The **IPTS** *REPORT*

EUROPEAN COMMISSION
Joint Research Centre

ENGLISH VERSION

ABOUT THE IPTS REPORT

*T*he IPTS Report is produced on a monthly basis - ten issues a year to be precise, since there are no issues in January and August - by the Institute for Prospective Technological Studies (IPTS) of the Joint Research Centre (JRC) of the European Commission. The IPTS formally collaborates in the production of the IPTS Report with a group of prestigious European institutions, forming with IPTS the European Science and Technology Observatory (ESTO). It also benefits from contributions from other colleagues in the JRC.

The Report is produced simultaneously in four languages (English, French, German and Spanish) by the IPTS. The fact that it is not only available in several languages, but also largely prepared and produced on the Internet's World Wide Web, makes it quite an uncommon undertaking.

The Report publishes articles in numerous areas, maintaining a rough balance between them, and exploiting interdisciplinarity as far as possible. Articles are deemed prospectively relevant if they attempt to explore issues not yet on the policymaker's agenda (but projected to be there sooner or later), or underappreciated aspects of issues already on the policymaker's agenda. The multi-stage drafting and redrafting process, based on a series of interactive consultations with outside experts guarantees quality control.

The first, and possibly most significant indicator, of success is that the Report is being read. The issue 00 (December 1995) had a print run of 2000 copies, in what seemed an optimistic projection at the time. Since then, readership of the paper and electronic versions has far exceeded the 10,000 mark. Feedback, requests for subscriptions, as well as contributions, have come from policymaking (but also academic and private sector) circles not only from various parts of Europe but also from the US, Japan, Australia, Latin America, N. Africa, etc.

We shall continue to endeavour to find the best way of fulfilling the expectations of our quite diverse readership, avoiding oversimplification, as well as encyclopaedic reviews and the inaccessibility of academic journals. The key is to remind ourselves, as well as the readers, that we cannot be all things to all people, that it is important to carve our niche and continue optimally exploring and exploiting it, hoping to illuminate topics under a new, revealing light for the benefit of the readers, in order to prepare them for managing the challenges ahead.

C O N T E N T S

EDITORIAL

World Trade negotiations after Seattle: The road from here

Dimitris Kyriakou and Giorgio Di Pietro, *IPTS*

I n the editorial of the April issue (43) of 'The IPTS Report' we argued that the abortive Seattle WTO meetings signalled a failure of a kind unseen in previous trade negotiations. In past rounds impasses reached usually involved technical/legal issues, which specialists could (and did) revisit, in order to sculpt a carefully worded, consensus-seeking text. Such impasses did not question the fundamental continuity of the process. In Seattle however, there were deep political divisions, with the less developed countries (LDCs) appearing uncharacteristically united. There was denunciation of the procedures, and not just the texts. There was little scientific and technical (S/T) preparation, both overall as well as on specific issues, to help clarify the terms of the debate, the stakes, the repercussions of alternatives considered. Policy choices did not ground their legitimacy in an S/T-informed process, and failed to look more than the result of power struggles, untamed by cool-headed analysis.

Reduced legitimacy opened up the way to attacks on the organization itself, and even public outcry on the streets by groups which descended on the city, stinging the WTO like a swarm of bees. Even if their protests played a small role in producing the debacle, they may well feel they have made their mark, won this battle and be emboldened for similar undertakings in the future against other international organizations which should be prepared for such an eventuality (the experience of the World Bank and IMF may be informative here).

Moreover we suggested that it was easier when trade round targets were numerical and hardly something against which to rally wide support. Reducing tariffs from 20 to 10% does not touch on what a country stands for; labour standards, food safety, environmental treatment come much closer to the hard core of sovereignty, the values by which a society lives. Past rounds (especially the previous one) conveniently postponed thorny issues for future rounds. As we reach the hard core of resistance against making everything secondary to trade expansion, the cost of going that extra liberalization mile rises very steeply.

Before we set our hopes too high on a serious relaunching effort before the US elections, we should take a few considerations into account: First, sufficient time should be given to allow experts to lay the groundwork to ensure success, to avoid another, even more devastating, ministerial level failure. Second, one must realistically assess the political incentives of US leaders in the next few months. Although in Davos US President Clinton endorsed a renewed effort towards a new

trade round, his reassertion of the importance of environmental and labour issues recalls the difficulties encountered in Seattle. Moreover, these issues appeared again in his last State-of-the-Union address as US President, where he effectively outlined what he may consider central elements of his legacy, and issues for his vice-president to campaign on. Thinking towards November, the US Reform Party which did extremely well in 1992 on a protectionist agenda will make Clinton/Gore unwilling to risk giving away an important part of their support base to a protectionist Reform party candidate.

The wise approach then would be to move very cautiously on issues where there is already apparent agreement: reviewing WTO procedures, increasing transparency, providing technical assistance to LDCs, instead of letting NGOs do it, enhancing confidence in the WTO, and addressing pending/urgent issues (relaxing quotas, electronic commerce, etc.). Moreover, whenever a new meeting does take place, the organizers will likely exhibit less fanfare, and choose a site which is neither in the US nor the EU. The latter attract both demonstrators and media; they also allow powerful headlines and dismay among the population, in case of protests.

More generally, the WTO may be a victim of its own meteoric rise: the WTO may have become too powerful too fast, threatening dearly-held paragons of sovereignty. It has enforceability powers unprecedented for a non-military international organization. It will either adapt by taking on more dimensions (such as environment, labour standards, etc.) of issues into consideration, effectively taking on more powers; or it will accept a gradual diminution of its power, allowing countries exemptions from enforcing its rulings, until its decisions assume a moral value, rather than a binding character. The third option that some entertain will keep the WTO as is and create other forums for environmental, labour, food safety, etc. issues. However this would imply that such institutions should be able to enforce their rulings, and when their rulings run contrary to those of the WTO, because of their different emphases/priorities, the result could well be paralysis.

In order to defend itself against attacks the WTO may try to co-opt NGOs (and recent suggestions for bringing them from the streets to the boardroom point this way), just like the World Bank did after it was attacked in 1994, involving them in much of what it does. It will be however harder for the WTO; it does not have the resources of the World Bank, and it will need to convince reluctant member states to increase its budget. It will not be surprising nevertheless if the WTO starts subcontracting studies to NGOs, jointly launching projects with them, and helping them finance activities in the future.

Beyond the above implications, specific to the WTO and the trade round, there are two more general ones. First, NGOs and anti-globalization activists have emerged stronger. The NGOs can swarm targets, coordinate attacks, and galvanize diffuse discontent in media-savvy ways. The talks may have provided inadvertently the catalyst for authority-questioning coalitions, even across national, linguistic, and other borders. They may even have enunciated an opposite pole to those perceived to have overwhelmingly benefited from liberalization and rising capital mobility so far. Maybe, after all, like most games, globalization is a game at which two can play.

Second, the Seattle failure has been a sharp reminder of the importance of bringing sound science closer to, and integrating it into, sound governance, in a way that is accountable, transparent, thorough, impartial and credible, and which will help focus the policy debate on the merits of proposed actions. Such integration will

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provide reference quality information and analyses, presenting in a distilled, user-friendly fashion what we know, what we do not know, and the extent of the uncertainties and risks involved in different actions. The Seattle talks suggest a glaring example of this need. Back in the early nineties the US Food & Drug Administration (FDA) gave its approval to the marketing of genetically modified food in the US. There was little if any collaboration-coordination with European-level counterparts.

Given recent suggestions that due to mounting pressure in the US the FDA may re-examine the issue, one can wonder whether early contact between the FDA and a European level organization might not have averted a quick approval by the FDA, and ultimately the trade tensions regarding genetically modified food. Collaboration at an S/T level might have ironed out differences, or at the very least, allowed better early warning and more time to deal with trade issues.

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An Analytical Framework for Assessing Sustainable Urban Mobility

Laura Lonza and Hector Hernández, *IPTS*

Issue: The Urban Mobility Agenda has broadened its scope from just transport issues to its present holistic approach including social, economic and environmental aspects of mobility. That is why urban mobility measures should be systematically and comprehensively assessed, with attention given to 'impacts' rather than 'outputs'. Moreover, the evaluation process needs to be transparent.

Relevance: Within the broad goal of sustainable development, urban policy-makers need sound evaluation frameworks to help them balance conflicting policy objectives such as fostering economic development and minimizing environmental stress. This need is particularly felt when tackling urban mobility, where dynamic information patterns are required to ensure monitoring of progress and to keep policy-makers constantly up-to-date.

Introduction

Sustainable Development has permeated policy-making at all levels[1]. The application of the sustainable development concept to urban areas is essential for a number of reasons. In economic terms, these reasons include the fact that cities are the engines of growth and centres of power. In environmental terms, urban areas pose serious challenges and place increasingly heavy burdens on the global environment (e.g. in terms of climate change), particularly in relation to the balanced use of resources and disposal of pollutants. And in social terms, urban areas shape lifestyles and are the prime reactors to change. Moreover, the phenomenon of urbanization is a growing worldwide, making the issues it raises yet more pressing.

Mobility in urban areas is closely linked to the economic, environmental and social aspects of life in cities and it is part of what enables them to be vital centres of activity. Moving towards sustainable urban mobility means mitigating the negative externalities of transport, such as air and noise pollution. It also calls for resource conservation, reducing energy consumption, easing congestion and resolving equity concerns.

The first part of the article presents an analytical framework to appraise sustainable mobility policy measures in urban areas. Existing research trends and results point in the direction of cross-sector[2] integration as the solution to the sustainability riddle.

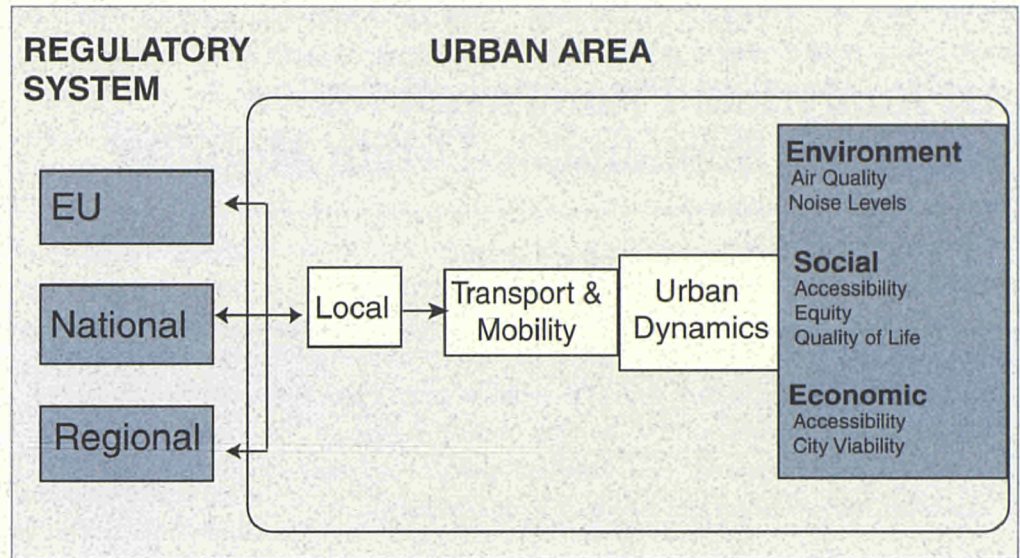A set of criteria derived from the application of the analytical framework is presented in the

Mobility in urban areas is closely linked to the economic, environmental and social aspects of life in cities and contributes to their role as vital centres of activity

Figure 1. Analytical Framework for Urban Mobility

Effective handling of cross-sector issues requires an impacts-driven approach to public policy, where structures, systems and processes are designed around the policy problem to be solved rather than having the problem defined in terms of the existing system

The framework for analysis proposed here aims to identify and characterize drawbacks and success factors for evaluation

second part. Strengths and weaknesses of specific measures for improved urban mobility are identified. Good-practice examples are taken from a range of urban mobility policy and technical measures to illustrate the criteria outlined.

A framework for analysis

An analytical framework is a useful way of drawing attention to the public policy system as a whole and to the need to see cross-sector issues as being characteristic of the policy system. Better handling of cross-sector issues is not just a matter of better tools and techniques, although they have their place, but of a fundamentally different approach to government. It seems that effective handling of cross-sector issues requires an impacts-driven approach to public policy, where structures, systems and processes are designed around the policy problem to be solved rather than having the problem defined in terms of the existing system. Moreover, a framework for analysis is useful in that it helps to identify limiting factors and critical areas for intervention, define

priorities, and provide a balanced view of the impacts of policy actions within a specific urban context. A schematic representation of an Analytical Framework for urban mobility is presented in Figure 1, showing the main areas and levels of competence concerned, together with their interactions.

Because each urban area is different, there can be no single quick-fix solution. The framework for analysis proposed here aims to identify and characterize drawbacks and success factors for evaluation. An inductive approach has been adopted, using indicators providing information so as to take into account the unique characteristics of each urban area.

From the analytical framework to indicators

The assessment of transport policies and their impacts on sustainability implies the need to represent complex phenomena. A set of indicators based on quantifiable and available information can provide concise information highlighting

what is happening in a large system, giving the opportunity to compare across sites and a useful and relatively quick way of displaying reality. Indeed, provided a number of criteria are respected, indicators can offer a reliable representation of systems.

Indicators make it possible to present results to non-technical experts such as policy-makers and citizens in a 'catchy' way, as well as allowing comparisons. Sound criteria must be considered when selecting indicators: (1) close correlation to the objectives set in order to achieve sustainable mobility; (2) quantitative and monitored data; (3) available —or easily obtainable— and reliable information; (4) close correlation with policy agenda and organizational schemes; (5) transparency, and avoidance of biases in favour of specific interests.

A set of indicators has been developed by analysing relevant sources in this area. The area of urban dynamics covered by the selected indicators includes the environment, land-use, city economic profile, and information about the organizational aspects of the public authority at the local level with regard to transport and mobility.

These indicators were subsequently grouped according to the three dimensions of sustainable development, namely social, economic and environmental values. These latter feed, in turn, into the urban system and bring us back to the analytical framework (see Figure 1). Although mobility-related measures may mainly affect the Transport and Mobility Component of the Urban System, their impacts are pervasive. Specifically, it is interesting to see how the regulatory framework

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Table 1. Selected Indicators Representing Urban Mobility

Needs	Main Areas Impacted by Transport	Quantitative Indicators
Social	Accessibility Mobility Equity Economic Activity (Enabler) Traffic Density (Congestion) Air Quality	• Urban Land Cover • Built-up Area • Open Areas • Derelict Areas • Urban Renewal Areas • Area Dedicated to Transportation Network • Mono-functional Areas • Land-use Distribution by Housing Units • Proximity to Urban Green Spaces • Urban Population Density • Employment Distribution in Productive Sectors/ Weight of Small and Medium Enterprises (SMEs)
Economic	Acoustic Quality Spatial Development (including Accessibility of Green Spaces) Rational Use of Materials and Energy Technical Safety and Personal Security in Vehicles and Transport Infrastructure	• Unemployment • Employment of People with Reduced Mobility • Concentration of local pollutants (e.g. SO_2, NO_x, CO, PM, Lead, Benzene) • Exposure to Noise (inhabitant per time period) • Car Ownership • Modal Split • Traffic Volumes/ Average Vehicle Speed • Commuting Patterns
Environmental	Visual Impact Preservation of Cultural Heritage	

is implicated in the process at the local level but also at the regional, national and EU level.

Using the analytical framework: relevant criteria

Despite the need to substitute functional separations with a holistic approach in urban policies, in-depth analysis is still crucial in order to establish the links between sectors of intervention and areas of impact. Therefore,

maintaining a specific focus on mobility is not contradictory. Additionally, the diversity of urban realities makes it highly desirable —although extremely difficult— to transfer experiences.

To achieve sustainable mobility in urban areas, many trade-offs must be faced. It is up to local decision-makers to recognize shortcomings and engineer them out of the urban mobility system. Therefore success depends on an integrated approach to closely related policy areas.

A number of factors have been identified as being important for success when analysing urban mobility measures with the proposed framework, such as long-term evaluation, coordination of transport and spatial development, and competence levels

Box 1: The Strasbourg Experience

The Urban Community of Strasbourg adopted in 1989 a far-reaching policy to modify transport patterns and urban space usage. Referring to the analytical framework, intervention on the Transport & Mobility component took place affecting Urban Dynamics. The overall goal was split into three objectives: reducing private car traffic (accounting for 72.5% of urban transport in 1989); increasing public transport use (11% of urban transport in 1989); and, if possible, increasing the use of bicycles (approximately 12% in 1989). Acceptability was checked via a household survey in 1989. In 1995, public transport services (trams and buses) were meeting the identified targets of a 30% increase compared to 1992 with a 32% increase in passengers, around 50% of them using park-and-ride facilities, which proves the popularity of the mix of measures. In 1995, traffic entering the wider city centre had decreased by 17% compared to 1992. Since 1997, a study has been under way involving the regional and national levels to see how public transport could be made more attractive in urban and suburban areas via improved co-ordination of rail and tram services.

The objectives were achieved via a mix of measures, ensuring a balanced impact on the three dimensions of sustainability. Accessibility and equity grew thanks to increased transport alternatives. The city gained in terms of the attractiveness and economic viability of its centrally located businesses through improved accessibility and its image of a forward-looking, dynamic urban area. Environmental quality improved thanks to the reduction in through-traffic.

Strategic objectives were clearly identified and shared by stakeholders, targets were defined and monitored, and care was taken to achieve a balanced impact on the various aspects of urban life. The analytical framework allows identification of the strengths of the policy adopted (on-going political commitment of the local administration), its weaknesses (limited involvement of the private sector), and therefore allows the site-specific and transferable aspects of the Strasbourg experience to be distinguished.

What is equally interesting is that the local administration functions as the innovation agent exporting its mobility policy to the surrounding regions and fostering the adoption of innovative mobility patterns. That is, original objectives are being adapted to new spatial and time horizons. (see: **http://www.www.transports-strasbourg.org**)

This is not an easy or straightforward task. Evaluating whether needs are being taken into account in a balanced way has to reflect a number of criteria going beyond the sectoral approach adopted so far. The process of moving from the vision of an integrated approach to its actual achievement is as yet far from being achieved. A number of factors have been identified as being important for success when analysing urban mobility measures with the proposed framework, such as long-term evaluation, coordination of transport and spatial development, and competence levels. These are discussed below.

Long-term evaluation using indicators

To evaluate the implementation of any given set of mobility measures correctly, it is crucial to define objectives, targets and indicators clearly. Nonetheless, dynamism must be given an appropriate place. No policies are carved in stone. The purpose of defining objectives, targets and indicators is to help monitor changes and, where changes are not achieved, to revise those elements which have not worked as initially foreseen.

Coordination of transport and spatial development policies

Interconnecting transport infrastructures with spatial planning is fundamental to try and steer urban mobility towards more sustainable patterns. This relationship determines the type and level of traffic. It also determines the activity of all other modes (pedestrian, public transport, etc.) and what happens to the connections between modes. Changing the balance between mobility needs and spatial planning changes the environmental impacts of transport and the social texture of urban areas. It is crucial to understand how this happens, and this involves understanding the relationships involved.

Competence levels, intervention areas and the spatial scope of urban mobility problems

Despite the different degrees of competence over urban policy matters, the problems, their causes, their evolution and, most importantly, their interrelationships with dimensions outside the transport sector need to be known in detail. If strategic long-term objectives and targets to measure their progressive achievement – or, conversely, their need to be adjusted – are to be decided upon in an efficient way, then the framework within which the dynamics of the system operate needs to be clearly outlined. Moreover, it also needs to be comprehensible to non-experts.

Fostering partnerships to reduce conflicts in urban mobility

Policy actions involving a large number of actors benefit greatly from partnerships with other organizations. That is why mobility managers have to consider working together with other departments, other local authorities and tightening links with the community and local transport operators. Improved cooperation patterns within the public sector are only a part of the process and partnerships with major employers and transport operators in and around the urban area are also highly important.

Conclusions: Using the analytical framework to monitor progress

Urban mobility actions belong to the urban dynamic and should be followed over time. That is why the impacts of any new measures and policies need to be checked systematically via a clearly defined monitoring programme.

Monitoring is a pre-requisite for optimizing system performance, i.e. to see how things have changed and whether targets are being met before taking corrective action. The aim of

Policy actions involving a large number of actors benefit greatly from partnerships with other organizations. Thus, mobility managers should consider working together with other departments, other local authorities and tightening links with the community and local transport operators

Box 2: Car-Free Housing in Hollerland

The Car-Free Housing project in the Hollerland area in Bremen was planned in 1992 as a first new housing area for a more car-independent lifestyle. With reduced space requirements for parking, car-free residential planning is primarily a housing project with attractive social spaces, fully geared towards quality of life for residents and where traffic-related planning constraints play a secondary role. The road network and the parking spaces for visitors, car-sharing and handicapped residents represented only 17% of the total area compared to the usual 40% in a traditional urban area.

Although the Bremen Hollerland project was stopped, the idea of a car-free area in an urban district overturns the dominant principles of the automobile society and rejects the conviction that modern urban life is impossible without a car. Additionally, it has been the starting point for several other projects in Bremen and other European cities. It has had an impact on the regulatory framework beyond Bremen city-state as the Ministry for Urban Development, Culture and Sport in North Rhine-Westphalia has set up a support programme for car-free living.

As regards the analytical framework, the Bremen Hollerland project was not backed up by information on the environment, social and economic (mainly) indicators and did not succeed in having a sufficiently strong impact on Urban Dynamics by affecting dominant patterns in the Transport & Mobility component. (see: **http://194.7.159.227/GEDdata/1999/03/23/00000088/69E.htm**)

The aim of monitoring is to compare situations whether differing in time, space or both. The use of indicators and a transposable analytical framework allows benchmarking of results across urban areas

Box 3: Mobility in Turin

The 5T project approach to mobility problems in Turin was led by high technology solutions aiming at reducing travel times by 25% and decreasing both mobility-related air pollution and energy consumption by 18%. The system developed is an open architecture covering urban traffic control, public transport management, priority for emergency vehicles, parking control and management, environment monitoring and control, driver information, fares and debiting. Since its inception in 1992, the main actors involved were the local public transport operator and other public and private partners.

As regards the analytical framework, the positive impacts of 5T on Transport & Mobility in the Urban Area have produced far-reaching effects on organizational schemes within the city boundaries and beyond. Regulatory frameworks are being revised to (a) extend the application to the whole public transport network and (b) turn the project consortium into a new body in charge of the management, integration and development of mobility in the area of Turin. A revision of the distribution of competencies is therefore under way at the local, provincial and regional levels (mainly for environmental monitoring concerns) and a new approach to the organization of the recently defined Metropolitan Areas are some of the outcomes of the 5T project. (see: **http://www.trentel.org/transport/frame1.htm)**

monitoring is therefore that of comparing situations whether in time, space or both. The use of indicators and a transposable analytical framework allows benchmarking of results across urban areas.

Using a twofold approach to monitoring seems to provide a comprehensive picture of the urban mobility system. On the one hand, there are the activities, initiatives and interrelationships of the regulatory system at different levels concerning specific mobi-

Box 4: Green Commuter Plans

A Green Commuter Plan is a site-based plan of action, implemented by an employer in partnership with its staff, which aims to reduce low occupancy car commuting. The plan promotes alternative modes of transport among regular car commuters. In Nottingham, a Commuter Planners' Club was established to provide a meeting point to commuter planners to exchange ideas, initiate projects and formulate common positions on shared problems.

The first Commuter Planner Club was established by Nottingham City Council following discussion with Commuter Planners after realizing that they faced essentially the same difficulties and that joint working would be highly beneficial. Regular meetings are held, hosted by each of the Commuter Planning organizations in turn. The main activities of the group involving both the public and the private sector centre on identifying common problems, working towards and lobbying for solutions.

The Commuter Planners Club has created a 'Tax sub-group' lobbying for tax revisions. At present, the UK tax system treats most financial commuter plan incentives as taxable benefits and the aim is to revise this approach. The Commuter Planners Club has also led to the formation of new partnerships such as the Cycle Friendly Employers Group which was successful in attracting funding from the Government to provide facilities and incentives for staff.

As regards the analytical framework, the Commuter Planner Club impacts the Urban Dynamics component. All other components of the urban system are affected, namely socio-economic dimensions of urban living. Although the local regulatory level has been involved from the beginning as a promoter of innovative approaches to commuting, the impacts are far-reaching, pushing for changes at the regional and national levels. (see: **http://utc.nottscc.gov.uk**)

lity actions. On the other, information is collected and impacts of given actions assessed via the use of indicators and a coherent scheme to analyse their impact on the three dimensions of sustainability.

The proposed framework aims at visualizing:

• Which aspects need to be checked regularly;
• Who is responsible for monitoring;
• How the monitoring will be done;
• How the results will be disseminated to stakeholders, and;
• How results will lead to reviewing the action monitored.

Methods used for monitoring need to be kept consistent over time so that results can be compared properly. In any case, they should be kept simple. And, certainly, it is essential to keep up the momentum: successful results need to be publicized and information about upcoming steps widely disseminated.

To conclude, we would reiterate the importance of appropriate institutional engineering in the striving towards sustainability. Technological and infrastructure improvements can help mitigate harmful effects of urban travel, but they will never solve the problem. They are instruments for producing fruitful results if planned and handled in an appropriate way to meet clear, understandable and acceptable objectives which are sustainable.

Indeed, it is only when they are embedded in a decision-making structure with clearly defined

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common objectives that monitoring tools, assessment strategies or methodologies, of whatever kind, can fully display their beneficial aspects.

In this article, we have put forward a tool to help identify policies that would help solve or at least mitigate urban mobility problems. The comparative approach is crucial both within and across urban areas to learn from one's own failure and successes as well as from others' experiences. The analytical framework proposed aims, therefore, at learning from best practices by helping readers identify site-specific and transferable success factors.

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Notes

1. Probably, the best-known definition of sustainable development is that proposed by the World Commission on Environment and Development (Bruntland Commission) in the publication "Our Common Future" in 1987: *"development that meets the needs of today's generation without compromising the ability of future generations to meet their own needs."*

2. 'Cross-sector' is intended in this article as what combines or pertains to two or more sectors. 'Sectors' are intended as fields or areas of intervention by the public authority.

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The .eu Domain: Issues for a Pan-European Registry Organization

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Issue: In seeking to strengthen the image and infrastructure of electronic commerce within the European Union, the Information Society Directorate, DGINFSO, issued a proposal regarding the creation of a .eu top-level domain on 2 February 2000.

Relevance: From an Internet user perspective, both the reception of a .eu TLD, and the authority of any eventual pan-European Registry Organization, will be closely related to the way in which the policy implications of this initiative are resolved.

Introduction

The Domain Name System (DNS) is one of the fundamental architectures facilitating the identification of specific locations on the Internet. The DNS is hierarchically structured in accordance with an inverted tree schema (see Figure 1). The domains immediately below the root are known as top-level domains (TLDs). At present there are three types of TLDs: (i) generic top-level domains (gTLDs); (ii) country-code top-level domains (ccTLDs); and (iii) top-level domains restricted to use by the United States government (see Table 1).

Internet users may register names at either the ccTLD or gTLD level. Within Europe, ccTLDs tend to be administered at the national level in accordance with policies that restrict the acceptance of name registrations to users within national jurisdictions. However, there are some exceptions to this approach. For example, the registration policies of the Austrian, Danish,

Luxembourg, and United Kingdom registries do not require name registrants to have a clear affiliation with these countries. The registration of names at the gTLD level, on the other hand, is currently administered by the US-based company, Network Solutions Inc. By far, the most popular domain it administers is *.com*, with approximately 12 million names registered in it in the spring of 2000. In contrast to the majority of European ccTLD registration policies, the acceptance of applications for names at the gTLD level is not linked to of the country in which registrants are based.

In the light of a growing scarcity of desirable names in the *.com* gTLD, and the different registration policies associated with national domains, expanding the DNS to include a *.eu* domain has the potential to benefit European Internet users in a number of ways:

- A *.eu* domain would provide European Internet users with greater choice in selecting TLDs within which to register names. Therefore, for European Internet users the creation of a *.eu*

Internet users wishing to register a domain name currently have a choice between registering under the generic, non-geographical top-level domains such as .com, .net, and .org, and national top-level domains, such as .uk, .fr, .de, etc.

Information and Communication Technology

Figure 1. Structure of the Domain Name Addressing System
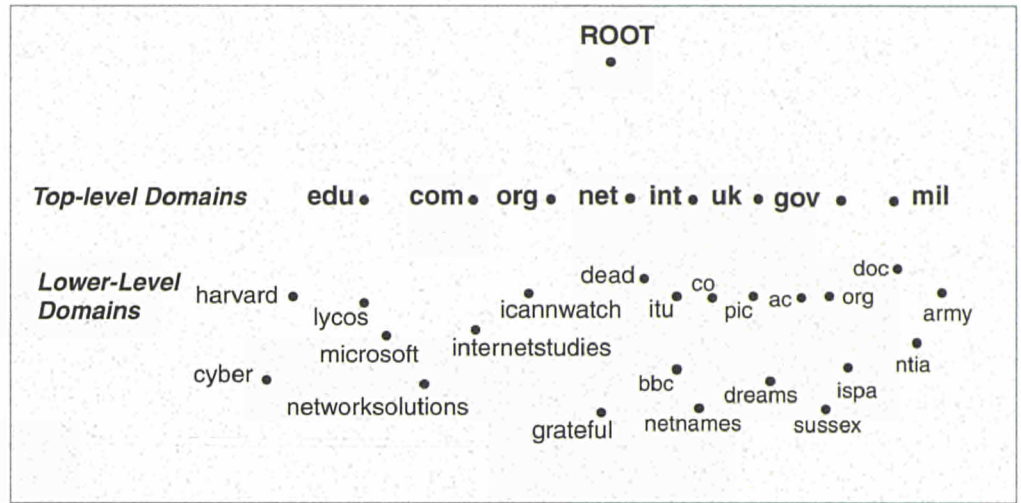
Source: Author's Diagram

Table 1. Defining Features of Top-Level Domains

Type of Top-Level Domain	Defining Features
Generic top-level domains (gTLDs)	• International in scope; • Not linked to any particular political jurisdiction; • Currently five in use: .com, .org, .net, .edu, .int
Country code top-level domains (ccTLDs)	• Linked to specific political jurisdictions; • Based generally on the two-character country codes detailed in ISO-3166 (ie. be for Belgium, fr for France, de for Germany)
Restricted Top-Level Domains	• .gov restricted for exclusive use by agencies of the United States Federal government; • .mil restricted for use by the United States military services and its agencies

Source: Author's Table

The requirements for registration under a national top-level-domain vary from country to country

domain could potentially reduce conflicts between name registrants over desired, or popular names and slogans.

• The creation of a *.eu* domain has the potential to increase opportunities for competition in the provision of registrar services in accordance with European Union competition and internal market law. This outcome, however, will be

contingent on the manner in which the registration system for this domain eventually is structured.

• The creation of a *.eu* domain might stimulate the further development of electronic commerce services in Europe by potentially fostering innovations in the development of value-added registration services. This would

be facilitated, in part, by the fact that this domain would most likely be administered through the implementation of unified registration rules applicable to all Internet users within the European Union.

- Given the linguistic diversity of Europe, the implementation of a .eu domain could also facilitate the development and implementation of multi-lingual naming technologies.

It should be noted, however, that these potential benefits are not restricted solely to European-based Internet users. They are applicable to any expansion in the number of available TLDs. In seeking to attain these potential benefits within the European context, a number of policy issues relating both to the .eu TLD, and the registry organization that may eventually be responsible for its administration must be considered.

Policy considerations for creating a .eu top-level domain

The notion of increasing the number of available TLDs has underpinned numerous political and legal controversies associated with domain naming since 1995. These conflicts have culminated in the drafting, and attempted implementation of no less than three separate regulatory frameworks including, the Internet Ad Hoc Committee (IAHC)/gTLD-MoU initiative, the United States government Green Paper, and the United States government White Papers on the Technical Management of Internet Addressing. The latter document served as the policy statement for the transfer of responsibility for the administration of the DNS to the private sector.

Responsibility for the introduction of new TLDs falls under the remit of Internet Corporation for Assigned Names and Numbers (ICANN). To date, its approach to expanding the number of TLDs has

been largely one of 'wait and see'. However, ICANN and its constituent organizations are expected to decide on whether, how, and when, to add new gTLDs to the DNS before the end of the year 2000.

In the light of this bottleneck, the European Commission has proposed that the .eu domain should be treated as a ccTLD (European Commission, 2000a). The territorial code EU has yet to be standardized or even included on the primary list of ISO-3166 two-letter country codes. Despite this fact, the European Commission is requesting that ICANN delegate a .eu domain on the basis of a decision by the ISO-3166 Maintenance Agency to reserve this two-letter code as a ccTLD identifier. Although the majority of respondents to the Commission's proposal expressed support for the establishment of a .eu domain (European Commission 2000b), this approach to its creation raises several policy issues whose resolution may influence how any future expansion of the Internet's TLDs proceeds.

- The creation of a .eu domain would entail the establishment of a supranational TLD that transcends the current dichotomy between ccTLDs and gTLDs. Consequently, the creation and allocation of such a domain would establish a precedent that other regional entities may seek to exploit so as to promote the development of inter-networking and electronic commerce in their respective jurisdictions. For example, if ICANN were to delegate the .eu domain as a ccTLD, one might foresee other regional associations such as the North American Free Trade Agreement (NAFTA), the Asia Pacific Economic Co-operation forum (APEC), and/or the Association of Southeast Asian Nations (ASEAN) also requesting the establishment of ISO-3166 letter codes to facilitate the creation of TLDs representing their respective regions. Simply put, other regional associations are also

The proposed .eu domain is intended to alleviate the current shortage of name space, and offer European registrants an alternative to both the national domains and the US-based generic domains

Although the need to increase the number of top-level domains has been apparent for some time, and a number of proposals have been made, as yet progress has been slow

*There is concern that
granting the European
Union the .eu domain
would open the
floodgates to
applications from other
regional associations*

*Some commentators
are concerned that
limiting .eu to the
European Union would
harm the development
of the Internet in
European countries that
are not a part of the EU*

in a position to claim that, on the basis of their respective size, economic importance, and the extensive use that could be made of new TLDs for the development of electronic commerce in these regions, the ISO-3166 Maintenance Agency should either create new codes, or reserve existing codes, for Internet related purposes.

- Although the European Commission is requesting that the *.eu* domain be allocated as a ccTLD, such a domain will be widely perceived by Internet users as an alternative, yet functional equivalent, to other gTLDs. Hence, the *Association des Industries de Marque* (AIM) has noted in its response to the Commission's proposal, that "appearance on the ISO 3166 list should not be a justification for *.eu*". Rather, "if the concept has merit it should win or die on that merit". The point being made here is that it remains unclear what added value a *.eu* domain would have over other gTLDs that may be created at a future date. Moreover, support for expanding the number of available TLDs is less than unanimous (at least not in all countries, e.g. the UK). For example, in a general questionnaire distributed by the author to 408 UK based providers of Internet services in November 1998, only 55% of the 106 respondents claimed to support TLD expansion. In addition, holders of trademark and intellectual property interests have also expressed concern about a potential link between TLD expansion and an increased risk of trademark infringement depending on the different approaches to trademark protection taken by individual countries. In responding to the Commission's proposal, several organizations representing these interests have questioned both the necessity of creating a new *.eu* TLD and how any perceived benefits would actually manifest themselves.

- Numerous questions regarding the desirability of expanding the TLD name space in accordance with national or regional jurisdictions remain unresolved. Some commentators have argued that nationally based naming schemes tend to limit price competition and service innovation, are not as semantically useful as gTLDs, and are not well suited to the non-territorial basis of Internet communication (Mueller 1998). In terms of the Commission's proposal, these concerns manifest themselves in the proposed restricting of the use of the *.eu* domain to the jurisdictional area of the European Union. Elaborating on this concern the *European Committee for Telecommunications Regulatory Affairs* (ECTRA) noted in its response to the Commission's proposal that, "the existence of this limitation could seriously affect the development of the Internet in European countries that are not part of the Union".

- Finally, requesting that ICANN allocate a *.eu* domain as a ccTLD may have repercussions for ICANN's credibility (similar to those raised by the treatment of the individual states of the US on the same level as countries elsewhere). By declaring that *.eu* should be allocated as a ccTLD, the Commission essentially trying to avoid the delays which may arise in the lengthy consultation process. Within ICANN, responsibility for assessing the merit of new TLDs rests with the working groups that comprise the Names Council of the Domain Name Supporting Organization (DNSO). Given that this body has not generally involved itself with ccTLD related questions, if *.eu* was allocated as a ccTLD the DNSO will not have carried out an assessment of the merits of creating a new type of supranational TLD. ICANN should not be seen to have to justify allocating the .eu domain, especially since, given the nature of the European integration process, the EU is already seen as both a state-

like and a superstate entity (e.g. the European Commission participates in G-8 meetings).

In spite of the uncertainties outlined above, the Commission has elected to proceed with its initiative claiming that, defining the *.eu* as a ccTLD is a pragmatic and time saving response to economic demands for additional name space in Europe (European Commission, 2000c). In tandem with its request for the allocation of the *.eu* domain, the Commission has also begun to consult with European-based Internet stakeholders about how this domain should be administered. This undertaking will also give rise to a host of related policy considerations that will influence the legitimacy of the authority exercised eventually by a pan-European Registry Organization.

Policy considerations for creating a Pan-European Registry Organization

Due to the semantic ambiguities in the White Paper (United States Department of Commerce 1998b), and the controversies associated with its formation, the legitimacy of ICANN's authority for managing Internet naming and addressing remains tenuous (Mueller, 1999); (Shaw 1999). In order for a pan-European Registry Organization to avoid a similar fate, the Commission will need to draw some lessons from the events surrounding the formation of ICANN.

- *Lesson 1*: The Commission's primary task in the registry formation process should be to facilitate a constructive dialogue among Internet stakeholders that avoids the interest-based factionalism that characterized the formation of ICANN. To date, issues relating to domain name management have been very divisive, with Internet stakeholders demonstrating a general unwillingness to co-operate or compromise when dealing with such matters. Overcoming these problems within the European context will be

dependent, in part, on the actions of the Commission throughout the registry formation process. Specifically, its primary role should be that of a neutral arbiter responsible for imposing constraints on the dialogue process in order to ensure that both the registry formation process, and its outcome, are consistent with European public policy.

- *Lesson 2*: The manner in which the collective exercise in decision making initiated by the public consultation process is conducted, as well as the outcome of this process, will affect the new Registry's flexibility and perceived efficacy among Internet stakeholders. More specifically, the *de jure* authority of the new Registry will be dependent on the support of interested parties including the European Internet industry, the governments of EU member and non-member states, and private Internet users. Consequently, the Commission should seek to ensure that: (i) the views of all interested parties, including private individual users, are given sufficient representation; and (ii) no particular interest, or group of interests, exert undue influence on the processes associated with the formation of a new Registry, and subsequently, in its operation. The recent decision of the EC Panel of Participants in Internet Organization and Management (EC-POP) to establish a Steering Group, comprised of an assortment of European Internet stakeholders, to propose administrative and operational policies for the new registry appears to be a step in the right direction (European Commission 2000d).

- *Lesson 3*: A curious omission from the *.eu* proposal was the lack of any questions regarding the principles that European-based Internet stakeholders believe should guide the evolution of how this new domain is administered —an omission which could be addressed in the

The Commission can learn a number of lessons from the controversy surrounding the setting up of ICANN, the current US naming agency, should it come to set up its own registry

Commission's approach to the registry formation process. In seeking to create a new registry organization, there is a need to focus on the extent to which the authority it exercises will be of a regulatory nature vis-à-vis Internet users and suppliers. Specifically, a clear distinction must be made between whether the new Registry's role will be one of European-based Internet governance per se, or one of technical co-ordination. In the ICANN case, the principles of "stability", "competition", "private bottom-up co-ordination", and "representation" have served as benchmarks for interested parties to appraise the legitimacy of its formation process, and subsequently, its activities (United States Department of Commerce, 1998b). Although ICANN's mandate is one of technical co-ordination, its management activities are more akin to those of an inter-governmental regulatory body. This operational discrepancy, combined with the ambiguous nature of the principles that were supposed to have guided its evolution, have contributed to the difficulties ICANN now faces in seeking to earn the trust of Internet users. To avoid similar problems with the pan-European Registry Organization, non-rhetorical principles that are to guide its evolution should be established prior to determining the new registry's structure and constitution.

- *Lesson 4*: It cannot be assumed at the outset that all EU countries favour the new Registry and/or European domain name registrars' applying World Intellectual Property Organization (WIPO) dispute and trademark policies to registrations in the *.eu* domain. In particular, there seems to be less support for this in UK than in continental Europe. First, although the responses to the Commission's proposal imply a relatively high level of congruence between the respondents' views and WIPO recommended polices, the response rate to the proposal was low,

consisting only of 92 responses in total (European Commission 2000b). The fact that only 76 of these responses were from European sources raises additional doubts about the extent to which the respondents' opinions truly reflect the diversity of views of European Internet stakeholders (especially in countries such as the UK). For example, the author's November 1998 survey results (admittedly based on a sample as small as that in the European Commission's report quoted above) do not suggest widespread support for the WIPO's playing this role. Only 43% of the 106 UK-based providers of Internet services who responded to the questionnaire indicated support for WIPO involvement in this realm. Similarly, in its response to the Commission's proposal the *European Internet Service Providers Association* (EuroISPA) noted that although WIPO should play a key role in deciding what is, or is not a famous name, dispute resolution should not be restricted solely to WIPO-based arbitration. Second, although many of the trans-jurisdictional intellectual property issues that have arisen in the gTLD context are also likely to arise in the commercial applications of the *.eu* domain, WIPO's disputes and trademark policies have been criticized heavily for being overly biased in favour of those with trademark and intellectual property interests (Froomkin, 1999). Therefore, one could explore the development of alternative dispute resolution policies, or implementing modified WIPO arbitration procedures, to achieve a better balance between the interests of individual Internet users and intellectual property holders. Ultimately, the legitimacy of a new pan-European Registry will be enhanced if inclusive strategies, representing the interests of all participants in the registry formation process, are adopted to determine the approach taken to dispute resolution.

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Concluding remarks

In seeking to strengthen the image and infrastructure of electronic commerce within the European Union, the European Commission has claimed that there is a need to create an *.eu* domain. The establishment of such a domain would mark the introduction of a new type of TLD into the domain name system.

In accordance with its desire to have the *.eu* domain allocated in months rather than years, the Commission has also begun consultations with European-based Internet stakeholders regarding the formation of a Pan-European Registry Organization. The task of creating such an entity will be a complex undertaking fraught with controversies reflecting different actors' perceptions of the goals of the *.eu* domain and how these goals might best be achieved. The level of debate associated with this initiative is likely to be directly related to, if not indicative of, the growing economic significance of electronic commerce services. The events associated with the formation of ICANN suggest that the legitimacy attained by a *.eu* Registry will not be restricted solely to the policies it implements. Rather, it also will be based on the manner in which these policies are derived. Simply put, since the fundamental issue within this context is one of *managing* a process, there is a need to establish from the outset unambiguous principles to guide the evolution of the new registry.

By assuming a pro-active role that emphasizes constructive dialogue between European-based Internet stakeholders, ensures adequate levels of user representation, and prevents particular interests from exerting undue influence on the registry formation process, the Commission will facilitate the legitimization of the institution responsible for managing and administering the *.eu* domain.

Keywords

Internet domain names, .eu, European registry organization

Notes

For addition additional information about:

- Responses to the *.eu* Proposal, see:
  http://www.ispo.cec.be/eif/InternetPoliciesSite/DotEU/Responses.html
- The Internet Corporation for Assigned Names and Numbers (ICANN), see: **http://www.icann.org**
- The Names Council of the Domain Name Supporting Organization, see: **http://www.dnso.org**
- Initiatives and controversies associated with the management of Internet names, see:
  http://www.domainhandbook.com

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Uncertainty and the Scientific Basis for Decision-Making

Hansvolker Ziegler, *Federal Ministry of Education and Research*

Issue: Science has begun the painful process of learning that "uncertainty" is intrinsic and that it can no longer hide behind a confident belief in itself and its claims to provide objective truth. The increasing difficulty of "freezing" relevant knowledge into systems and databanks runs counter to the perception that information technology can bring all knowledge into easy reach.

Relevance: Both the policy-making and science subsystems have to act according to the "precautionary principle". This means a new common ethic for science and politics, which leaves behind their at times naïve view of their relationship, but which needs time to be developed and understood.

The quest for both "sound" scientific advice and a stable knowledge base for decision making, i.e. a "Common System of S&T reference", is a contradiction in a situation, such as that in which we now find ourselves, where the scientific establishment has begun the painful process of learning that "uncertainty" is intrinsic to science and it can no longer hide behind a confident belief in itself and its claims to provide objective truth. At the same time, the increasing difficulty of "freezing" relevant knowledge into systems and databanks runs counter to the perception that information technology can bring all knowledge into easy reach.

One outcome of this new ("post-normal" or "mode 2") self-perception of science, which began with the climate research community and now affects all scientific communities following the experience of mad cow disease (BSE) and genetically modified foods, is that both the policy-making and science subsystems have to act according to the "precautionary principle". This means a new common ethic for science and politics, which leaves behind their, at times, naïve view of their relationship, but which needs time to be developed and understood.

Two well-known examples can give an idea of the difficulties of learning in this way:

- The integration of all uncertainties into the findings of the climate research community focuses its message on the need to avoid risks even before the traditional scientific approach can accurately predict them. The legitimacy of science depends on its making this situation transparent and giving advice despite this uncertainty.

- The guidelines for the use of scientific advice given by Sir Robert May and the learning

Uncertainty has become a common feature in scientific advice, making the 'precautionary principle' a common basis for science and policy

*Problems do not neatly
align themselves within
the borders of the
academic disciplines.
Transparent dialogue is
therefore needed across
the borders*

process he has triggered within governments. The Canadian SAGE proposal follows and adds to this approach (see the article by the CSTA in issue 45 of *the IPTS Report*).

Traditionally politicians tend to make use of scientific advice by calling the "top ten" scientists in order to bolster their reputation through celebrity staging. However, the relationship between science and policy-making is being made more complicated by the fact that it has become increasingly difficult to pin down reliable, undeniably "true" knowledge. Moreover, the concept of a "top ten" of scientific experts is increasingly untenable. It is understandable then, that in the age of the "knowledge society", politicians often pin their hopes on technology's being able to provide "state-of-the-art knowledge" just a mouse click away. Ironically, though, this very ease of access to information may lead us to believe that objectivity can be bought or that decisions can be made to appear reliable simply by investing in sophisticated equipment storing state-of-the-art knowledge. This may well block access to human reasoning and the relevance of science for people's expectations.

This context precludes the possibility of any straightforward effort to build common EU-wide systems of S&T reference for policy implementation. Without fostering research communities in advance, concentrating on solving complex real life problems, and with a sense of responsibility over them, and therefore caring about relevant common knowledge, any reference system will operate and exert its influence in ways that are not transparent. To develop and store "robust" knowledge requires a new focus and new responsibility of post-normal "mode 2" science clusters and networks for the components of their infrastructure and acceptance by science at large.

There are a number of things that can be done to help build more robust knowledge:

- Mistrusting any databank of experts, whatever its source institution, which claims to contain the "best" information. It is not technically feasible to organize reference in terms of excellence in a way that is meaningful when faced with real-life problems. It is a fairly safe bet that any institution claiming to be an indisputable authority for experts and evaluation is overstating its abilities.

- Recognizing that "problems" do not neatly align themselves with the borders of academic disciplines. To select the appropriate expertise including that of the "stakeholders" will remain the task for a transparent dialogue across the borders (*Reference systems concerning experts*).

- Avoiding institutional divisions arising between research and related infrastructure (*Reference systems concerning the knowledge base*).

- Stimulating research which concerns itself continuously and critically with its own reference base (as is intended in the horizontal parts of the Fifth Framework Programme), instead of innocently complaining when it comes to conclusions that the research was hampered by having to rely on theoretically inadequate databases. This will mean paying much more attention to issues of statistically quantified results and their concealed assumptions and will certainly destroy more of our perception of reality than can be rebuilt at the same time (e.g. by relinquishing growth concepts as success criteria for policy).

- It can be achieved at "hot spots" but not right across the board (hot-spots not being the news of the day, but problems with pervasive impact).

- Forming alliances between established science and NGO think tanks as a way of extending

stakeholders' tentacles into science may help bridge the gap but should not act as an isolated addendum or translation. The scientific establishment has to organize itself "internally" around the new task.

- Binding innovative frontiers and institutionalized reliability, which is best achieved through nodes and knots in research networks as long as these stable forms are set up by the research community and looked after by it. From this perspective IIASA used to be a positive example in global change research and the IPTS can develop that kind of relationship with networks in technology foresight.

- Funding agencies (not least the EU-Framework Programmes on research) need to lend a helping hand and strike the balance between the aversion to institutional funding and the need for incentives for reliability.

- Easing of exchanges of personnel (taking account of career structures) should tighten up

the links between the research community and the various observatories, monitoring systems and official statistics agencies, which are at the same time "hands on" instruments of running day-to-day policy.

The point of departure for any attempt is a point in history. No general recipe will suit. No big decision on "a system" will help, but only the courage to tackle hot spots and the assurance that no one who should take part is left out.

One caveat, however, at the end is that if the scientific establishment does not organize itself to take this role —including critical reference systems— the job will be done somewhere else. Consultants and scientific entrepreneurs following in the footsteps of biologist cum entrepreneur Craig Venter will 'privatize' the task and even do it despite governments' reluctance. And of course, there are those who stand to gain from functioning without the involvement of public institutions and governments.

Keywords

S&T reference systems, uncertainty, robust knowledge

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Science & Technology and Governance of the Euro-Mediterranean Partnership

Giorgio Di Pietro, Khaled Elshuraydeh, Sergio Gomez y Paloma, and Mario Zappacosta, *IPTS*

Issue: In the context of the evolving free-trade area, science and technology (S&T) can play a key role in strengthening the Euro-Mediterranean region's social and economic integration.

Relevance: Including S&T in the broad, stake-holder inclusive, decision-making envisaged under the Barcelona process would help make the process more effective, transparent and accountable.

The series of agreements on economic, technical and financial cooperation comprising the Euro-Mediterranean Partnership have been designed to form the groundwork for a Free Trade Area (FTA) between the EU and Mediterranean Partner Countries (MPCs) to be completed by 2010

The ultimate goal of the Euro-Mediterranean Partnership, as announced during the Interministerial Conference in Barcelona in November 1995, is to achieve greater well-being throughout the region. The series of agreements on economic, technical and financial cooperation comprising the Euro-Mediterranean Partnership have been designed to form the groundwork for a Free Trade Area (FTA) between the EU and MPCs to be completed by 2010. Additionally, these agreements are crucial in helping MPCs to bridge the socio-economic gaps with the EU Member States.

Trade and technological progress are crucial to raising regional income, and the creation of the Euro-Mediterranean FTA should stimulate both. The setting up of the Euro-Mediterranean FTA is also likely to increase technology diffusion towards MPCs. There is solid evidence that international trade leads to faster technological diffusion and higher rates of productivity growth (e.g. Helpman, 1997). While this would be important for all Euro-Mediterranean countries, it has considerable implications for MPCs in their endeavour to catch up with the technological leaders in the EU.

The importance of S&T as an economic growth-enhancing factor for MPCs within the Euro-Mediterranean context has already been pointed out (e.g. Bontoux, Hardy and Rojo, 1998). The aim of this article is to shed light on the role of S&T in alleviating some problems stemming from the implementation of the free trade agreements and in making the Barcelona process more transparent, effective and accountable. Specifically, S&T could ensure the overall sustainability of the Euro-Mediterranean Partnership through achieving the following objectives:

- Reducing MPCs' socio-economic costs due to the required adjustments in preparation of entering the FTA and during its course,

especially in terms of unemployment and migration;

- Relieving trade tensions between the EU and MPCs;

- Alleviating social tensions in the Euro-Mediterranean area.

This article deals with the role that S&T can play in achieving the aforementioned objectives:

- Providing more opportunities for cooperation between Small and Medium Sized Enterprises (SMEs) in the different EU and MP countries;

- Strengthening MPCs' competitiveness through the acquisition of new and advanced technology embedded in Foreign Direct Investment (FDI);

- Increasing awareness of the interdependence and interaction between the different actors (economic, social, political, institutional) involved in the Free Trade Agreements;

- Facilitating custom transactions and trade harmonization.

S&T and cooperation between SMEs

Increased competition stemming from the implementation of the Euro-Mediterranean Free Trade Area will force many MPCs firms to close down or to embark on a restructuring process. Only those firms with higher productivity than their competitors will be able to survive in the market. This restructuring process will cause capital and labour reallocation and may consequently increase unemployment, at least in the short-medium term. In this regard it is worth mentioning the shrinking role of the public sector as a main provider of jobs and income in MPCs.

SMEs are likely to play a crucial role in combating unemployment in MPCs. This is due to (i) the lower cost of creating jobs in SMEs than in large companies (1/6 according to Hamoudeh, 1996); (ii) the diverse range of economic activities in which SMEs are involved; and, (iii) the proportion of total employment accounted for by SMEs (more than 90 per cent). Additionally, their importance in economic stability and social cohesion is increasingly being recognized. Since several regions in MPCs have a great number of family-owned small and medium-sized enterprises with a tradition extending over centuries, these firms are an important part of the structure of local communities (Di Pietro G., Gomez y Paloma and Ghazi, 1998).

Market liberalization on a Euro-Mediterranean scale will broaden the range of opportunities open to SMEs. The lure of new markets on the one hand and increased competitive pressure on the other may act as a strong stimulus to SMEs to enhance their level of productivity and thereby to strengthen their position in the market. Nevertheless, the shortcomings of their small size (i.e., limited financial and technical manpower resources, small marketing resources and limited management skills), mean SMEs are often compelled to seek greater efficiency through more specialization and closer cooperation with each other and with research centres. S&T may play a crucial role in enabling inter-firm cooperation and in establishing an efficient collaboration between research centres and enterprises (e.g. Fanfani, 1999). Advances in technology, especially in information technology, could expedite SMEs networking at a lower cost even if they are located in geographically distant areas. Technological progress may in fact enable EU and MPCs' SMEs, regardless their geographical location, to achieve an efficient division of labour taking advantage of their complementary specialization. The significant enhancement in trade in traditional industries between MPCs and

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The increased competition brought about by the Euro-Mediterranean Free Trade Area will make business restructuring necessary in the partner countries. SMEs are likely to play a more important role in creating employment than are larger companies

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*The creation of a free-
trade area is likely to
bring about an increase
in FDI flows into the
partner countries. Other
examples suggest this is
likely to bring technology
transfer in its wake*

southern regions of Italy seen over the last five years is mainly attributed to the increased cooperation between SMEs across the Mediterranean basin (Schiattarella, 1998).

S&T and competitiveness

The establishment of an Euro-Mediterranean FTA is likely to increase MPCs' ability to attract FDI. The formal nature of the agreements and the availability of financial and technical EU measures to assist MPCs in undertaking structural reforms is likely to enhance their credibility for foreign investors. Additionally, (i) the adoption of EU standards and regulations, (ii) increased security of market access (e.g. through contractual assurances of access to MPCs' exports) and (iii) MPCs' commitments to the partnership with the EU through the different binding agreements, going beyond World Trade Organization (WTO) requirements in the areas of investment, services and intellectual property rights, will all certainly contribute to the promotion of a business environment conducive to FDI.

The impact of FDI on MPCs economies and in particular on total-factor productivity could be of considerable importance since FDI generally includes the transfer of new and advanced technologies. There is considerable evidence that spill-overs from FDI may provide important benefits for the host countries of multinational corporations. Local firms' performance and consequently their competitiveness may improve as foreign firms enter the market and use new technologies, employ and train the local workforce, and provide technical assistance to local suppliers and customers.

S&T and raising awareness

Within the MPCs' local communities S&T can help increase tolerance of the socio-economic adjustment costs resulting from the implementation

of the Free Trade agreements. By fostering the dissemination of reference quality information, S&T could provide a solid base for the debate among the different stakeholders and better clarify consequences of the different alternatives.

Additionally, S&T may increase multilateral participation of different social groups in the decision-making process. S&T is a powerful tool in empowering and encouraging individuals to participate in and influence the decision-making process, developing the capability of policy formulation and planning, and providing the means and mobility for cross-border cooperation.

The role that S&T can play in raising public awareness and participation would effectively contribute to the alleviation of social conflicts and thereby increase the social feasibility of the Barcelona process.

S&T and trade facilitation

S&T could both enhance transparency of administrative trade procedures and simplify customs transactions. The abolition of the existing red tape involved in moving goods across borders will lead to remarkable savings in time, money and human resources.

Additionally, the use of information technology increases the efficiency of customs administrations and cooperation between traders and official agencies. The introduction of automated customs clearance systems significantly reduces clearance time and cost.

An Asia Pacific Economic Cooperation (APEC) study estimates that trade facilitation programmes would generate gains of about 0.26 per cent of APEC Member countries real GDP, almost double the expected gains from global tariff liberalization (APEC, 1999).

Harmonization of trade regulations is essential to the implementation of any free-trade area. The setting up of common requirements makes it operationally possible for many imported goods to compete within domestic markets. S&T can effectively enhance the efficiency of this process between the EU and MPCs and improve the quality of the resulting rules. On the one hand, S&T create conditions for the development and acceleration of harmonizing activities. On the other hand, S&T enable technical collaboration between European competent authorities and MPCs counterparts thereby improving the mutual understanding of the needs in terms of functions and acceptance tests. This is crucial to iron out the differences and facilitate a closer matching of the various needs expressed and the harmonizing requirements.

Many advocates of free trade strongly believe that trade regulation harmonization is a prerequisite to fully benefit from the potential growth opportunities offered by free trade (e.g. Enders, 1997). Such harmonization favours the effective dismantling of technical barriers thereby significantly contributing to the completion of a single market. Additionally, one may note that MPCs' competitiveness would increase as a result of higher quality of products brought by the introduction of harmonization requirements.

Concluding remarks

This article argues that there is scope to increase the employment of S&T to support the implementation of the Euro-Mediterranean agreements and thereby strengthening the governance (i.e., the broad, stake-holder inclusive, decision-making process) of the Euro-Mediterranean Partnership. S&T may in fact greatly contribute to the achievement of the underlying objectives of the Barcelona process that go well beyond the mere scope of trade regulation. Indeed, S&T can be extremely beneficial to MPCs since they may alleviate socio-economic and trade tensions emerging as a short-medium term consequence of the setting up of the FTA.

S&T is a powerful tool in empowering and encouraging individuals to participate in and influence the decision-making process, developing the capability of policy formulation and planning, and providing the means and mobility for cross-border cooperation

The use of information technology increases the efficiency of customs administrations and cooperation between traders and official agencies. The introduction of automated customs clearance systems significantly reduces clearance time and cost

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Keywords

Euro-Mediterranean area, science and technology, governance, trade liberalization, raising awareness

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Lifelong Learning:
Beyond Education and Training

Odd Björn Ure, James P. Gavigan, *IPTS*

Issue: The prevailing socio-economic situation makes it necessary for individuals to keep up-to-date with the knowledge they need to function in their working and private living spheres, and more generally to participate fully as active citizens in society. This is beginning to shift the balance away from institutional to individual and collective responsibility, often linked to individual rights of access to lifelong learning. We also see the onset of a shift from formal to more informal modes of learning, and from a youth-centred learning to a more even lifelong distribution.

Relevance: In spite of the policy attention to lifelong learning in recent years, real progress in accommodating the emerging needs on the ground in the form of education-system reform, and support for the new forms of learning, is incommensurate with the rhetoric. Looking ahead to identify the serious bottlenecks and problems that may result from today's inertia may help to galvanize more effective action.

Introduction

Today, in parallel to the passive, teacher-led learning of traditional education, a more active type of learning is emerging where the main player - the individual - increasingly engages in self-motivated learning activities. This is just one of the developments which heralds the onset of a new Lifelong Learning (LLL) paradigm. Public awareness of the need for Lifelong Learning increased substantially during the European Year of Lifelong Learning in 1996, as a result of co-financed events all over Europe (and at all levels of the EU). One major achievement seems to be that LLL is no longer simply identified with higher doses of further and continuing education. On-the-job training, civic education and training as well as extension of learning experiences for individuals over their life span are now widely understood to be key elements in the learning repertoire for European citizens.

The European Commission offers the following definition of LLL:

"Lifelong Learning can be defined as encompassing all purposeful learning activity, whether formal or informal, undertaken on an ongoing basis with the aim of improving knowledge, skills and competence"[1].

This definition implicitly recognizes the need for fundamental changes in education and training systems. However, to date the LLL debate

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language expression) as
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languages, academic
scholarship, literacy
and numeracy)*

has had insufficient impact on education and training system reform in the sense that relatively very little attention is given to the many recognizable learning activities that lie outside the traditional systems or policy frameworks.

In addition, the implications of LLL cannot be confined to the realm of education and training policy, but require active responses across a whole range of policies and societal institutions as discussed below. We argue that effective LLL strategies in particular depend on labour market policies and on a successful dissemination of science and technology.

Lifelong learning at national level

A key determinant of the take-up of LLL is the rate of realignment of initial education systems at all levels to the new learning paradigm[2]. The current slow pace of adaptation is problematic. In a knowledge society, one of the main functions of schools should be to endow learners with the methods and frameworks they need to access, understand and transform vast amounts of information into knowledge. The school should maintain its role as a point of orientation for knowledge production and as an important incubator for social skills.

However, when national ministries report on achievements in LLL, they stress that all education levels (primary, secondary, and tertiary) undergo similar reforms towards improving the system along the following lines[3]:

* broadening and diversifying provision
* combating school failure and drop-out rate
* introducing Information and Communication Technologies (ICT) as a learning tool
* developing cooperation in- and outside the education system
* increasing flexibility between education paths and improving transparency

The underlying thought seems to be that a strengthened system by definition entails improvements in the provision and progress towards instituting LLL, but this is not necessarily so. Of course it helps, but we argue that initial education has to be reformed with a particular aim of empowering pupils to continuously update their knowledge and skills, and to not consider their diploma or qualification certificate as bearing witness to a definitive, once-and-for-all level of accomplishment. This calls for innovations such as the use of credit systems or lifelong guarantees for continuous education.

So the question remains how the state of play of *effective* LLL in the national education systems can be measured. One traditional indicator of the performance of initial education (which may last until after university-level studies) is the educational attainment level of the workforce aged 25-29.

So far, the trend has been to prolong the compulsory learning period at school and the countries scoring highest on this, are considered to be those investing most in education and training, or those paying most attention to this issue. However, one consequence of the LLL paradigm for initial education is that you should learn more about how to update your knowledge throughout your lifetime. This does not mean that you just extend the formal education period or simply learn how to download information from the Internet! Much more basic changes need to be made to the curricular content and delivery of education. School curricula should target as much 'personal' and 'social' competencies (e.g. creativity, critical argumentation, self-confidence, teamwork, langua-ge expression) just as they have done to date for 'instrumental' competencies (e.g. languages, academic scholarship, literacy and numeracy).

To some extent, the reforms suggested in the Declarations of Sorbonne (1998) and Bologna

(1999)[4] signed by European ministers of education, point towards a redefinition of tertiary education. The most concrete proposal is that the first university degree should last at least 3 years - a "bachelor's degree" in Anglo-Saxon terms. Part of the rationale for this harmonization is increased mobility and transparency at European level. Furthermore, those wishing to cut education costs by reducing the length of studies might also appreciate the proposal. This is related to the fact that a bachelor – master – Ph.D. model not mentioned in the two declarations but nonetheless part of the background music), will affect spending on education, not least because there might be a shift in spending from initial education to further and continuing education.

Table 1. Percentage of adults having received training in the past 4 weeks, by country

Country	%
Denmark	11.8
Sweden	11.7
Finland	10.7
Holland	8.6
United Kingdom	7.4
Italy	1.9
Spain	1.7
Belgium	1.7
Luxembourg	1.5
Portugal	1.4
France	1.3
Greece	0.3
European Union	3.6

EUROSTAT: Labour Force Survey 1996

The implementation of such a model would clearly generate a substantial increase in the educational attainment level of the 25-29 age group mentioned above. Given that people with higher levels of formal education tend to take more advantage of offers for continuous education and training[5], such higher attainment levels might imply that people engage in LLL activities at earlier ages. Another indicator on Lifelong Learning is the percentage of adults over 30 having attended some kind of training over the four weeks preceding a survey (see Table 1).

We cannot dispute that surveys of such participation rates present a snapshot of the LLL situation in the Member States. But the variations are so high and the results so surprising that we are reluctant to draw any conclusions. For example, France scores very low in spite of the existence of a law obliging enterprises to set aside a certain percentage of labour costs for employee training.

At present, EU Member States are involved in defining new indicators for measuring and benchmarking LLL. They particularly strive to come up with better cross-national comparisons of LLL. This work is done in the context of the National Action Plans for employment set up according to the Employment Guidelines for 1998 and 1999, as a follow-up to the European Employment Strategy (the Luxembourg process). In 1999, the Employment and Labour Market Committee asked the Commission to continue work done with a view to measuring LLL at a national level.

Lifelong learning at European level

When looking for the impact of LLL at a European level, some indications of the state of play can be obtained by studying the main trends in the new generation of European programmes on education and training (2000-2006). These increasingly concentrate on different mobility actions and on innovative actions aimed at integrating the normally separate fields of education and training. By themselves, such

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actions contribute to LLL. In addition, some more direct actions are underway:

- SOCRATES, concentrating on education, has a separate action "GRUNDTVIG"[6] devoted to adult education and other educational pathways aimed at encouraging the European dimension of LLL. The action addresses those who, at whatever stage of their life, seek access to knowledge and competencies, be it formal, informal or autonomous learning. One project line is designed for the development of information and support services for adult learners and for providers of adult education. Guidance and counselling can for example also be included in this kind of projects.

- LEONARDO[7], concentrating on vocational training, has as one of its three objectives "to improve the quality of, and access to, continuing vocational training and the life-long acquisition of skills and competencies…."This objective is, above all, followed up in specific measures aimed at developing new approaches to certification and recognition of competencies acquired outside the traditional education system or in the work place. One example is automatic (computer assisted) tests for evaluating formal skills (such as in grammar, mathematics and computing), but also to some extent individual skills and competencies. If these tests receive broad recognition, individual autonomous learning (self-learning) could increase substantially.

What distinguishes most of the EU Member states from some other OECD countries in the field of training is a well-structured and institutionalized social dialogue between employers and employees. The social dialogue on vocational training has primarily come up with proposals concerning widened access to further and continuing education for employees. Some very interesting contributions to the evolution of

LLL are experiments on "time-for-work/time-for-training". These may be arrangements allowing the individual to save working hours that later can be used for training purposes (instead of additional pay or holidays). Also, the seasonal variations in the workload of an enterprise can be used to save time for training and to carry out training of employees. Often trade unions, the state and the individual learners co-finance such arrangements.

Recently, education and training as part of the social dialogue at European level has become more and more integrated in general employment policy (cf. objective 3 of the Social funds[8]) and in macro-economic considerations. One of the latest and most promising results (or by-products) of the social dialogue is the mobility certificate "EUROPASS training". Launched by the European Commission, this initiative demonstrates an attempt to systematically involve the social partners in structured training mobility actions.

It follows from this that a sustainable LLL strategy is highly reliant on labour market policies. However, even though a labour market perspective on LLL and the consequent links between labour market and Education and Training policy are very promising, it is unlikely that this approach is sufficient for reshaping the present offer for LLL. This hypothesis does not disregard the achievements of social dialogue at a European or national level, but points to the even broader policy implications of a LLL paradigm as mentioned at the start.

The European scene also stages other initiatives addressing the European citizen. A joint project between the Joint Research Centre[9] and DG Education and Culture aims to provide key information and discussion spaces for the general public as well as for researchers and decision-makers. It is entitled "Building a GATEWAY to the

European Learning Area" and will set up an Internet based Gateway to information in the fields of education, training and youth. The project reflects the shift from Open and Distance Learning or Computer Assisted Learning, to *Internet supported learning*. It can be situated at the intersection between Lifelong Learning, Information and Communication Technologies and Citizenship. By means of sophisticated search tools, European citizens will have easy access to information they need in their learning career.

A citizen's perspective on lifelong learning

In addition to the expansion of the learning period throughout one's entire life, the content of the learning is an essential consideration. In the service sectors for example, which employ more and more people, the quality of the services offered depends very much on the social and communication skills of the employees. In all such sectors, personal aptitudes and competencies acquired during life-long learning, gain in importance. Therefore, in order to understand and develop a citizen's perspective on LLL, the breadth and the variety of formal and informal learning have to be taken into account.

A citizen's perspective on LLL is a very broad issue. We believe that two interrelated aspects should be given more attention:

• Extending the offer of LLL to groups less accustomed to formal education and training. On the one hand it is important to build on experiences such as teaching of adults with little formal education (in particular early school leavers, language and civic training for immigrants). On the other hand it is vital to harvest from and further develop informal learning experiences, often facilitated by associations and voluntary organizations combating social exclusion.

• Civic education and training.

Informal learning, centred on the citizen's needs and experiences, has to be promoted and further developed as a key aspect of LLL. This applies in particular when we address the challenge of disseminating computer literacy, even in its simplest form e.g. to be able to get money out of a cash dispenser instead of queuing up in your local bank.

Experiences from *informal learning settings* are important for civic education and training. One example is the Study Circle, a group-based pedagogical and organizational format for participatory education, problem solving and research. Originally, study circles were set up as a "self-help" alternative to traditional forms of education and training. They were particularly strong in the Nordic countries. The widespread use of information and communication technologies has sparked off numerous study circles on computer-mediated communication, to the extent that some observers refer to a study circle movement in North America[10]. Such study circles, sometimes referred to as Technology Intelligence Networks (TIN), have proven to be efficient when it comes to combating computer illiteracy, especially among early school leavers and groups without a long formal education.

An important note from a theoretical point of view is that we are faced with some problems in making a distinction between social learning and LLL. To avoid a concept that covers every aspect of a person's evolution from childhood to adult citizenship, we need to relate LLL to the development of skills and competencies that somehow can be verified. Therefore, more effort should be put into the development of measures for testing the outcome of informal training (cf. our reference above to EU projects in the frame of LEONARDO DA VINCI II for developing tests aimed at evaluating formal skills as well as an individual's broader competencies).

LLL should be extended to reach groups less accustomed to formal education and training. Informal learning centred on citizen's needs should also be developed further

LLL needs to be distinguished from social learning to avoid a concept that covers every aspect of a person's evolution from childhood to adult citizenship. Therefore we need to relate LLL to the development of skills and competencies that somehow can be verified

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Why has penetration of lifelong learning been slow?

In spite of promising examples at national and at European level, there are clear indications that the implications of LLL are only slowly being taken on board in the education & training systems. From a quantitative point of view, we would not be surprised if the pervasiveness of LLL, as measured in numbers accessing specific LLL-type activities, is slow for the citizens. As we discussed above, the available data do not permit any clear conclusion on this issue.

The question therefore arises as to why we are faced with slow progress in this area. A first assumption is that the urgent adaptation to LLL comes on the policy agenda at the same time as education and training witnesses the arrival of competition between global actors. This double challenge may partly explain the hesitation at formal system level.

A second assumption is that the slow pace has something to do with the complexity and the high ambitions behind the idea of LLL. When the Member States address LLL by strengthening the whole educational machine, this is a response to a complex challenge. But this is not necessarily a good LLL strategy. Moreover, it is doubtful whether the Member States are sufficiently concerned with the changing structure of the education and training systems, let alone the necessity of developing a Lifelong Learning mentality during the period of initial education.

A third explanation of the retarded implementation of lifelong learning has to do with the question of who should pay the bill. Certainly, this question varies from country to country in terms of such parameters as public/private balance in education provision, availability of public support to individual training, agreements between the social partners for (partly) financing training of

employees, arrangements for training of unemployed, support from voluntary organizations and associations to education and training for groups or individuals. There is no recipe for financing lifelong learning, but rather a certain consensus that several stakeholders have to co-operate when the bill is paid.

A fourth point concerns the apparently low consideration and/ or impact of serious medium to long term prospective analysis on education and training policy. A EURYDICE report[11] produced at the request of the German Presidency of the EU in 1999, for example, states that *no country has established within its ministry of education a service or a division concerned exclusively with forward planning*. The report takes stock of forward planning work in education in the Member States pointing out that not all the education systems make exclusive use of forward planning in preparing for the future. One particular Delphi expert survey carried out in Germany[12] recorded a high degree of pessimism regarding the changes experts expect will actually be made to the education system in order to meet the needs of the knowledge society on the 2005-2020 horizon. The experts anticipate that the changes made will be six times smaller than those required.

A further complexity resides in the large number of policy areas that have to be streamlined in order to live up to a LLL paradigm. As pointed out in the FUTURES report on "Knowledge and Learning[13]", there is a need for coherence between policies centred on knowledge production. The Member States are therefore faced with a complex cross-over of policy areas with deeply-rooted histories and constituencies, and few criteria with which to select coherent policy options to embark on the long adaptation to a paradigm of Lifelong Learning.

We argue that as long as we witness a slow and hesitant rapprochement between different policy areas, we probably cannot expect any significant break-through in LLL. This is not a result of European "sclerosis", but is common for most OECD countries. Parts of the explanation can be related to the fact that:

"technology policies continue to be piecemeal, with insufficient consideration given to linkages within national innovation systems and to the broader structural reform agenda (financial markets, labour markets)[14]".

This is the situation although it is widely acknowledged that:

"complementarity between technology and education and training policies is important for reducing mismatches between demand and supply for skills and improving employment performance[15]".

In order to keep abreast of scientific and technological changes and in particular the likely development of an Internet-economy and the entailing needs for ICT skills, integration with other policy areas, especially Research and Development policy, seems unavoidable. This point is also vital within a perspective of diffusion of knowledge and of technology.

Conclusion

LLL rests on factors determined outside the realm of national education systems. More than in other policy areas, the successful attainment of a LLL paradigm depends on an embedded policy approach at both national and European level. LLL is one pillar of the recent initiatives under the heading the *European Learning Area*, of which the essence is that by fostering mobility, transnational co-operation and the systematic exchange of experience, the European Union is laying the foundations for a European learning area.

In an information society, the diffusion of technological knowledge is pivotal to avoid computer illiteracy. This is one example of the close proximity between LLL and another major European Commission initiative entitled a *European Research Area* in which the core idea is to better integrate national and transnational research actions. National governments and institutions of the EU are striving to make the information society more accessible and user-friendly. One key approach lies in the use of information and communication technologies for learning purposes. Education and training are increasingly delivered over the World Wide Web. The drive towards (Internet) technology-supported learning, also in informal learning settings, further underscores the necessity to embed or harmonize different policy areas.

In addition, it seems vital to further explore non-institutionalized and informal learning experiences. This points towards a citizen's perspective on LLL. Here, a major challenge is to make this perspective more operational, as shown in our reference to experiences with study circles and technology intelligence networks.

If these forms of learning are increasingly developed, European citizens will be further supported for embarking on a lifelong and life wide learning experience. Because of the inertia in the present institutional frameworks for education and training, the informal learning experiments, which certainly also count on major stakeholders in the labour market, are vital in a leap towards Lifelong Learning.

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Notes

1. DG V/XXII, in "Setting targets for lifelong learning in Europe"(1999).
2. Cf. the FUTURES report on Knowledge and Learning, p. 28.
3. Cf. "Lifelong Learning: the contribution of education systems in the Member States of the European Union", Eurydice Survey, 2000.
4. The Sorbonne declaration can be downloaded in French on URL:
   http://www.education.gouv.fr/discours1998/declar.htm and the Bologna declaration on
   http://www.education.gouv.fr/realisations/education/superieur/bologne.htm.
5. EUROSTAT, 1996 EU Labour Force Survey.
6. Cf. URL: **http://europa.eu.int/comm/education/socrates/adult/home.html**
7. Cf. URL **http://europa.eu.int/comm/education/leonardo/leonardo2_en.html**
8. **Objective 3** – "Combating long term unemployment, facilitating the integration into working life of young people and those exposed to exclusion from the labour market, and the promotion of equal opportunities for men and women in the labour market".
9. represented by the Institute for Systems, Informatics and Safety and by the Institute for Prospective Technological Studies.
10. See the forthcoming IPTS publication on Study Circles in Targeted Intelligence Networks (written by Dr. Lars Karlsson) and also "Men's work, Tomorrow" by Peter Fleissner, Wolfgang Hofkirchner, Margit Pohl and Peter Purgathofer (1996), ISBN 3-901742-00-X. The latter can be downloaded at **http://www.jrc.es/~fleissne/** Look in "additional information".
11. Cf. "Forward Planning in Education in the Member States of the European Union", Eurydice Survey, 1999.
12. Potential and Dimensions of the Knowledge Society - Impact on Educational Processes and Structures See BMBF Prospect 3/98.
    http://www.bmbf.de/deutsch/veroeff/prospect/pro_0398/index.htm#Tor
13. "Towards a Learning Europe", J.P. Gavigan et al, Futures Report Series 14, IPTS, December 1999.
14. "Technology, productivity and job creation: Best policy practices", OECD 1996.
15. ibid.

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A B O U T   T H E   I P T S

The Institute for Prospective Technological Studies (IPTS) is one of the eight institutes making up the Joint Research Centre (JRC) of the European Commission. It was established in Seville, Spain, in September 1994.

The mission of the Institute is to provide techno-economic analysis support to European decision-makers, by monitoring and analysing Science & Technology related developments, their cross-sectoral impact, their inter-relationship in the socio-economic context and future policy implications and to present this information in a timely and integrated way.

The IPTS is a unique public advisory body, independent from special national or commercial interests, closely associated with the EU policy-making process. In fact, most of the work undertaken by the IPTS is in response to direct requests from (or takes the form of long-term policy support on behalf of) the European Commission Directorate Generals, or European Parliament Committees. The IPTS also does work for Member States' governmental, academic or industrial organizations, though this represents a minor share of its total activities.

Although particular emphasis is placed on key Science and Technology fields, especially those that have a driving role and even the potential to reshape our society, important efforts are devoted to improving the understanding of the complex interactions between technology, economy and society. Indeed, the impact of technology on society and, conversely, the way technological development is driven by societal changes, are highly relevant themes within the European decision-making context.

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- Technologies for Sustainable Development
- Life Sciences / Information and Communication Technologies
- Technology, Employment, Competitiveness and Society

In order to implement its mission, the Institute develops appropriate contacts, awareness and skills for anticipating and following the agenda of the policy decision-makers. In addition to its own resources, the IPTS makes use of external Advisory Groups and operates a Network of European Institutes working in similar areas. These networking activities enable the IPTS to draw on a large pool of available expertise, while allowing a continuous process of external peer-review of the in-house activities.

S.P.I.00.06

GK-AA-00-006-EN-C

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- NUTEK - Department of Technology Policy Studies - S
- OST - Observatoire des Sciences et des Techniques - F
- PREST - Policy Research in Engineering, Science & Technology - UK
- SPRU - Science Policy Research Unit - UK
- TNO - Centre for Technology and Policy Studies - NL
- VDI-TZ - Technology Centre Future Technologies Division - D
- VITO - Flemish Institute for Technology Research - B
- VTT - Group for Technology Studies - FIN

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