europe Plus Thirty under the final control of the Board and its Budgetary Committee. Europe Plus Thirty will be very small compared with the Commission itself, and must operate independently.

Build-up of Europe Plus Thirty

IV.63. Technology assessments may be fairly quickly done, but forecasting work is long-term work by its nature. We are anxious that Europe Plus Thirty should be given time to prove its value, and the value of such long-term work as this is not quickly proven. We have in mind a period of several years; a year or two, or even five years, are not sufficient.

We recommend, therefore, that Europe Plus Thirty should be guaranteed a minimum life of ten years. Ten years would be enough for it to build up a procedure of integrated forecasting, to produce results, and even to

allow a few years after their appearance during which European decision-makers can judge their utility. Less than ten years would not be enough for this.

IV.64. The ten-year build-up of Europe Plus Thirty should be divided into three phases:

1) A preparatory phase, probably of one year.
2) A four-year build-up.
3) A five-year undisturbed run.

At the end of this ten-year programme, the Commission, the Parliament and the Council, or whatever at that time are the power centres of the Community, should assess the achievements and the utility of Europe Plus Thirty, and decide whether or not to arrange for a new ten-year programme.

1. The Preparatory Phase

IV.65. During this phase the Board should be appointed and should select the first Director. Jointly with the Board, the Director should draw up a plan for the phased build-up over the next four years, and for the work structure and working methods to be achieved at the end of it. Arrangements for meshing with the Commission's work should be devised. Premises should be obtained. On the choice of Board members and of the first Director will depend the success of the whole enterprise. If the right people cannot be found within a year, the preparatory phase should be extended to two years, or should be deemed to run from the moment when the first Director takes up his duties.

2. The Four-Year Build-up

IV.66. It takes a long time to obtain the services of first-rate people, and we are sure that Europe Plus Thirty will not be worth having unless it is staffed by first-rate people. So during this four-year phase, with the plan devised during the preparatory phase in hand, the Director should take on staff in an orderly manner, and the administrative infrastructure should be built up. The build-up will not necessarily be the same for technology assessment as for forecasting. Probably technology assessment could develop rather faster, and so could certain ad hoc studies which might be called for.

IV.67. We think it may well take two or three years from the beginning of this stage for the first forecasts to appear. As we see it, then, the first forecasting work might begin in the first year of this second phase and appear in the third year. Not until Europe Plus Thirty is up to full strength, at the end of five years, will it be possible to undertake work on the scale we have been discussing in this report.

IV.68. At first, Europe Plus Thirty would have to devote a greater proportion of its resources to the passive network (as we described it above) than the 10% suggested. The proportions suggested on page 6 should be achieved only at the beginning of the third phase. During the second phase it would in any case be necessary for Europe Plus Thirty to become thoroughly familiar with all the relevant work already being done. The balance would then swing gradually, over the four-year period, from a somewhat passive pattern of work towards the active control of research and results which must be achieved as soon as possible.

IV.69. We have been much perplexed by the question whether to recommend what kind of forecasting should be undertaken first during this build-up period. Should we recommend priorities? We have decided not to because we think that these priorities can only be settled in the light of two factors which are unknown to us: first, what problems will appear urgent in the first half of 1977 (which is the earliest this question could realistically be settled) and second, in what fields will good people first become available? It should in any case be the purpose of Europe Plus Thirty to reach truly integrated work as soon as possible.

IV.70. As we have said above, part at least of the technology assessment could be done by the same people who are doing the forecasting. The links between TA and technological, economic, and social forecasting are so obvious that we need not labour the case for embedding the TA work in Europe Plus Thirty.

IV.71. Still, there is a case for having one or two people who are primarily concerned with TA work, especially with planning it in advance. Towards the beginning of the four-year build-up, an inter-disciplinary team of about 5 - 7 people could be assembled, from among those in Europe Plus Thirty, to do whatever TAs may be called for. The shape of such a team might usually be: natural sciences and technology: 2; economics: 1; social sciences (including, where appropriate, law): 2. Five is the minimum; seven would be better. We do not

think it necessary to follow the example of the American Office of Technology Assessment and build up to 40 or 50 in two years, with 300 or more outside panelists. They do this because they are closely tied to Congress, which demands instant results.

Probably the first TAs done by Europe Plus Thirty might take about eighteen months; as experience was gained this could be speeded up to twelve months. We think it quite important that Europe Plus Thirty should not start with one TA only; it should undertake two at the same time, which should be possible if it takes eighteen months over them. Naturally, the length of time and the mix of people will depend on the job.

IV.72. There will be a big role in TA for outside contracts and for brain-storming visits, perhaps even bigger than in forecasting as such. We do not envisage contracting out whole TAs to existing institutions. None of them appear yet to be able to take a European view. (See Part III above).

3. The Undisturbed Run

IV.73. By the first year of the third phase, being the sixth year of Europe Plus Thirty's existence, the staff would be at full complement, the balance of expenditure outlined on page 6 would be achieved, and the operation would be under way as intended.

We include here an Illustrative Table of the first ten years' activities of Europe Plus Thirty. It is not meant to be followed precisely, but mainly to show what we mean by the three phases of the build-up.

ILLUSTRATIVE TABLE.

PHASE	YEARS	WORK
Preparatory	1 (or 1-2)	Council appointed. Director chosen, work structure and plan developed, premises obtained.
Build-up	2	Staff assumed. Forecasting begins. High proportion of "listening post" work. Technology assessment begins. Task forces organised.
	3	Staff assumed. First forecasts appear. First technology assessments appear. TAs continue and appear from now on.
	4	Staff assumed. First "Teleonomic" forecasting appears. Increasing proportion of contract work and in-house work.
	5	Staff completed. First forecasts updated.
Undisturbed Run	6	Staff complete. First full teleonomy appears. Integrated "teleonomic" forecasting continues. Stable proportion achieved between in-house, contract, and listening post work.
	7	All work now fully integrated and the "double cone" approach fully exploited.
	8	Second teleonomy appears.
	9	As Year 7.
	10	Third teleonomy appears. Commission, Parliament and Council begin to review achievements and utility of Europe Plus Thirty.
	11	Review completed, and decisions taken about future of Europe Plus Thirty.

Cost

IV.74. We turn now to the question of cost, and we base our calculation on a figure of 75 professionals. This is the figure which we adopted at page 11 above as the optimum to be reached at the end of the five-year build-up, and it also corresponds approximately with the sum of the professionals recommended in the chapters of part II and in part III. Taking an average number of supporting staff per professional of 1.5, the total number of employees at the end of the build-up period would be about 185.

Allowing for a reasonable figure for external contracts, symposia, conferences for presenting work done etc., then at 1975 prices the annual running cost, after build-up to this figure, would be 5.6 million units of account. For details, see Annex 4.

If a lower figure were adopted for the number of graduates at the end of the build-up period, the annual cost would be less, in direct proportion. At this point we would like to remind the reader of what we said in the last paragraph of our General Introduction.

Geographical Location

IV.75. The right geographical place for Europe Plus Thirty will be that which best suits its functional place. We have suggested it should have a close relation with the European Commission, but not too close. Ideally, Europe Plus Thirty should find premises which are not less than one and not more than three hours, door to door, from the offices of the Commission. Less than one hour would mean time-wasting and too close contacts. People would be dropping in for no good reason, both ways. Europe Plus Thirty would risk becoming an organ of day-to-day advice, which it should not. More than three hours would mean that every meeting required an overnight stay. Personal contact would mean an expedition, and that too would be wrong. It would tend to remote and academic work.

IV.76. There is another important question: should the office of Europe Plus Thirty be in a city or in the country? A place in the country would have the advantage of peace and quiet. A place in the city, and

especially in a great city, would have the advantage not only of that surrounding intellectual effervescence which is only found in a metropolis, but also of a wider choice of schools for the children and jobs for the spouses of staff members.

We would like to see Europe Plus Thirty staffed by people with broad and lively minds, and largely by younger people. Such people are more likely to be attracted to work in a great city than to the calm of the countryside. There is also the danger of an integrated team becoming hermetic or eccentric, and this would be less in a metropolitan environment. We recommend accordingly that a place in a great city should be chosen.

IV.77. One last factor: the number of beautiful old buildings which form part of the architectural heritage of Europe, and for which it is difficult to find a use, is so great that we think it would be right to choose one of these, or several small ones if they are close together. The future grows out of the past, and we would like to see this truth symbolised by the use of a fine old European building or buildings for studies about the European future.

Name

IV.78. We are not quite satisfied that the name "Europe Plus Thirty", which was invented by Commissioner Dahrendorf and has been given by the Council of Ministers to our own study, should necessarily also be that of the continuing instrument we recommend, although we have used it throughout this report. It is short and easy to say, but we have found when telling our friends about it that it often takes a lot of explaining. "Plus Thirty what?" they ask: "Thirty more countries?" "Thirty wise men?" On the other hand, the obvious alternatives are mostly forbiddingly prolix: European Long-term Forecasting Institute, European Futures Research Institute, etc. It might be possible to name the instrument after the place where it sets up house.

We recommend that the question be left open as long as possible in case anyone comes forward with a better suggestion in time. They may well not, and in that case "Europe Plus Thirty" will serve pretty well.

ANNEX 1 THE PATTERN OF FORECASTING IN THE WORLD *

Surveys of Forecasting Activity

A.1.1. An OECD survey in 1966 of the US, Western Europe and Israel identified 100 organisations with a permanent forecasting activity (60% in industry), and from 1968-70 the Council of Europe surveyed long-range forecasting efforts in ten Western European countries. Of the 292 organisations identified by the latter 101 were in government, 66 in universities, and 12 were inter-governmental agencies. The remaining 113 were private, independent, non-profit groups. The breakdown between countries was as follows: Belgium (12), Denmark (6), the Federal Republic of Germany (33), France (70), Italy (22), the Netherlands (18), Norway (15), Sweden (7), Switzerland (13) and the United Kingdom (84).

A.1.2. A world-wide survey by P.E.P. (a London consultancy) in 1970 lists 269 sources in government and outside. The continuing world-wide survey carried out by Irades from 1972 lists 200 organisations (mainly non-governmental) specialising in forecasting and a further 700-800 engaged in it. The Centre for Integrative Studies of the University of New York at Binghampton carried out surveys in 1970 and 1972 of forecasting in the United States. The survey indicated an increase in activity of some 50%. A non-selective world-wide survey by the Futures Group (an American consultancy) in 1973 identified 937 institutions in 42 countries with at least one recent substantive futures project. Of these 532 were based in the United States, 90 elsewhere in America (mainly Canada), 224 in Western Europe, 36 in the Soviet Union and Eastern Europe, and 55 in other countries (many in Japan). The breakdown of this was 20-30% each in industry, universities and independent institutions, and 8% in Government, the rest being made up of individuals and associations. A survey published in 1974 by the Woodrow Wilson School for International Scholars in the United States identified 97 projects focusing on 'growth'. In another ongoing and uncompleted survey for the United Nations, the Centre for Integrative Studies has contacted several thousand institutions, about 1000 of them in Europe, who are believed to engage in some kind of forecasting activity, of which about 230 have replied confirming their involvement.

A.1.3. The objectives and definitions used in these studies differed, which affected the pattern recorded by each. The numbers, or the impression given about any particular institute, may be misleading;

* Surveys such as this Annex tend to be out of date from the moment they appear. The Commission would appreciate it if readers were to send in any corrections or amendments to keep it up to date.

for example, an addition might be the result of a slight shift in emphasis of ongoing work or the setting up of a large forecasting institute.

A.1.4. Casting one's net very wide, as these studies have done, is more suggestive than informative. Institutions come and go; aims may be taken asachievements, and so on. In dealing with existing forecasting capacity, Europe Plus Thirty will have to be careful not to put its eggs into untried baskets.

Forecasting in the European Community Countries

Belgium

A.1.5. There is relatively little forecasting activity in Belgium (compared with the Netherlands, say, a country with similar population).

A.1.6. The general planning agency in Belgium is the Bureau du Plan established in 1959 which is part of the Economic Ministry. In practice it is responsible to the Prime Minister and other ministers. Primarily, the Bureau's task is to prepare an economic plan dealing with public and private investment (e.g. regional investment incentives) and to produce indicative (i.e. extrapolative) forecasts. The current plan prepared in 1970 extends until 1975. However, from 1971 the Plan has included social and cultural issues and there is an attempt to construct a satisfactory set of social indicators.

Integration of growth factors takes place in a variety of ways. Recently a sophisticated regional-national econometric model has been introduced to supplement existing accounting procedures. An input-output model is used in the preparation of short-term government economic policies.

Each region in Belgium is now required to prepare a sectoral plan taking into account all economic and social factors (e.g. transport, land use, industry). The integration of these plans is carried out by the Ministry of Urbanism.

A.1.7. Further policy co-ordination at a national level takes place in the CMCS (Ministerial Committee on Economics and Social Co-ordination). The CMCS itself has little research capability, and to some extent shares responsibility with the Planning Bureau.

A.1.8. Forecasting takes place in each Ministry although only few have much research capability. Fairly sophisticated methods are used in the Ministry of Transportation which also commissions studies and the Institut National du Logement and the Ministry of Education. There is, in addition, a National Committee on Economic Growth which has representatives from government, unions and business. Responsibility for environmental issues is currently shared between several ministries and agencies.

A.1.9. Forecasting research is conducted at a number of universities. The Catholic University of Louvain has a programme of demographic research, and, like the Free University of Brussels, makes mid-term economic forecasts.

A.1.10. Industry in Belgium operates largely without government intervention and this, as elsewhere, tends to reduce the volume of governmental forecasting. Regional policy in Belgium is an especially sensitive issue, and this too is a major factor militating against comprehensive long-term forecasting in Belgium.

Denmark

A.1.11. Of the ten European countries covered in the Council of Europe study,(1) Denmark has the fewest organisations listed, although there has been increased activity in the last few years.

A.1.12. In Government, most of the bigger ministerial departments do their own forecasting, but very little of this work is general or carried out on a regular and systematic basis. The Budget Department of the Ministry of Finance has carried out short, medium and long-term forecasting for the public sector and the whole economy. In particular, a working group was set up in 1968 to assist a cabinet committee to co-ordinate long-term economic planning in government departments; this group has prepared two 15 year planning reports on the main groups of public expenditure in Denmark. The latest report (1973) also covered the main areas of the private sector of the economy, trends in private consumption, industrial production, and the impact of new technologies. Short-term economic forecasting on a regular yearly basis is carried out in the Ministry of Economics, which also carries out medium-term forecasts for the

(1) See page 1 of this Annex

ECE in cooperation with the Treasury and the Bureau of Statistics. The Bureau of Statistics itself also prepares demographic and labour force forecasts. The Bureau's comprehensive input output table for 1966 was used in the above mentioned long-term government planning, as well as in several sectoral forecasting projects.

A.1.13. In the Economic Council, established by Statute in 1962, Denmark has an institution similar to the U.K. National Institute for Economic and Social Research (see later). It is an independent government-financed body which makes short-term (and to some extent medium-term) economic forecasts alternative to the government forecasts. The Council also performs longer-term structural analyses of particular sectors such as housing and agriculture.

A.1.14. Public service and regional forecasting is carried out by the National Planning Committee Secretariat, set up in 1961. The activities of the Secretariat have included regional population forecasts to the year 2000, forecasts of manpower demand and supply, and public expenditure forecasts up to 1985. Statistical extrapolation techniques are mainly used. The Danish Building Research Institute has undertaken studies on technological forecasting, and produced a critique of forecasting methods, concluding that Delphi, scenario, morphological and network techniques cannot yet replace more traditional methods, but should be used as aids to planning. The Institute itself has used Delphi in a study of possible scientific fields to be established in the next 30 years.

A.1.15. Non-government institutes in Denmark carrying out forecasting are few in number but tend to be engaged exclusively in futures studies. The Academy of Futures Studies is an interdisciplinary organisation, founded by a group from universities and industry specialising in the study of changing social systems. The related Institute of Futures Research is sponsored by some 40 industrial companies and also undertakes contract research. Its work is primarily concerned with industrial problems and technological forecasting, with a time span of up to ten years; methods used include morphology, trend extrapolation, simulation models and computerised cross-impact techniques.

The Society for Futures Research, established in 1968, has a more general educational function than the two organisations above. Summer schools, meetings and colloquia are arranged, and the society produces the only Scandinavian journal of futures research.

Federal Republic of Germany

A.1.16. In the Federal Republic of Germany there has been no detailed overall economic plan or long-term co-ordination except that implied by the Marshall Aid Programme. An ad hoc 'Commission on Economic and Social Change' was, however, set up in 1971 by the Federal Government to examine and suggest policies with regard to technological, economic and social change. The Commission is due to report to Parliament in 1975.

A.1.17. Medium-term forecasts of objectives prepared by the Ministry for Economic Affairs form a basis for financial planning. This forecast attempts to harmonise production capacity with revenue and expenditure. The calculation does not consider alternative growth rates and economic or financial strategies.

A.1.18. Several Federal Ministeries have, however, for some time been engaged in long-term forecasting with a time horizon of 1985 to 1990 They include not only the Finance Ministry, but also the Bundesministerium (BM) Wirtschaft (economic sectors, development forecasts) and BM Arbeit Und Soziales (labour market, social security requirements), the BM Inneres (regional and urban land use planning), the BM Wissenschaft und Bildung (educational needs), and the BM Forschung und Technologie (specific technological issues).

A.1.19. Nevertheless, planning which influences regional and structural developments has intensified in recent years, and between regions plans are becoming more co-ordinated. Through the Federal Programme of Regional Planning set up in 1969-1970, it is intended to begin with extrapolation forecasts up to 1985 and then to update these regularly in the light of perceived regional needs. Examples of co-ordinated activity are the overall Education Plan instituted at the national and regional level by the Bund-Länder Kommission für Bildungs Planung, and the Second Development Plan for Federal Highways (1971-1985). Both of these plans are based on cohort and regional analysis of population trends.

A.1.20. The Bundeskanzleramt (Chancellor's office) evaluates existing public programmes (such as pensions, health, housing and agriculture). Extrapolations of the social and financial trends over an average of 10-15 years are made. The forecasts used by Ministries are produced either by internal research units or by Government supported

or owned research units (e.g. Studiengruppe für Systemforschung, and the Sachverstandigenrat which corresponds roughly to the Danish Economic Council).

A.1.21. As in the United States, there are a number of private and non-profit agencies engaged in forecasting, and the government relies on the forecasts of these agencies to some degree. For example, in planning transport and energy the government uses the long-term forecasts of the Institut für Wirtschaftsforschung. Battelle (Frankfurt) has contributed to forecasting labour markets, foreign trade and social environment.

A.1.22. Coordination between the Federal, state, university and industrial activities differs rather widely, depending upon the respective partners and the field of concern. The German Government in fact intervenes in private business less than in (say) the United Kingdom or France, largely because there is a much smaller publicly owned sector; in this respect also the FRG is similar to the US. In addition to this, somewhat wider powers are vested in the Länder (state governments) than in other EEC countries.

A.1.23. However, cooperation takes place in other ways. For example, research into employment (labour market and vocational research) is carried out by the Institute of Employment Research of the Federal Employment Institution, which is a self-governing body representing employees, employers and public corporations. A range of time horizons are adopted, forecasts are made using extrapolative methods. Work of this nature is also taken into consideration by government, for example in the Education Plan.

A.1.24. About 8-10% of German industrial enterprises have a staff unit working on forecasts of technological and business trends over more than five years ahead. Within private and semi-private institutions such as Zentrum Berlin für Zukunftsforschung and Battelle e.V., there is considerable experimentation with methods of forecasting such as Delphi and simulation modelling, although there appears to be a general impression that these methods are rarely used at present in industry or government.

France

A.1.25. Compared with other EEC countries, a high proportion of planning and forecasting is carried out in France by central government agencies rather than by local or regional authorities.

A.1.26. France was one of the first EEC nations to engage in comprehensive long-range government planning. The Commissariat Général du Plan (or Plan for short) was set up in 1946. The purpose of the first Plan, covering the years 1946-53, was to relieve long-standing economic stagnation through large-scale investment in a few key sectors such as energy, steel, cement, railroad and farm machinery. It was based on a sectoral-economic rather than a regional analysis, using rather unsatisfactory data. A first attempt was made to construct a national accounts framework.

From 1954, the Plan widened in scope to include social as well as economic capital expenditure, and its construction made use of the new national accounts framework. In addition sectoral targets were complemented by regional development programmes.

A.1.27. Since the 3rd Plan (1958-61) the time-horizon has been extended to ten years. Conventional extrapolation of demographic and macro-economic trends is used, and the rationale is that structural changes are better identified through a longer-range approach. In this way, possible repercussions arising from the Plan itself could be taken into account in its formulation. By the 4th Plan (1962-65), programmes were being developed at the regional level and co-ordinated through the Plan.

A.1.28. With the 5th Plan (1966-71) the approach used was to develop a comprehensive report dealing less with macro-economic variables than with substantive sectoral issues (agriculture, education, R & D etc) and qualitative considerations on social and cultural conditions and the consequences of economic growth.

A.1.29 For the preparation of the 6th Plan (1972-75) a two-pronged approach was adopted. On the one hand several "analytic" studies were prepared on a wide range of problems: social development (eg. life style, patterns of consumption and leisure, urban development, demography, manpower mobility) energy, transportation, telecommunications, and postal services. In parallel with this went an integrated study called 1985 - France Confronts Future Shock.

A.I.30. For the 7th Plan (1976-80), as well as a number of sectoral studies along the lines of previous work (e.g. energy and transport), two broad social issues were approached in a future-oriented way, the family, and the role of work in society and for the individual. In addition a "third generation" of integrated futures research took place under the so-called Piganiol Report, "Towards real growth", which explored the long-term potential of economic growth in the light of current energy crises, and made large-scale proposals to narrow the perceived gaps between measurable increases in living standards and social well-being.

A.I.31. Very many agencies and non-governmental institutions collaborate with the Plan: INSEE[1] and the Direction de la Prévision of the Ministry of Finance provide the data base as well as policy studies and projections. DATAR,[2] an interministerial agency responsible for regional policies, has a strong capability for long-range studies on land-use planning and alternative schemes for the geographical distribution of population and economic activity. Several departments have their own capacities for policy analysis and long-range forecasting and planning, including Defence (Centre de Prospective et d'Evaluation), Foreign Affairs (Centre d'Analyse et de Prévision), Public Works (Service des Affaires Economiques et Internationales), etc.

A.I.32. The Commissariat Général has a staff of about 150 (in total approximately 2000 people are working on the Plan). Coordination of the many agencies engaged by the Plan is complex, but broadly speaking the planning function is achieved through 'horizontal' services concerned with economic, financial and social matters which cut across 'vertical' sectoral considerations by joint committees including government, industry, the trade unions, and agriculture.

A.I.33. As with all forecasting activities, it is not easy to say how much notice is taken of the Plan by ministries, and development has not actually followed the Plan very closely. The 1956-65 projections failed, for example, to take into account the tremendous upsurge in social capital expenditure of that decade. The methods of analysis used in the Plan have varied; input-output tables were used from the 3rd Plan (such as Fifi, a physical-financial model), but some of the attempts to introduce sophistication, such as five-year forecasts of trends in technical co-efficients, were found impossible.

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(1) Institut National de la Statistique et des Etudes Economiques.

(2) Délégation à l'Aménagement du Territoire et à l'Action Régionale.

A.1.34. As in other countries, individual ministries carry out their own short and medium term assessments, and there has been an attempt to institute Planning, Programming & Budgeting System (PPBS) in most ministries.

A.1.35. In the business sector, a number of private and public enterprises do a lot of forecasting on market trends and technological developments for the needs of their own long-term investment programming. Some of this work is done in conjunction with university groups (for example the University of Grenoble.)

A.1.36. Some research institutes are under contract to government agencies for future-oriented studies, eg. BIPE[1] on technological innovations, CREDOC[2] on household life-styles, GEPI[3] on long term patterns of international trade.

A.1.37. Finally, one should mention the role of "turntable" between public and private forecasting units played by the private association "Futuribles" which publishes a journal on futures research, as well as organising regular round tables on future policy issues and long-term trends.

Ireland

A.1.38. Ireland's first economic programme was initiated during 1957-8 by the Department of Finance. Simple and unsophisticated in composition, the plan, which covered a five-year period from 1959, focussed largely on agriculture and set very modest growth targets. It is considered to have been an important psychological boost to Irish national morale.

A.1.39. The Second Programme was the first real attempt to establish a national plan for Ireland, and for this the Economic Development Division was set up in 1959 in the Department of Finance. Work began in 1962 and to some extent followed French experience. The Second Programme, extended to 7 years (1964-1970), was much more sophisticated than its predecessor. A national accounts framework, together with simple extrapolation was used. An attempt to construct input-output tables as a cross check on these forecasts was made. The overall objectives were not achieved and it is generally considered that the growth rates set by the Programme were too optimistic. For the Third Programme (1969-1972), similar methodologies were employed but less sophisticated in terms of the sectoral detail, and the time span was shortened to four years.

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(1) Bureau d'Informations et de Prévisions Economiques
(2) Centre de Recherche et de Documentation sur la Consommation
(3) Groupe d'Etudes Prospectives sur les Echanges Internationaux.

However, the Third Programme covers a wider range of issues, and in particular more details of social policy. The need for better demographic forecasting became apparent and it was subsequently improved.

A.1.40. Many of the forecasts used by the Economic Development Division are based on work by the National Institute of Economic Research and the Institute for Industrial Research. The other major research organisation is the Economic and Social Research Institute, set up in 1959 to conduct applied social research into questions of Irish development, largely concerned with demographic, socio-economic matters and agriculture. Originally sponsored by the Ford Foundation, this is now a government department.

Italy

A.1.41. There is relatively little long-term forecasting activity in Italy although since the war successive attempts have been made to set the regional imbalance between North and South in the perspective of a long-term national plan. One proposal for integrating the economies of the North and South was rejected in 1962 as being little more than an extrapolation of existing trends. The first national economic programme under the Ministero del Bilancio e della Programmazione Economica was the Pieraccini Plan (1966-1971) which attempted to resolve the structural imbalances in earnest. An inter-ministerial Committee for Economic Programming was set up to coordinate the activities of all public authorities. In practice the plan was too late and too weak. Nevertheless, the setting up of special regional planning committees was part of a general move towards planning in the 1960's. Inter-ministerial planning is coordinated to some degree by the Ministry of Planning. A bi-regional mid-term national growth model is in operation. It is intended to develop this into an econometric model for the 20 administrative regions. There are a number of industrial and independent institutions engaged in forecasting.

A.1.42. IRADES work on on-going documentation on world-wide forecasting activity has already been mentioned. The Istituto Studi Programmazione Economica (ISPE), The Istituto Ricerche Economica Applica - Futuribili (IREA) and the Centro Informazioni Studi ed Esperienze (CISE) all conduct research into economic forecasting.

A.1.43. With a large public industrial sector, forecasting within individual companies is important in Italy. FIAT, ENI, Pirelli,

Montedison and the State Railway all operate forecasting departments and some are experimenting with simulation techniques. The Agnelli Foundation and the Olivetti Foundation sponsor a number of social forecasting projects.

A.1.44 The GIPT (Gruppo Interaziendale per le Previsioni Tecnologiche-Intercompany Working Group for Technological Forecasting) is an informal association of several main Italian firms, promoted in 1970 with the aim of verifying the validity of the approach to technological forecasting (TF) adopted by industry. This is done by forming working groups with technical experts, often from the R & D department belonging to the several firms involved.

A.1.45. The only study to look at many economic and non-economic regional, sectoral and social trends in Italy simultaneously was "Projetto 80" carried out by ISPE in 1969. This was designed to gear national planning to long-term forecasting. The study included technological forecasts of the Italian production system by CNR (The National Research Council). The basic economic studies were carried out by CSPE (Centro Studi e Piani Economica).

Luxembourg

A.1.46. Forecasting in Luxembourg has been going on since 1964 mainly in the EEC context, though some independent long-term forecasting is in progress in Aménagement du Territoire.

A.1.47. Economic budgets are worked out by the Service Central de la Statistique et des Etudes Economiques (STATEC) and used for the preparation of the State budgets, as well as on the European Community level.

Medium-term forecasts (5 years) are also STATEC's concern. This work has been pursued since 1964 within the framework of the European study group on medium-term economic forecasts. In 1970 and again in 1975 the Minister of National Economy convened round tables to establish 5-year forecasts of production, investment and employment. Forecasts have been published by STATEC in 1966 (1965/70) and in 1971 (1970-75).

A.1.48. In the field of long-term planning, mention must be made of the Government's endeavours since 1970 to establish a "Programme directeur d'aménagement du territoire", based on forecasts to the year 2000 of population, agriculture, industry, services, investment, housing, health and social overheads, environment, etc. This work has been divided into 35 sectoral programmes and is being carried out under contract by a specialised French firm with the collaboration of the Luxembourg ministries. Progress has been retarded by the intrinsic difficulties of the subject, the limited personnel resources and the difficulties of coordination.

A.1.49. Mention should be made also of two recent studies by STATEC: a population forecast up to the year 2000 and an analysis of the trend and the cycle over the last 30 years of steel production, Luxembourg's major industry.

The Netherlands

A.1.50. Government forecasting in the Netherlands is indicative and not directed explicitly towards the formulation of policies. Planning is largely ministerial and regional and consequently largely based on independent projections. The three main government planning agencies - the Central Planning Bureau, the Social Planning Bureau and the Physical Planning Bureau - are located within the Ministries of Economics, Housing; and Culture, Recreation and Welfare, respectively.

A.1.51. The Central Planning Bureau is unofficially responsible to the Council of Ministers. It has a total of 130 staff which has remained constant for about 10 years. It was set up after the war (Jan Tinbergen was the first Director) to undertake overall planning, but evolved instead a short term economic forecasting role. A 'Central Economic Plan', a one-year macroeconomic forecast of the Netherland's economy, is published annually, and studies are made of the likely effects of policy options. Since 1963, medium term forecasting was begun, covering periods of 3-10 years; two such studies have so far been

published, a third being due in 1975 to cover the period up to 1980. Work is proceeding on an experimental longer term integral model including economic, demographic, social and health factors, education, housing, pollution and employment.

The Central Planning Bureau also has a co-ordinating role; when conflicts arise between ministries, the Planning Bureau maps out the alternatives but remains fairly independent.

A.1.52. Methods used by the Central Planning Bureau include econometric, statistical and model-building techniques. Methods similar to cost-benefit analyses are used to incorporate social and environmental issues from an economic standpoint. The Dutch have attempted to employ non-linear relations in econometric models although in general this was found to be more sophisticated than the data available would stand. The Dutch Government appears to take more notice of the findings of its economic models than any other governments. This may be because of the nature of Dutch government, which permits non-elected experts (eg. professors of economics) to be seconded into the Cabinet.

A.1.53. Long-range forecasts in all aspects of land-use planning are undertaken by the State Planning Service which has been in existence since 1941. This physical planning agency has, as one of its tasks, the preparation of national reports on physical planning policy; it develops 'structure schemes' for planning in such fields as communications, electricity, waste disposal, waterways and airports. As an example, the national report of 1966 gave an indication of highway infrastructure in the year 2000. The Agency also produces regional forecasts and policies.

A.1.54. The Social Planning Bureau has been in existence for about one and a half years and commissions research and prepares 'state of the nation' type reports. This bureau is not independent of immediate day-to-day decisions and issues and is not a full time planning agency.

A.1.55. The recently established Scientific Council for Government Policy has been set up in an attempt to integrate the policies of the other Government planning agencies, although these agencies are not formally

subordinated to the Council. It is responsible to the whole cabinet and is required to formulate long-term policy problems and forecasts for Holland as a whole, and to develop an integrated long-term basis for priority determination, including recommendations for changes in institutional arrangements and resources for long-term planning. In fact, the purpose of the Council is to take a wide and unfettered view of long-term objectives and represents a formal acknowledgement by government of the need for considerable reappraisal of trends and goals. In this respect it is similar to the Swedish Secretariat for Futures Studies (see later). It is entitled by law to publish whatever conclusions of its work it wishes. The Council has been formally established but is essentially experimental.

A.1.56. These organisations all use data supplied by the Central Bureau of Statistics. This Bureau has produced demographic projections using rather simple extrapolation methods, and apparently taking no account of migration. Estimates for the year 2000 have been repeatedly revised downwards, from 20 million in 1969 to 15.4 to 16 million in 1973, which has required revision in the long-term forecasts produced by the other Bureaux. The technique used is likely to be refined shortly. Institutional co-operation has been established with the Physical and Economic Planning Offices with respect to regional and labour force projections.

A.1.57. Apart from the work of the above bodies, some ministries make separate studies in their own fields. The Ministries of Defence, Foreign Affairs, Agriculture and Housing (through the Physical Planning Agency) are undertaking long-term programmes. The Ministry of Justice uses simple analysis by precursive events to forecast crime statistics, assuming a four year delay compared with the USA. The Ministry of Economic Affairs is conducting long-term studies of energy problems, although this work is soon to be transferred to the Central Planning Bureau.

A.1.58. Each of the eleven Dutch provinces has a so-called provincial "planological" service, with responsibilities similar to the "State Planological Service" but restricted to their own regions. For the area around Rotterdam, a new public authority call 'Rijnemond' is carrying out forecasting and planning of harbour activities, industrial

development and environmental issues connected with the development of the harbour and related industries.

A.1.59. As in other countries, technological forecasting is carried out by large nationalised industries such as Netherlands Railways and PTT (postal, telegraph and telephone services). Private industry in Holland is dominated by large corporations such as Philips and Shell, both of which have groups active in general futures research.

A.1.60. There are several non-industrial institutes in Holland, either partly or totally independent of government, carrying out forecasting in specific areas. The foundation 'Future Shape of Technology', partly supported by the Government, is studying important technological developments and their impact on Dutch society. The Institute of Agricultural Economics, also mainly government funded, forecasts agricultural production, consumption, labour force etc., methods used include trend extrapolation, linear programming models and mathematical models. The Netherlands Economic Institute, a private organisation, carries out long-term economic forecasting.

A.1.61. The 'Limits to Growth' study had an enormous impact in Holland, more copies of the book being sold per capita than in any other country. This interest is reflected in a number of projects which began in Universities after its publication. Project Global Dynamics was set up in 1972 at Eindhoven to analyse the MIT world models using control-theory techniques, and is continuing with general methodological work. Work on a separate world simulation model was begun at the Free University of Amsterdam, but this study is now restricted to agriculture.

The United Kingdom

A.1.62. In the United Kingdom long-term planning is largely the responsibility of individual ministries and of the local authorities.

A.1.63. Apart from short-term forecasts the Treasury carry out five-year public expenditure plans (in the United Kingdom this constitutes 50% of GDP) which draw upon the medium-term forecasts developed in different departments (i.e. each department is asked to estimate what it will spend in the next five years). The forecasts are extended in

outline only up to 10-15 years to indicate aggregate effects on the economy. Detailed forecasts are only extended beyond five years when technical lead times require.

A.1.64. Most ministries carry out 5 - 10 year forecasts. For example, forecasts for at least 10 years are made by the Department of Health and Social Security of hospitals and social services; by the Department of the Environment for road and transportation planning, housing and the construction industry; the Department of Education etc. A wide variety of methods are employed. Population projections from the Government Actuary Department (set up in 1929) are based on cohort extrapolations, although in the light of recent experience with wide variations for population projections for the year 2000 more sophisticated methods are comtemplated. Departments concerned with transportation, urban development and manpower planning have all experimented with computer models. The recently established Department of Energy uses several very sophisticated methods in an attempt to forecast the future pattern of energy demand 15-20 years ahead. The Ministry of Defence and the Defence Operational Analysis Department engage in long-term studies. There is some official coordination between ministries through interdepartmental committees, but there has been little systematic attempt at producing a comprehensive development plan.

A.1.65. The failure of the 'stop-go' policies around 1960 led to a type of indicative economic planning, and in 1965 a National Plan was produced. This showed the output and trade levels required to sustain a certain growth rate and balance of payments. By 1968 the Plan was recognised as over-ambitious. In 1969 a less ambitious and more flexible Plan 'The Task Ahead' examined various economic alternatives for the United Kingdom. A detailed 'social accounting matrix' (input-output model), constructed as part of the Cambridge Growth Project, contributed to the Plan. Much of the work was done by NEDO (National Economic Development Office) and its subsidiary sectoral councils working directly with industry. NEDO also is the main forum of discussion between government (Departments of Trade and Industry), employers (Confederation of British Industry) and the trade unions (Trade Union Congress). The discussions are mainly concerned with short or medium term matters.

A.1.66. Regional planning boards attempt to forecast economic activity in the regions (including Scotland and Wales and Northern Ireland). Local authorities (ie. towns and rural areas) are required to submit a 'structure plan' which designates land use for the foreseeable future (10-20 years). Local structure plans are intended to outline strategies for an area taking into account economic and social and planning factors. They contribute to regional plans and indirectly to central government regional investment policy (investment incentives, employment subsidies etc.). Structure plans are based on straightforward projection methods, supplemented by more sophisticated regression analyses, time series analysis, etc., and there are several more experiments such as the dynamic modelling of city growth.

A.1.67. The short-term Treasury Forecast is paralleled by similar forecasts (also based on econometric modelling methods) of the London Business School and N.I.E.S.R. (The National Institute of Economic and Social Research), a semi-independent institute which orginally began these forecasts in 1959 at the request of the Treasury to provide a cross-check on the Treasury Forecast. Some 50 economists are employed in the Treasury. The Bank of England also makes influential short-term pronouncements. In recent years the difference between the Treasury short and medium-term forecasting models has reduced and the two have been largely integrated.

A.1.68. Two new departments have recently been established in the United Kingdom government with a brief to consider longer term issues. The first is a small multi-disciplinary group in the Cabinet Office, the Central Policy Review Staff, set up to consider long term strategic objectives and to promote in-depth studies of important departmental issues such as energy, race relations and regional policy. The second small group set up is the Department of the Environment's 'Systems Analysis Research Unit'. It is looking at a variety of growth factors up to the end of the century, and has constructed experimental 'world models'. The setting up of this department was a result of the 1973 United Nations Conference on the Environment held in Stockholm. Although small, both groups are believed to represent significant departures from traditional thinking, but neither publish anything.

A.1.69. Commissions and Committees such as those which produced the Robbins Report on Higher Education (1963) and the Roskill Enquiry on

the Third London Airport are an important way of assessing the impact of specific trends or technologies. Such investigations show up most of the problems of long-range forecasting. One of the most extensive modelling exercises in the United Kingdom was the Royal Commission on Population of 1950. Despite many alternative projections, with much supporting analysis, the actual population, twenty years later, is outside the range of alternatives suggested.

A.1.70. Research funds to universities from government are largely channelled through the Research Councils, although government departments contract studies directly both to universities and to specialist private organisations. The Home Office, for example, makes extensive use of a wide range of agencies with a forecasting element specialising in social problems such as the Institute of Criminology, the Tavistock Institute, the Institute of Community Studies, and "Political and Economic Planning " (PEP). The latter organisation has carried out a survey of forecasting methods and performed cost-benefit analyses.

A.1.71. The Research Councils have their own research institutions but in general these do not undertake forecasting. Exceptions are the Institute of Terrestial Ecology in the Natural Environment Research Council, which has undertaken work within the International Man and Biosphere Programme and the Survey Research Unit set up to advise on methods of data collection and analysis for social research.

A.1.72. Among nationalised industries, forecasting is carried out extensively by the Post Office and the National Coal Board, both of which have long technological lead times. The Central Planning Unit of the Coal Board is mainly concerned with 5-10 year perspectives, but with some work up to the year 2000. The Board has a large Operational Research Executive which collaborates with the Planning Unit in drawing up forecasts by means of simulation models. The Post Office maintains a 10 year rolling Business Plan but examines possible alternative developments up to the end of the century. British Rail are interested in social futures to help determine contexts within which possible long-term investments will come to fruition; they are currently conducting a large-scale Delphi survey. In the electronics industry, the independent Electrical Research Association carry out

forecasting in a number of fields, using modelling, cross-impact and Delphi techniques. This association is sponsored by government departments and various private companies.

A.1.73. The Science Policy Research Unit in the University of Sussex is carrying out a programme of long-term forecasting in a number of fields including energy, agriculture, and materials. Methods used include computer modelling and scenario writing. As in the case of the IREP project in Grenoble, the energy research is sponsored by several private and public industries. A number of specialist depart ments are active in particular fields, eg. at Queen Mary College (linear programming energy model), East Anglia (climatology), Aberdeen (agriculture), and Cambridge (Department of Applied Economics and Department of Control Engineering, the latter concerned mainly with methodology).

Forecasting in Eastern Europe

A.1.74. Planning methods in Eastern European nations all resemble the Soviet pattern in that fairly rigid 3 and 5 year plans based on similar methods are prepared.

A plan of co-operation for forecasting between COMECON countries was adopted in 1971 and a five-year programme to examine the implications of this was established. Different countries accepted certain responsibilities; for example, Czechoslavakia undertook to co-ordinate the project and carry out methodological research into forecasting techniques. Nevertheless, the varying experiences of Eastern European nations make it worth considering them in turn.

Czechoslovakia

A.1.75. The first complete long-term forecasting study for Czechoslovakia was provided by the Academy of Sciences' Institute of Philosophy and Sociology in 1966. This study took seven years and employed about 100 researchers from many disciplines. Problems of social forecasting have been studied in depth in the institute using various methods such as Delphi, extrapolation and cross impact. Scientific and technological forecasts and studies are made by the Institute of Economics and Management of Scientific and Technological Development.

A.1.76. In 1971 the Czech Government attempted to co-ordinate forecasting activities in order to prepare a forecast for the nation up to 1990.

The areas considered include broad economic, social and technological issues and detailed sectoral studies of, for example, life style, housing and machinery (including computers and automation).

Democratic Republic of Germany

A.1.77. As with other Eastern European nations, planning in the Democratic Republic follows the Soviet pattern of a 5-year plan backed up by short and long-term forecasts. The State Planning Commission is the major agency and this reports directly to the Council of Ministers. The Planning Commission pays much attention to the elaboration and application of mathematical economic models at all levels of management. Both static and dynamic sectoral input-output models are used in conjunction with dynamic econometric models (constructed from regression equations) and simulation models designed to forecast 5-10 years ahead. For longer range forecasts availability of historic data presents significant problems. Simulation and other models have been built by the Research Institute of the Planning Commission for use by ministries.

Hungary

A.1.78. Hungary has had National Economic Planning for over 26 years but until recently its scope extended for only 5 years.

A.1.79. As in the Soviet Union at the beginning of the 1960's, an attempt was made to formulate a 20-year plan. This experimental exercise was abandoned, although the experience gained was used in the development of a 15-year plan (1971-1985). This project began in 1968 and was directed by the National Planning Office who co-ordinated a network of committees on manpower and living standards, industrial development, construction and building materials, agriculture and food, transport and communications, foreign trade and regional planning. Much of the work is carried out in consultative committees set up, for example, by the Hungarian Academy of Sciences. Comparative studies of industry are carried out by the Central Statistical Office and the Institute of Industrial Economics using a variety of methods including modelling.

A.1.80. In Hungary the first attempt to make a plan using mathematical methods was in the years 1963-65 in preparation for the Third National Plan (1966-70). In the preparation of the fourth 5-year plan the Ministry of Metallurgy and Machine Industry attempted to test the

effectiveness of modelling methods against traditional modes of planning. One reason for the establishment of long term forecasting was that it is considered that a five-year forecast is too short for planning an entire process. (Typically 50-60 % of investment to be realised during any five-year period is already committed at the outset of the period). It is interesting to observe however that this five-year forecasting was considered too long-term by many Hungarian companies who preferred to develop instead a three-year forecasting model.

Poland

A.1.81. The importance of planning in Poland appears to have increased over the last fifteen years. The primary sources of official forecasts are the Polish Research and Prognostic Committee 'Poland 2000' in the Polish Academy of Sciences, the 'Main Forecast Commission' and the Forecast Commissions in the different government departments.

A.1.82. In principle, there is an interrelated system of plans for socio-economic development; perspective plans for periods of ten to twenty years, regular five year plans and annual and other short-term plans. Besides this over-lapping series of national plans there is a parallel process whereby these national plans are broken down into comprehensive development plans for particular regions. Regional, industrial development is increasingly supplemented by spatial and city planning (i.e. residential, recreation and services planning).

A.1.83. 'Poland 2000' was established in 1969 to examine possible socio-economic developments and land use planning up to 1990. As such, its main task is to prepare forecasts of social and cultural developments. Considerable effort is put into theoretical and methodological studies, in particular, the preparation of 'synthetic' forecasts which would relate together the activities of the various planning departments. 'Poland 2000' provides a major input into 'perspective' planning and reports to the Planning Commission at the Council of Ministers. Reports on demographic changes, patterns of settlement, employment and education and energy and other resource stocks have been made to date.

Rumania

A.1.84. In Rumania the Central Commission of Prognosis, set up in 1971, commissioned long-range forecasting to provide a framework for the National Plan. The work is conducted in university research institutes, such as the Laboratory of Prospective Research at Bucharest University and industries, and synthesised by the Prognosis Commission. The forecasts in some sectors up to 1990 and 2000 are intended for the preparation of the sixth National Plan (1976-1980). The intention is to add 15-year forecasts and some 25-year forecasts to the rigid five-year plan (similar to the 20-year forecast included in French five-year plans).

The methods used include input-output analysis, experimental simulation modelling and Delphi exercises.

Soviet Union

A.1.85. Long-term planning in the Soviet Union has a long history beginning with the GOERLO plan initiated by Lenin. The first comprehensive attempt at long-term planning was during the late 1950's when the State Economic Council focussing on long range planning issues was established alongside Gosplan (the State Planning Committee with responsibility for short-term matters). The main activity of the State Economic Council was to prepare a 20-year forecast for the period 1961-1980. This was a very large-scale project. Many institutions took part and sixty commissions were set up to deal with specific issues: economic, scientific, technological and social. Only a few results were subsequently published. Among the forecasts still considered satisfactory in 1969 were the forecasts of scientific and technological progress. Despite a certain amount of success the State Economic Council was disbanded in 1961 following the forecast and attention focussed on the preparation by Gosplan of a succession of rigid 5-year plans within the framework of ideological goals. (The 9th Plan (1975-1980) is now in preparation). Static input-output sectoral analysis is the main tool employed although some attempts have been made to introduce dynamic elements.

A.1.86. There is apparently much less 'spin off' from military planning activities than in the United States. Nevertheless, there is a considerable amount of experimentation in the Soviet Union with sophisticated forecasting systems utilising computer methods, e.g. integrated systems of teritorial and production models which employ optimisation routines to indicate routes to national goals. However, especially in the technological and scientific fields, the collected opinions of many expert committees are relied upon (with up to 40 experts on each issue). The Academy of Science is the co-ordinating body for much of this activity. Statistical information is provided by the Ministry of Industry and Trade and the National Institute for Statistical and Economic Research. Studies of forecasting methodology are conducted by the Institute of Social Research.

Forecasting elsewhere in Europe

Austria

A.1.87. The primary instrument of planning in Austria is the federal budget. The only real long-term planning in Austria is the ten-year federal investment programme, which is prepared in 3-year stages and includes medium-term plans for school construction, telephone systems and railways.

A.1.88. The Finance Ministry depends heavily on the Austrian Institute for Economic Research, and also commissions the Institute for Advanced Studies to do short and medium-term econometric forecasts.

A.1.89. The Institute for Economic Research uses both econometric and non-econometric methods, and is the only Austrian centre to deal with business cycle analyses and forecasts. The Institute for Advanced Studies was a pioneer in macroeconometrics and prepared the first macro-model of Austria. Input-output and game theory methods are also used. It is undertaking empirical projects in sociology, such as a study of health services, and a project on social indicators is under way. Most studies are done for the government, a number of government officials being on the board of the Institute.

Norway

A.1.90. In Norway a National Plan is prepared covering a period of four years, to coincide with national elections. The Plan, which covers such areas as pollution, social policy, education, population, leisure pursuits and working conditions, is a combined forecast and political programme; it is more political than Sweden's long-term survey. The plan is presented in April of the election year, and used as a focus of political debate prior to the October elections. During the Government's reign the plan is used as a benchmark for political success or failure. The plan is prepared by ad hoc study groups in collaboration with the Finance Ministry.

A.1.91. The Economics Department in this Ministry performs both long-term (up to 2000) and short-term forecasting using econometric models. Modelling is also a main activity of the Central Bureau of Statistics, who use highly disaggregated input-output methods, with data supplied by different ministries. These models seem to be used to a comparatively great extent in policy formation. A third major institution performing economic forecasting is the Institute of Economics at the University of Oslo which has pioneered work in econometric modelling.

Sweden

A.1.92. For some time the most ambitious attempt to create a broad planning base in Sweden has been the "long-range" (5-year) economic forecasts commissioned by the Ministry of Finance. The first such forecast was prepared in 1948 by an independent committee of experts, and since 1965 they have been carried out by the Secretariat for Economic Planning. The latest forecast was produced in 1970. A form of Delphi has been used; data is gathered from responses to questionnaires to government agencies, local authorities and industry, analysed by the Industrial Institute for Economic and Social Research using an input-output model, the data is then extrapolated and returned to respondents for their comments. Its object is to aid Government planning and assist communication between sectors of the economy. Short-term forecasting is done both by the Secretariat and by the independent Institute for Business Research. The National Institute for Economic Research prepares quarterly economic forecasts in collaboration with the Finance Ministry. An input-output method is used. The Royal Academy of Engineering also conducts studies into forecasting.

A.1.93. Government planning and forecasting is also fairly extensive in the fields of defence, regional development and physical developments. Time horizons vary from 1 to 15 years. In 1971, the Prime Minister appointed a working party to consider various aspects of futures studies in Sweden. The main aim was to enable the Government to evaluate the need for more systematic efforts in the futures field. The report of the working party, "To Choose a Future" was published in 1972.(1) Following this, a Secretariat for Futures Studies was set up in 1973 to consider fundamental longer-term issues of social values and objectives. The Secretariat has begun to set up a study group on technology assessment, and has planned university courses to promote future-oriented education and research. The Government are taking increasing interest and in the 1974-75 budget SKr 4 million was allocated specifically to futures research.

Switzerland

A.1.94. There is little central planning in Switzerland; only recently has the Federal Government attempted to develop a legal basis for national planning, its historical role being only to produce suggestions or rules for the cantons to debate and implement. Recently, the Federal Government did reach a consensus on a national development scheme, which the Delegierte für Raumplanung are studying. The group has developed a population model, a traffic model, and input-output models of agriculture and the environment.

A.1.95. A report on planning was co-ordinated at the University of St Gallen by Professor Kneschaurek. This study consists of forecasts of population, traffic, agricultural production and energy in Switzerland, up to the year 2000.

Forecasting in the United States

A.1.96 Forecasting in the United States is characterised by a high degree of decentralisation and lack of uniformity. This arises from the pluralistic nature of the organisational and institutional structure of the country. The continental nature of the nation and its three-tier governmental structure (federal, state and local) contributes to this diversification. Much organised social and economic activity takes place outside of government control in universities,

(1) "To choose a future" - a basis for discussion and deliberations on Future Studies in Sweden - Royal Ministry for Foreign Affairs in cooperation with the Secretariat for Future Studies (1972).

private businesses and private and non-profit agencies. For example, there are eight government and non-government forecasts of short-term economic trends which are used by the American Statistical Association, in arriving at their 'average' forecast.

The four major long-range efforts for the United States are an inter-agency growth study by the United States Department of Labour, an inter-industry forecast by the University of Maryland, the water resources programme by the Department of Commerce, and national and regional economic projects by the National Planning Association. The methodology for the projects varies. The inter-industry study uses a dynamic input-output model. Although there are no national overall 'growth projects', about 12 states and local communities are examining their particular situation.

A.1.97. Nevertheless, the United States Government has periodically set up commissions to investigate problems of a long-term character. Typical is the Paley Commission set up after the Korean War to consider the long-term demand and supply situation up to 1975 for raw materials in the United States. In the main, extrapolative techniques were used. For most, but not all, raw materials demand was under-estimated.

A.1.98. Several government agencies, such as the Environmental Protection Agency and the Office for Technology Assessment, have been established in response to the perceived need for means of assessing and controlling the impact of technology.

The Environment Protection Agency (EPA) was set up in 1972 to monitor pollution and other environmental hazards and to suggest remedial legislation. Considerable effort has been put into the construction of simulation models of the ecological and social systems considered by the EPA.

A.1.99. The Office of Technology Assessment was founded in 1972 as an advisory arm to Congress to help identify physical, biological, economic, social and political impacts of technologies. Technical staff may number 20-25 professionals, assessments being carried out principally by outside contractors and consultants.

A.1.100. The Science and Technology Office of the National Science Foundation (NSF) was set up in 1973 to assist the Director of the NSF to carry out the functions of the former Office of Science and Technology. This office assists the Director in providing advice on national civilian S & T policy, developing technical options, appraising overall effectiveness of federal and national R & D efforts and recommending policy and programme action towards the achievement of national goals.

A.1.101. Co-ordination of federal social forecasting efforts, by and large, is minimal and mainly ad hoc through Senate Committees of Investigation and a large number of inter-dependent planning committees. Mechanisms for inter-agency co-ordination include the statistical services offered by the Statistical Policy Division of the Office of Management and Budget, and the environmental impact statements required by the Environmental Protection Act of 1972 for certain proposed federal actions.

A.1.102. Beginning a decade ago, a drive to introduce PPBS into governmental planning was attempted. This was in use by 1961 at the Department of Defence, and all executive departments (directly under the President) and 22 government agencies were included. The aim was to bring to the foreground the basic choices in research and in the application of research. These departments and agencies did their own planning and forecasting; there was no master plan'. At the same time a number of federal programmes called for the preparation of state plans. Both PPBS and federal plans achieved mixed results, and much criticism was mounted against them. Nevertheless, they were and are an important feature of American public policy. PPBS involves medium-term forecasting of GNP and the distribution of output. Some experiments with public expenditure models have also been made.

A.1.103. There has certainly been a substantial increase in the number of forecasting institutions in the United States since the mid-sixties. Survey results suggest that the proportion of non-government institutes is rather low in the United States (perhaps 5-10%, compared with 20-40% world-wide) with universities accounting for 10-15%, industry 20-25%, the remainder being distributed between non-profit making organisations

and consultancies. There is much private sponsorship of futures research (35% of individuals are working on contracts provided by private business) and there are a large number of consultancies. Several studies are sponsored by benevolent organisations (such as the Ford Foundation, Energy Policy Project). Several major corporations (eg. General Motors) carry out major short-term economic forecasts.

A.1.104. However, a recent survey concludes that the number of people engaged full time with futures research in the United States has not expanded significantly since 1969 in comparison with the vast increase in people involved with the future in many different ways (eg. concern with long-term effects of S & T.) Also, within futures research itself, the earlier emphasis on 'forecasting' and 'prediction' seems to have shifted somewhat towards the 'normative' approach of exploring overall costs and benefits of alternative courses of action.

A.1.105. For many of the large number of organisations in the United States, futures research is not the main activity. There are only about six non-governmental organisations (and perhaps only two governmental organisations) in the United States that can be said to be involved in full time futures research. These non-governmental organisations include independent private corporations like The Futures Group (in Connecticut) and Forecasting International Ltd. (in Washington), the non-profit Institute for the Future (in California); academic groups like the Center for Futures Research (at USC); and the Center for Futures Studies (at Portland State University); quasi-professional organisations like the World Future Society (in Washington, D.C.); and the ad hoc research organisations like Governor Rockefeller's Commission on Critical Choices.

A.1.106. A recent survey of methods currently used showed that since 1969 there has been a reduction in the popularity of Delphi and quasi-Delphi techniques. Scenario writing maintained a high ranking in order of preference. This may be attributed to the relatively large inflow of social scientists and educators into the futures field. Simulation is used extensively.

A.1.107. The United States provides a home for 'forecasting spectaculars ' such as the Hudson Institute's 'Year 2000' or the Club of Rome's 'Limits to Growth', and for 'new' methods and concepts such as RAND'S 'Delphi' technique, which are often rather minor modifications of traditional methods. The publicity campaigns surrounding such works and celebrities has led to, in the main, healthy public discussion. Government agencies too have engaged in the controversy; for example, the United States Department of Health, Education and Welfare undertook a study of the 'Limits to Growth' and concluded that no immediate policy action was justified on the basis of the model. Following studies of several major modelling efforts, the National Science Foundation is now demanding greater 'policy relevance' in its own projects.

Canada

A.1.108. In 1974, the Senate Committee on Science Policy has proposed that a Commission on the Future be set up, to act as a post-box or coordinator of futures studes, in the country in general.

A.1.109. In the Canadian Federal Government there is an interdepartmental committee on futures research, it has done 11 Delphis, mainly through consultants, though the government controls and appoints panel members. The committee groups 15 government departments, and has a sub-committee of 5 members on methodology.

A.1.110. The Economic Council of Canada, government appointed and funded, but reporting independently, is hesitant about the idea of overall forecasting. It has, however, a large econometric model, CANDIDE, which is useful on the impact of external trade. It can be used for economic target-setting, and there has been discussion of the extension of its use to "social targets".

Forecasting in Japan

A.1.111. In Japan economic planning is carried out in the governmental Economic Planning Agency, which uses econometric methods in constructing plans and forecasts for five years ahead. Such a plan was made in 1972, taking into account both economic and social variables, including inflation and welfare indicators. The oil crisis has necessitated substantial revisions of this plan. The Agency regularly produces an annual forecast (using analysis and discussion rather than econometric methods) and a 13 region world econometric model is being constructed.

A.1.112. The Economic Council, appointed by the Prime Minister, has an interesting practice. The staff of the Council, which is drawn from the relevant ministry, submits to it every year three alternative growth scenarios, high, middle and low, from which they make a choice. This is passed on as a recommendation to the Prime Minister, who by accepting or rejecting it affects national planning.

A.1.113. In the field of Science and Technology, a ten year plan conceived by the Prime Minister's Office was drawn up for the decade 1960-1970 by an Advisory Council consisting of expert academics and industrialists, and updated once in the middle of this period. Starting in 1970, a sliding ten-year plan, updated every year has been made. The Japanese Government has also recently established a Comprehensive Research and Development Organisation (funded partly by private sources) to promote research into a wide range of economic, social and technological issues.

A.1.114. In 1970, the Science and Technology Agency was set up to establish technological forecasting as a formal and recognised activity, the previous emphasis on nuclear energy and space objectives giving way to a more balanced approach. This agency has undertaken what must be the largest Delphi exercise so far carried out in the world, with 4000 panelists. The object is to determine important fields for consideration and obtain estimates of probability dates for the realisation of selected objectives. The agency has also developed a simulation model of the interactions between scientific research, development, the acquisition of new technology and industrial activity. It is far more ambitious than similar aggregate models developed elsewhere.

A.1.115. The Economic Planning, and Science and Technology Agencies also have a role in co-ordinating the planning and forecasting work carried out in individual ministries. The Ministries of International Trade and Industry (MITI), Finance, Agriculture, Construction and Transport are among those with their own in-house activities. These are perhaps most developed in MITI, which, in view of pollution and resource problems, has prepared a report 'Vision of New Industrial Structure' with a ten-year time horizon. This study involved expert discussion meetings and the use of input-output tables. MITI has also used Delphi in a study of electrical innovations.

A.1.116. A number of private organisations carry out forecasting; the Nomura Research Institute, for example, performs technological forecasting for industry and government. Most large industries make forecasts; for example, the petrochemical industry has produced a five-year study to be used as a guideline for policy making.

A.1.117. The Japan Techno-Economics Society is important as an initiator of work in academic institutions. A number of studies are being carried out under the auspices of the Society at the University of Tokyo, and funded by MITI, including a world simulation model, and input-output economic models of Japan. Work of a global nature, with special reference to Japan, is carried out rather widely, no doubt reflecting the dependence of the country on world economic conditions; such work is also being carried out at the Osaka and Rikkyo Universities.

Forecasting in International Organisations

Governmental

A.1.118. Following the retirement testament of its late Secretary General U. Thant, the United Nations has, in recent years, deepened its concern with the longer-term global issues, of which the Stockholm Conference on the Environment and that at Bucarest on population have been the most striking manifestations. It has recently created within its Institute for Training and Research (UNITAR) a Commission on the Future. This body will be active with regard to forecasting methodology and modelling, in addition to stimulating and coordinating research on the future, on a world-wide basis.

A.1.119. Several United Nations agencies devote substantial resources to forecasting activities, and many also sponsor work by outside institutions on a large scale. In general, the largest programmes have been those for which the issues involved have required a high level of international cooperation (in that the actions taken by one country strongly influence other countries) and are comparatively non-controversial.

A.1.120. Environmental issues in particular satisfy these conditions. The UNDP, for example, has projects on the Mediterranean, Caribbean, Arctic, and Pacific; UNESCO has sponsored and coordinated the world-wide ecological study, the Man and Biosphere Programme, for which a substantial amount of simulation modelling is being used, it being

felt that 'Systems and modelling approaches can help to bring about greater coherence and significance'.

A.1.121. Mathematical modelling is also used by the International Labour Office (a study of prospects for health and socio-economic development). Indeed, United Nations agencies in general appear to be showing considerably more interest in sophisticated methods than national governments; the E.C.E., for example, has made a study of econometric forecasts and holds discussions on methodology.

A.1.122. United Nations agencies publish volumes of statistics pertinent to their own specialities, and often use these as a basis for trend extrapolations. The FAO, for instance, has published projections of supply and demand for food in under-developed countries up to 1985. The European Centre for Coordination of Research and Documentation in the Social Sciences has carried out a major project, 'Images of the World in the Year 2000'.

A.1.123. The OECD has, in recent years, shown an increasing interest in longer-term problems and trends. At the beginning of the 1960's and again of the 1970's, its Council at Ministerial level issued forecasts of the economic growth prospects of its countries and of the membership as a whole for the decade ahead. OECD undertakes annual reviews of the economic policies of each of its member countries in which the implications of forecasts for macro-economic policy are stressed. In general, however, the OECD economic forecasts are of short and medium range. Similar reviews and forecasts of national policies are undertaken on a periodic basis in environmental, science, educational, social and aid policies. The OECD has undertaken a pioneer study of technological forecasting and, more recently, has published a review of technology assessment activities and methodologies; it is also active in the field of social indicators. The recent OECD energy studies cover the problems of energy supply and demand until 1985 and beyond, while research and development aspects are considered in an even longer-term perspective. A study of the long-term passenger transport requirements between the main European cities has been undertaken in cooperation with EEC. A proposal is now under discussion, on the initiative of the Japanese government, to undertake a programme of study on the long-term problems of member countries.

OECD is a major source of comparative data on a wide range of sectoral activities including economics, trade, monetary transactions, agriculture, energy, tourism, employment, education etc. In this way it complements the statistical work of the United Nations and its specialised agencies, by providing comparative data more rapidly and often in greater detail.

Although the work of OECD is more future oriented than that of most of the other international organisations, little or no attempt has been made as yet to take an integrated approach in forecasting, or in identifying the interconnections and cross impacts of the various sectoral trends.

A.1.124. The forecasting done by and for the European Communities has already been described in I.1.

Non-governmental

A.1.125. In the academic field, the International Institute for Applied Systems Analysis in Vienna is the result of an agreement between the U.S., the Soviet Union, and East and West European countries, to cooperate in various studies of international problems. IIASA was set up in 1972 and is staffed by scholars from a wide range of Western and Communist countries, most of whom are on short-term secondment from other institutions. Environmental, energy and methodological studies predominate in the Institute's programme, and many projects involve sophisticated mathematical and simulation techniques.

A.1.126. An attempt to cultivate transdisciplinary research on the major world problems, on a long-term basis, is undertaken by the International Federation of Institutes of Advanced Study (IFIAS) which was set up in 1972 under the auspices of the Nobel and Rockefeller Foundations. Its objective is to assist its 23 member institutes, most of which are highly specialised, to conceive their work within a social, economic and human framework. A number of research projects are in progress, in which the relevant member institutes and other scientists take part. There is strong participation by the Soviet Academy of Sciences. In some ways the activities of the Federation can be regarded as an academic complement to the work of the Club of Rome - indeed several members of its Board of Trustees are prominent members of that Club.

A.1.127. The Club of Rome is strongly involved in forecasting. The chief concern of this purely informal group is with what it terms "the world problematique", the tangle of inter-connecting problems which confronts contemporary society and which, in the view of the Club, cannot easily be tackled with traditional policies and institutions. The Club of Rome has two functions - to stimulate research which will help to elucidate the interactions between the various elements within the problematique, and secondly to discuss with decision-makers in governments and industry the implications of these problems and interconnections on national and industrial policy.

A.1.128. The European Cultural Foundation, set up in 1954, is also involved in general forecasting activities; its aim is the 'promotion of cultural, scientific and educational activities of a multi-national character and of European inspiration'. The Foundation makes use of inter-disciplinary discussion groups and scenario writing rather than mathematical techniques. Its major project is 'Europe 2000' which consists of studies of alternative social structures in the fields of education, industrialisation, urbanisation and rural society in the 21st Century.

A.1.129. Another example of international cooperation is 'Project Link' initiated by the United States Social Sciences Research Council to examine the feasibility of forging links between national econometric models. The idea is that each participating country provides estimates of its local inputs and import and export prices from its own national model, these data being used centrally, mainly to forecast future world trade. These data are fed back to participants for possible re-evaluation of their own estimates.

A.1.130. The World Futures Studies Federation provides a forum for conferences with delegates from, particularly, Eastern and Western Europe and the United States.

A.1.131. There are international consultancy organisations which undertake forecasting and related work under contract; the largest of these maintain quite an extensive capability, and the best bear comparison with the best governmental and academic work. Several U.S. based organisations have offshoots in Western Europe.

A.1.132. Most international firms carry out forecasting, particularly those with long technological lead times. Methods used include Brainstorming and Delphi; studies involving sophisticated methods are also undertaken but are usually contracted out to other organisations.

ANNEX 2

An Interaction between European Parliamentarians and the Mesarovic-Pestel World Model

A.2.1. On February 24 - 26, 1975, on the initiative of the Commission of the European Communities, a meeting was held at the Medizinische Hochschule, Hanover, when seven members of the parliaments of Community countries, some of whom were also members of the European Parliament, were personally to "interact" with the Mesarovic-Pestel World Model.

The parliamentarians present were:

P.-B Couste	France
G. Flämig	Germany
Lord Kennet	Britain
C. Meintz	Luxembourg
K. Helwig Petersen	Denmark
Senator Mary Robinson	Ireland
J.C. Terlouw	Netherlands

Professors Mesarovic and Pestel, certain members of their team, certain members of the Europe Plus Thirty Project Board and Team, and about 15 other observers, some from the European Commission, were also present.

Presentations and Activities

A.2.2. The structure of the model and its modes of operation were described by Professors Mesarovic and Pestel and members of their team.(1) The model is global in scope, disaggregated into ten geographical regions and nine economic sectors, and is highly complex, containing about 100,000 relationships. These relationships are contained in a so-called 'causal stratum' and, in operation, are supplemented by input values specified by the operator. Values which must be specified are of two types: 'policy' variables (i.e. allocation of resources between sectors) and 'parameter' variables (such as potential oil reserves, about which uncertainty exists). The specification of these variables constitutes the

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(1) See "Mankind at the Turning Point" by Professors Mesarovic and Pestel and IIASA conference proceedings: "Multilevel Computer Model of World Development System" by Professors Mesarovic and Pestel (6 volumes) (Laxenburg - 29th April - 3rd May, 1974).

operator's 'scenario', the repercussions of which are to be indicated by the model. These variables can be given in qualitative form (e.g. a choice made between high, medium or low values) or quantitative (numerical) form.

A.2.3. The model was in a state where two particular issues could be explored: the world oil and food situations. On the first day some sample runs of oil scenarios were made and results discussed. On the second day, the parliamentarians were given the opportunity personally to operate the model, on-line via terminals in the conference room, allowing them to study the repercussions of alternative scenarios directly.

Reactions of the Parliamentarians

A.2.4. The parliamentarians all felt that the operation had been useful, and also that computer models in general could form a useful input into the policy-making process, and could help to reduce uncertainty in decision-making.

A.2.5. Obviously, the model did not address itself to the kind of problem with which they were often concerned in their day-to-day work. Firstly, the scale of the problems considered in the model was very broad; the parliamentarians were usually concerned with comparatively 'small' decisions, while the model considered gigantic ones. Politicians were normally engaged in forming policy within particular sectors, and were not used to discussing cross-sectoral policy. Secondly, the time scale covered by the model runs (up to fifty years) was far greater than that normally considered by parliamentarians, who were often forced to be concerned with short-term issues with an eye on the next election. On the other hand, one member of the Mesarovic-Pestel team, who had been sitting with the parliamentarians and coaching them in the interaction procedures, gave the opinion that they used the model "better" than the average group of the same education, since they were "already aggregated to the right level", i.e. used to thinking farther and wider than most people.

A.2.6. Most of the parliamentarians thought that the model had an indirect value, in that it helped them to step back and survey long-term issues. One compared it to a religious retreat. This view is in line with its makers' own hope, that it can help to form conceptual guidelines for policy rather than specific policies. Some parliamentarians remarked that it forced them to think far and wide.

One parliamentarian devoted considerable preparation and care to "trying the standard solution of lower energy consumption and lower growth in the West and seeing if I inadvertently kill a few million Asians". None of the parliamentarians was flummoxed by the interaction process, though some learned to do it much more slowly than others, and continued to do it for longer. Several asked searching questions about the relation between man, machine and reality. The experiment confirmed what was already known: you don't have to be a computer professional to use a computer, or a systems analyst to understand a system.

Conclusion

A.2.7. The meeting was not to judge the place of computer modelling in forecasting or the validity and merits of the particular model used. It was simply to try, for the first time, a direct interaction between a group of parliamentarians and a model, in order that the parliamentarians could assess the possible utility of such a technique from their point of view. Obviously any conclusions must be highly tentative, because there is no guarantee that the group was representative of the parliamentarians in the member countries, nor that the model was representative of the real world. Although reservations were expressed regarding the value of large-scale models in view of the diversity and complexity of the policy-making process, the feeling of the meeting was that such exercises could provide a useful stimulus to discussion about broad long-term developments and could act as an educational aid to politicians. We sum up by quoting the words of one of them: "It is hard to believe once a policy-maker has been introduced to it that he would just say thank you very much and walk away.

ANNEX 3

TECHNOLOGY ASSESSMENT AS IT IS DONE AT PRESENT

Developments inside the European Community

Federal Republic of Germany

A.3. 1. The Federal Republic of Germany is one of the few countries in which a parliamentary discussion on the creation of a central TA institution has been seriously undertaken. The working group on research and technology of the CDU/CSU faction started this discussion. They elaborated a proposal for the creation of an "Office of Evaluation of Technological Development" in the German Bundestag; it was introduced in the Bundestag by the opposition in April 1973, and was briefly debated on first reading in May 1973. The proposers start from the premise that parliamentarians are overtaxed when assessing complicated and expensive research and development projects and that they feel overrun by concentrated expert knowledge. They felt that, although the creation of a committee for research and technology provided the preconditions of a certain control of technology policy, to improve the preparation of decisions for parliamentarians an institution would be necessary which would identify and assess the social and economic effects of technological developments with the aid of systems analysis. The Research and Technology Committee of the Bundestag is called upon, in the proposal, to carry out studies on the organisation, the manpower, and the finance for such a TA institution.

A.3. 2. The present coalition parties are not fundamentally opposed to an establishment advising parliamentarians as to the consequences of technology. But they prefer other institutional possibilities. The SPD warns against uncritically taking over the American OTA solution, which was developed for a system of separation of powers typical of the USA and differing substantially from the German system. Instead it suggests something corresponding to the German Council of Experts for the Examination of Economic Development

(Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung). The SDP proposes the establishment of an "organisational office" attached to the Secretariat of the Committee for Research and Technology or to the Scientific Service of the Bundestag. This office would put together ad hoc units to carry out TA contracts.

A.3. 3. In December 1973 at a TA hearing parliamentarians had the opportunity to question an expert panel, invited by the Research and Technology Committee, on the goals and methods of TA and on the possibilities of its political implementation. At the beginning of 1974 the Studiengruppe für Systemforschung (SfS), Heidelberg, was asked by the administration of the Bundestag to report on the problems and methods of TA and the possibilities of institutionalising it under the Bundestag. This report formed the basis of a further debate on the CDU/CSU legislative proposal in the Committee for Research and Technology in December 1974. The representative of the Ministry for Research and Technology (BMFT) announced at this meeting the willingness of the government to make all TA studies of the BMFT available to the Bundestag, and to give the Bundestag the opportunity to expand the subject matter before contracting any studies. The Committee did not yet make a recommendation to the Bundestag for the decision on the question of a parliamentary TA establishment, but asked the CDU/CSU to make its ideas more precise. Finally, however, at a meeting in April 1975 the Government majority in the Committee for Research and Technology rejected the CDU/CSU legislative proposal.

A.3. 4. In the industrial sector, the Messerschmitt-Bölkow-Blohm GmbH (Ottobrunn) and the Dornier System GmbH (Friedrichshafen), with their large systems engineering capabilities, are particularly worthy of mention. Some of their systems studies on aerospace and other transport technologies can be regarded as partial TA analyses. Since 1970 industry has financed the Institute for the Study of Technological Developments (Institut zur Erforschung technologischer Entwicklungslinien - ITE) in Hamburg, which deals with urban development, transport, environment and associated problems. Its study

on passenger transport in large residential areas includes an evaluation of new alternative transport systems from the viewpoint of technology, the economy, and society and is an example of a problem-oriented TA analysis.

A.3. 5. In the non-profit sector, the Study Group for Systems Research (Studiengruppe für Systemforschung e.V. - SfS) in Heidelberg, an independent organisation with a scientific staff of about 50, and financed by the BMFT, has in the last few years undertaken a series of TA-like studies, including one on the application of modern technical aids in schools. At the beginning of 1975 part of the SfS was merged with the systems engineering division of the Institute for Applied Systems Engineering and Reactor Physics (Institut für Angewandte Systemtechnik und Reaktorphysik - IASR) of the Nuclear Research Centre in Karlsruhe to form a new Institute for Applied Systems Analysis (Institut für Angewandte Systemanalyse - IAS). The aim of this merger is to complement the predominantly natural science and technology oriented systems analysis and forecasting capacity of the former IASR with a substantial social science capacity. For 1976 the new systems analysis group is planning, among other things, an assessment analysis of alternative concepts for siting nuclear power plants (e.g. energy parks) and a study on the tolerance limits of environmental pollution.

A.3. 6. The Battelle Institute, Frankfurt, has established in its department "Applied Social and Behavioural Research" a division called "Technology Assessment, Corporate Social Accounting and Evaluation Research". It mainly deals with industrial TA.

One of the few studies in the Federal Republic which from the beginning was set out as a technology assessment, is the project on a planned refinery extension in North Baden, undertaken by the Institute for Systems Technique and Innovation Research (Institut für Systemtechnik und Innovationsforschung - ISI) of the Fraunhofer Society for the Promotion of Applied Research in Karlsruhe. Originally this study was conceived of as a "participatory assessment", in which representatives of affected groups, especially trade unions,

industry and citizen groups were to take part in a simulation experiment. But industry and the trade unions have stopped participating so as not to impair their freedom of decision. In 1973 ISI had a staff of 20. It is planning further TA analyses, for instance on the impact of automation in manufacturing industry.

A.3. 7. If we are to take a very broad definition of technology assessment, we should mention in this connection the "Max Planck Institute for the Study of Living Conditions in the Scientific-Technical World" (Max-Planck-Institut zur Erforschung der Lebensbedingungen der wissenschaftlich-technischen Welt) at Starnberg near Munich. In the main this institute pursues basic research. The questions dealt with are predominantly in the fields of conflict research, consequences of atomic warfare, environmental problems, problems of the 'Third World', the role of science in the world of today and tomorrow.

France

A.3. 8. In France there has so far been no serious debate on institutionalising the "Evaluation des Options Techniques" (assessment of technical choices) at the legislative level. One should, however, mention that during the latest presidential election the Socialists pleaded that written "environmental impact statements" should be legally enforced.

On the other hand, in the course of "planification" government authorities and institutions have for years taken the evaluation of consequences into consideration in their plans and decisions. This is particularly true for two areas of government planning, environment and land use. Besides the TA and TA-like activities of such governmental institutions as the Délégation à l'Aménagement du Territoire et à l'Action Régionale (DATAR), the Agences Financières de Bassin, and the working group "Evolution des techniques et techniques nouvelles au regard de l'Environnement" (Groupe D) of the Interministerial

Project Group for Environment Problems, a new TA initiative in the French executive deserves special mention, viz., the establishment of the research group EVATEC (Evaluation Technique) by the French Atomic Energy Authority and the Conservatoire National des Arts et Métiers.

Great Britain

A.3. 9. The debate on the control of technological progress is also followed in Great Britain with lively interest, but the institutionalisation of TA in the legislature on the American model is not seriously considered.

A.3.10. The activities of the Programmes Analysis Unit (PAU), the "in-house" analysis capacity of the Department of Industry and the Atomic Energy Authority, range from testing and developing methods for the evaluation of R & D programmes, to the assessment of technological projects and technological and social forecasting. The PAU carries out analyses according to the needs of its sponsors. It is not the task of PAU to judge which technological developments or assessment tasks have special relevance according to overarching criteria and should therefore be given priority. PAU's significance in promoting and spreading the idea of TA and its implementation and, thus, in guiding the future development of British society, is severely limited because nearly all its studies are confidential. Among those which have become known in detail there are some, such as the study entitled "An Economic and Technical Appraisal of Air Pollution in the United Kingdom"(1) and a study of the dredging technology(2), which can be regarded as partial TA's.

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(1) PAU, Chilton, Didcot, Berks., 1972.

(2) Economic Study of Dredging Technology, study prepared by the PAU for the Committee on Marine Technology, CMT publication No. 6, London 1971.

A.3.11. Public Inquiries are not fixed in detail by law; they are initiated by ministers after an appeal to central government by citizens or organisations against decisions on the local or regional level, or immediately by the minister concerned. In the last few years many Public Inquiries have been carried out whose subject matter and approach made them like TA's. Cases of ex post facto technology assessments in inquiry form were, for instance, the inquiries into the accident to the drilling rig "Sea Gem" (1967), the collapse of the Ronan Point Building in London because of a gas explosion (1968), the accident at the Hixon level crossing (1968), and the explosion of the chemical plant at Flixborough near Scunthorpe (1974). In all these instances, interviews, discussions, investigations, and reports brought to light important insights into technical sources of error and weaknesses in engineering which affected public safety. Information was gained which, had it been assessed in the technical planning phase, would have led to safer construction and might have avoided the accidents.

A.3.12. The Select Committee on Science and Technology of the House of Commons does not carry out assessment in the proper sense, but it does persevere in reporting on current science and technology policy problems. Especially worthy of mention is its report of July 1973 on the cancellation of the tracked hovercraft project, dealing with the development of a track-bound high-speed transport system on air cushions, which between 1967 and the beginning of 1973 used up £5.25 million.

A.3.13. The annual report of the Science Policy Research Unit (SPRU) at the University of Sussex for the year 1974 mentions among others within its programme "Social and Technological Forecasting and Technology Assessment" the following TA studies:

- Technology assessment of electric vehicles (carried out in cooperation with the PAU)
- Technology assessment of industrialisation in developing countries
- Technology assessment of chemical weapons.

A.3.14. Not infrequently, as an argument against the need for installing a central TA institution in Great Britain, the existence of several independent "public spirited" bodies is brought forward. These can sometimes put heavy pressure on ministries, with their memoranda on possible deleterious side effects of applications of technology. Of the associations which carry out, finance or encourage TA-like studies - mainly from the environmental angle - the following are worthy of note:

- Natural History Society (independent)
- the Nature Conservancy Council (government financed)
- the Countryside Commission (government financed)
- Friends of the Earth (independent)
- Civic societies (independent, locally active, permanent citizen groups).

A.3.15. The recently established Council for Science and Society, which is financed by a foundation, includes the following in its programme:

- The standards to be applied, and the procedures for applying them, in weighing "acceptable risk" against anticipated benefits from new technologies.
- The use of surgical, pharmacological, psychological and other techniques for the control of individual behaviour deemed to be harmful or deviant.
- The problems involved in the development and use of 'harmless' weapons for the control of civil disorder.
- The social and ethical implications of the non-clinical use of mood-control drugs.

The Netherlands

A.3.16. In 1974 an attempt to create a special parliamentary TA institution was narrowly defeated in the Dutch parliament. The Government White Paper on Science Policy (published in December 1974), however, devotes a paragraph to TA and suggests

a careful approach on the national level, because of the international impact of most technologies. The paper goes on to mention that discussions have started with TNO (semi-government Organisation for Applied Research) to explore the possibilities of performing some TA studies. Also the Government paper mentions agreement with the TA-related work of the Future Shape of Technology Foundation which was initiated by the Royal Institute of Engineers.

A.3.17. The TA unit within TNO is working closely together with related groups on risk analysis, innovation policy, and future studies. The Future Shape of Technology Foundation also has a secretariat which coordinates future-oriented studies performed (on a voluntary basis) by members of the Royal Institute of Engineers. Although none of these studies is labelled as TA, the approach is often multi-disciplinary.

Developments in some countries outside the European Community

Canada

A.3.18. In Canada there are, as in most other economically advanced countries, government bodies that carry out at least TA-like activities; for instance the Department of Communications, the Department of the Environment and its attached services, the Ministry of State for Science & Technology, and the Science Council. But apparently the systematic evaluation of the consequences of technology, going beyond traditional cost-benefit analysis, is not yet seen as an important, independent duty of the government, as it is in the USA.

A.3.19. The Science Council was founded in 1966 and deals with the general implications of science and technology policy. Its small staff is supported

by outside experts from different disciplines when making recommendations on science and technology policy. In view of its statutory functions, the Science Council sees itself in a key position as far as initiating TA studies is concerned. Its growing interest in TA, as a reflection of government and private worry about the use or misuse of technological possibilities, comes out clearly in a TA background and case study, published in 1974(1). In this study the future role of the Science Council with regard to technology assessment is seen as, firstly, identifying TA-worthy technologies and problems; secondly, as justifying the implementation of TA studies to the Cabinet (via the Ministry of Science and Technology) and to all public and private groups, whose briefing seems necessary; and thirdly, to carry these studies so far that a special "TA Commission" or "task force" can be formed and charged with the implementation. It seems to be the view of the Science Council that no new body within the executive is necessary for this. They do not regard the establishment of a TA office within the legislature as necessary. One of the reasons given is that - in contrast to the USA - decisions on expenditure for large technological projects are taken in the Cabinet and not in Parliament.

Japan

A.3.20. Since the end of the Sixties, after a long phase of hasty

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(1) M. Gibbons, R. Voyer (Science Council of Canada), A Technology Assessment System - A Case Study of East Coast Offshore Petroleum Exploration, Background Study No. 30, Ottawa 1974.

technological development, there are now signs of a fundamental change in Japanese science and technology policy and a growing acceptance of the idea of technology assessment. After demonstrations in many parts of the country, the Law against Air and Water Pollution was passed in 1968. In 1969 the Subcommittee on Technology Advancement of the Economic Council put forward a report on technology policy, in which it is stressed that technological advance has to be in harmony with social developments. The report warns against the life-endangering effects of large technological projects and proposes a "Security and Welfare Control System" that is to become effective before, during, and after the realisation of a project. Without using the term "technology assessment" the report in its references to a "control system", and in many other places, reflects the leading ideas of the TA movement. In 1971 the Council for Science and Technology, a body of immense importance in Japan as far as science and technology policy is concerned and whose Chairman is the Prime Minister, formulated recommendations for a comprehensive science and technology policy for the seventies. In these recommendations technology assessment is viewed as one of tbe bases for technology policy.(1)

A.3.21. In May 1971, the Ministry of International Trade and Industry (MITI), announcing its industry-technology policy for the seventies, recommended that the emphasis of future government responsibility be on development of policies to control and guide industrial technologies; to this end technology assessment is seen as an important means. The government is advised to build TA into industrial policy as an intrinsic part, in order to do justice to the social desire for a better quality of life and better environment. It was made clear to private corporations that their existence would be called in question, if they do not harmonise their technological developments with those of society at large.

A.3.22. With regard to a TA action programme MITI makes, among others, the following recommendations:

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(1) Japanese Science Policy in the 1970's; A Report of the Council for Science and Technology, Tokyo 1971.

- At first, the technologies to be evaluated are those whose development is easily foreseeable and which have wide impacts on the social environment.

- The organisation responsible for TA shall be multi-disciplinary and neutral, so that technological impacts on society can be evaluated comprehensively and objectively.

- The legislative system is to be included in the process of forecasting, analysing, and guiding technological developments.

- Before government R & D projects are begun, assessment analyses, which could lead to the abandoning or changing of projects, are to be carried out. After the completion of R & D projects, but before the application or production phase, the newly developed technologies are again to be assessed. If there is a strong suspicion that privately developed technologies might have deleterious effects on society, an assessment is to be made immediately.

A.3.23. In 1971 the Planning Bureau of the Science and Technology Agency (STA) began a study programme on technology assessment that, among other things, addressed itself to the following questions:

- What subjects are suitable for government TA ?

- What organisations should carry out assessments, falling under the responsibility of the government ?

- What methods are most suitable ?

- How can science and technology policies be brought into harmony with other policies of the government with respect to TA ?

Pilot case studies were undertaken to clarify these questions.

A.3.24. TA and TA-like activities are also carried out or sponsored by other ministries and governmental bodies, such as the Ministry of Transport, the Economic Planning Agency, the Environment Agency

or by non-profit or private organisations such as the Japan Society for the Promotion of the Machine Industry, the Japan Research Institute, and the Institute for Policy Sciences.

Sweden

A.3.25. Sweden's strong interest in the idea of TA should be viewed in the context of its highly developed environmental awareness. In 1967 the OECD and the Swedish Ministry of Agriculture organised an international seminar in Stockholm on the possibilities of cooperatively measuring air pollution. In 1969 investigations with TA-like characteristics were started on the impacts on health and the economy of a nuclear power plant sited near a town. In 1970 the Swedish Coast Guard Service was commissioned to put together a 3-year programme to combat the oil plague in the waters around Sweden. They were particularly concerned with evaluating alternative oil transport technologies. In 1970 the Swedish Environmental Protection Agency put forward a "de-escalation programme" to reduce environmental dangers; it demanded an upper limit for the sulphur content of heating oil and warned against the toxic effect of SO_2 in the atmosphere. Swedish scientists also warned against the long-term indirect consequences, namely the destructive effects of sulphuric acid in rainfall on forests and in water. Because of the international connotations of this problem, environmental pollution via sulphuric acid and sulphur dioxide was taken as the subject of a study which was the main scientific contribution of Sweden to the United Nations Conference on the Human Environment in Stockholm in 1972.

A.3.26. The creation of an Office of Technology Assessment in the USA was closely followed by the advisory bodies of the Swedish government dealing with science, research, and technology. The

Royal Commission on Future Studies brought out a report in August 1972 on the future shape of Swedish society; in it among other things the necessity of technology assessment is stressed. On the basis of this report the Swedish Secretariat for Future Studies attached to the Prime Minister's Office was established at the beginning of 1973. For 1974/75 the Secretariat, which only has a small permanent staff, had at its disposal a budget of about $ 500,000 for contracting out to contractors. The main effort of the Secretariat's work is going into the very comprehensive fields of "the labour market in a future perspective", "resources and growth in a global and national perspective," "Sweden and its role in the world". TA activities form only part of the work of the Secretariat.

USA.

The Office of Technology Assessment

A.3.27. The Committee on Science and Astronautics of the House of Representatives in the American Congress began studies, in the mid-60's, on the negative side-effects of the use of technology. In 1966 the Subcommittee on Science, Research, and Development of the Committee on Science and Astronautics published a report on the primary and secondary impacts of technical innovation;(1) it was there that the term "technology assessment" was used for the first time. The report also demanded that an "early warning system" be established in Congress with the aim of discovering the negative and positive effects in the use of technology.

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(1) U.S. Congress, House of Representatives, Inquiries, Legislation, Policy Studies Re: Science and Technology: Review and Forecast, Second Progress Report of the Sub-Committee on Science, Research, and Development to the Committee on Science and Astronautics, 89th Congress, 2nd session, U.S. Government Printing Office, Washington 1966.

A.3.28. In March 1967 Emilio Daddario, a democratic Representative and chairman of the Subcommittee on Science, Research, and Development, proposed legislation in Congress on the establishment of a "Technology Assessment Board". In the summer of 1967 he laid before Congress a report[1] in support of his plans, which includes a definition of "technology assessment". The aim of this legislative proposal was not to have a decision made on the creation of a Technology Assessment Board, but rather to initiate a discussion on technology assessment and its institutionalisation in Congress.

A.3.29. In the period thereafter, Congress, with the help of four studies, which it commissioned, studied the problems of TA. The studies were undertaken by the Library of Congress, the National Academy of Engineering, the National Academy of Sciences, and the National Academy of Public Administration. The Subcommittee on Science, Research, and Development also organised many seminars and hearings, both to have the basic information in the studies evaluated, and to supplement it.

A.3.30. The second legislative proposal in April 1970 found supporters from both parties. It demanded a TA office for the legislature, governed and supervised by a TA Board. Several hearings on the organisation of an Office of Technology Assessment (OTA) followed; they led to a third proposal laid before Congress in July 1970 and February 1971. Out of this proposal came the Technology Assessment Act passed by the House of Representatives in February 1972, accepted with a few amendments by the Senate in September 1972 and signed by the President in October 1972.

A.3.31. In 1973, on the basis of this law, the organs of the OTA were created, that is the Technology Assessment Board (TAB), the Director of the OTA and his staff, and the Technology Assessment Advisory Council (TAAC):

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(1) U.S. Congress, House of Representatives, Technology Assessment Statement of E.Q. Daddario, Chairman, Subcommittee on Science, Research, and Development of the Committee on Science and Astronautics, 90th Congress, 1st session, U.S. Government Printing Office, Washington 1967.

- The TA Board is made up of 6 senators and 6 representatives, belonging in equal proportions to the minority and majority party, as well as the non-voting director of the OTA. It is the political governing body; among other things, it decides what studies are to be undertaken.

- The director of the OTA is elected by the Board for 6 years, and has to manage the office according to the guidelines of the Board.

- The TA Advisory Council is made up of 10 members nominated by the Board, the Comptroller General and the Director of the Congressional Research Service. It has to pass judgement on the work of the OTA; to check TA results and to make proposals for work.

A.3.32. The OTA is entitled to call on the services of the Congressional Research Service and of the General Accounting Office. It is also to cooperate closely with the National Science Foundation, in order to avoid duplication of research activity. The chairmen of the Committees and Joint-Committees, the TA Board and the director of the OTA (after prior consultation with the Board) have the right to initiate technology assessments.

A.3.33. The first chairman of the TAB was Senator Edward M. Kennedy, who was succeeded in 1975 by Congressman Olin E. Teague. The first director of the OTA is Emilio Q. Daddario. Among others, Jerome B. Wiesner, the President of MIT, belongs to the TAAC.

A.3.34. The Office of Technology Assessment began sponsoring projects early in 1974. Priority for contracts is given to six areas: food, energy, the oceans, materials resources, health, urban mass transportation. In November 1974 the OTA let its largest contract so far. For $ 500,000 Braddock, Dunn and MacDonald, Inc., who have mostly specialised in the analysis of weapon-systems, are to carry out a study on "potential on- and offshore risks, costs, and benefits of exploiting the potential uses of the outer continental shelf off the coasts of New Jersey and Delaware, with particular emphasis on oil and gas recovery and transportation, and the siting of nuclear power plants".

Inventories of TA activities in the USA

A.3.35. The most comprehensive inventory of TA activities in the USA so far was commissioned by the National Science Foundation (NSF)[1] and carried out between 1970 and 1972 by Peat, Marwick, Mitchell & Co. According to this inventory government authorities such as the Food and Drug Administration, the National Bureau of Standards and the Department of Commerce began in the mix-sixties to contract out or carry out themselves assessments on new medicines, transport systems, communications, etc. Around 500 of the 2000 government agencies, research institutes, universities, associations and corporations contacted in this study answered that they had groups carrying out TA studies. In total 1342 studies were mentioned, which corresponded to the TA definition used. They are divided up in the following way:

Federal Government	559
States and Communities	140
Commercial undertakings	362
Private research institutes, associations, foundations, etc.	148
Universities	133
	1,342

A.3.36. Apart from the inventory by Peat, Marwick, Mitchell & Co., the NSF financed two further investigations on TA studies. One was by V.T. Coates, carried out in the framework of the Program of Policy Studies in Science and Technology at the George Washington University. It analyses technology assessment in the US Federal Government (1972; 97 studies).[2] The other was a detailed comparative analysis of a selection of important TA case studies and was carried out by the MITRE Corporation (1973; 13 studies).[3]

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(1) Peat, Marwick, Mitchell & Co., A Survey of Technology Assessment Today, Washington 1972.

(2) V.T. Coates, Technology and Public Policy: The Process of Technology Assessment in the Federal Government, 2 vols. and summary report, George Washington University, Washington, D.C., 1972.

(3) M.V. Jones, A Comparative State-of-the-Art Review of Selected U.S. Technology Assessment Studies, MITRE Corporation, Washington, May 1973.

A.3.37. The 13 comprehensive TA case studies analysed by the MITRE Corporation (among them the 9 studies classified as "wide-scope assessments" by V.T. Coates), not only had a significant influence on subsequent policy decisions; they were also valuable in assessing the organisation and costs necessary for such studies and the usefulness of the methods applied.

A.3.38. The majority of these 13 studies start from problems of energy supply and transport. An analysis of 106 American TA studies undertaken by the Studiengruppe für Systemforschung, Heidelberg, revealed that about 80% of these studies fall into the categories of energy supply, transport, environmental damage, and communication/data-processing.(1) In the education and health sector technology assessment in America still plays an insignificant role.

Aspects of the organisation of TA studies

A.3.39. Ministries and other government agencies quite often entrust TA analyses and TA-like studies to "in-house" analysis teams. Of the 97 studies undertaken in the Federal Government and analysed by V.T. Coates:

- 42% by contractors,
- 38% were carried out by in-house teams,
- 9% in cooperation between the government and the contractors,
- 6% by special panels of leading experts,
- 4% by inter-agency groups.

Partial TA studies were mainly done by contractors.

A.3.40. V.T. Coates has established that the US Federal Authorities - when contracting out - give preference to non-university institutions. Only 15% of the 97 investigations went to university teams (of a total of 42% for outside contracts). Of the 9 "wide-scope assessments" only one was carried out by a university.

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(1) Studiengruppe für Systemforschung, Expert Report on Technology Assessment, commissioned by the German Bundestag, Heidelberg, August 1974.

A.3.41. The organisation and general methodology of many of the more recent TA analyses - not only in the USA - have been influenced by a study of the MITRE Corporation published in 1971: "A Technology Assessment Methodology", which was carried out in conjunction with and on commission of the Office of Science and Technology (Executive Office of the President). This six-volume work contains a proposal for a general methodology (procedural plan) for carrying out TA analyses, as well as 5 model case studies for checking and demonstrating the proposed methodology.(1) "A Study of Technology Assessment", a report commissioned by the American Congress from the Committee on Public Engineering Policy of the National Academy of Engineering and published in July 1969, has also been of considerable importance for the shaping of TA studies.(2) It contains 3 experimental TA case studies on the subjects of technology of teaching aids, subsonic aircraft noise, and multiphase health screening.

TA activities of the OECD

A.3.42. The OECD is at present probably the most "TA active" international organisation. At the beginning of 1970, it called upon its member states to participate in the solution of the conflict between desirable and necessary technical innovation and unforeseen damage to the human environment; and to become active in the assessment of new technologies before and after their introduction. There are, in particular, two bodies of the OECD which deal with these problems; namely the Environment Committee (until 1970 the Committee for Research Cooperation) and the Committee for Scientific and Technological Policy.

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(1) The MITRE Corporation, A Technology Assessment Methodology, project summary and 6 vols., Washington, D.C., 1971.

(2) U.S. Congress, House of Representatives, Committee on Science and Astronautics, A Study of Technology Assessment, Report of the Committee on Public Engineering Policy, National Academy of Engineering, July 1969, U.S. Government Printing Office, Washington 1969.

A.3.43. The Environment Committee of the OECD is made up of Sector Management Groups for water (1967), air (1968), chemicals (1971), and urban environment (1971). They are composed of government officials from the corresponding departments in the member states. These groups have carried out a series of environmental studies, that can be called "partial assessments". This is also true of some studies undertaken by ad hoc groups of the Environment Committee, in which certain environmentally dangerous technologies or industries have been analysed and where the economic and political consequences of protection measures have been assessed.

A.3.44. The Environment Committee is paying increased attention to the analysis and evaluation of environmental policy measures (taxes, subsidies, licences) with particular emphasis on the effects of environmental protection technologies on the competitiveness of the industries concerned.

A.3.45. The Committee for Scientific and Technological Policy of the OECD has taken up TA in the stricter sense. One of the three main points in its programme for the seventies, is the assessment of probable social and economic consequences of technological innovation. On this basis an Advisory Group on Control and Management of Technology was formed in 1973. It deals with questions of technology assessment, but especially with the political problems and aspects of implementing TA studies within the OECD. An expert panel of this Advisory Group supported the OECD Secretariat in setting up methodological guidelines for TA studies.

A.3.46. The members of the Advisory Group took stock of TA in their countries and placed the results at the disposal of the OECD Secretariat for a comparative analysis. Further it worked out a preliminary and very general list of fields in which on the national, multi-national, and OECD level, TA studies seem particularly essential. In July 1974 in a meeting of the Advisory Group the following subjects were selected on which national research teams are to carry out TA analyses, which the OECD later wants to bring together in a comparative report:

- New Urban Transportation Systems
- Humanised Working Conditions
- Telecommunications as an Instrument of Regional Planning and Balanced Regional Economic and Social Development.

ANNEX 4

Cost of Europe Plus Thirty

A.4.1. This appendix supplements page 25 of Part IV above.

In arriving at a cost figure for Europe Plus Thirty at the end of its build-up phase the number of professional staff is established at 75 for the reasons given on page 11 of Part IV.

Taking an average number of supporting staff per professional staff member of 1.5 results in some 110 supporting staff at the end of the build-up phase.

If we assume the division of cost at the end of the build-up phase as being 2/3 in-house cost and 1/3 contracts, (see Part IV, p. 6.) the average cost of professional staff including overheads (in 1975) is 32.000 units of account, and the average cost of supporting staff is 16.000 units of account. The cost of Europe Plus Thirty at the end of the build-up phase is thus as follows (at 1975 prices):-

	U.A. (1975)
a. in-house work	
professional staff	2.400.000
supporting staff	1.760.000
b. contracts	1.200.000
c. publications - seminars etc.	240.000
	5.600.000

Build-up of staff and cost during build-up phase

A.4.2. In the table below, the costs are given for each of the first five years of the Europe Plus Thirty institute.

	Numbers of professional staff	Cost in U.A. (1975)
preparatory phase	2	150.000
1st year of build-up	15	1.100.000
2nd year of build-up	35	2.700.000
3rd year of build-up	55	4.100.000
4th year of build-up	75	5.600.000

We are not sure a support ratio of 1.5/1.0 is high enough. If a higher figure were adopted, say 2/1, the increase can easily be calculated.

N.B. We have not included anything for the cost of the Council of Europe Plus Thirty. It will be small compared with the rest and we recommend the Commission of the European Communities work it out with the first Chairman.