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- Access to sustainable energy sources at the local level in developing countries

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COMMISSION STAFF WORKING PAPER

Access to sustainable energy sources at the local level in developing countries

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(presented by the Commission)

1. INTRODUCTION

The energy challenges facing the world today are top of the global agenda. There are essentially three challenges: First, given the limited future oil supply, volatile fuel prices and the surge in demand from developing economies, energy security is a major concern. The second is to cut greenhouse-gas emissions to a level which will not cause irreparable damage to the climate.¹ The third challenge is the urgent needs of developing countries to have access to energy to promote economic growth and improve the livelihoods of their people.

This staff working paper focuses on access to modern energy services in developing countries, with a special focus on Africa, being the continent lagging most behind and providing the greatest challenges.

Energy and the Millennium Development Goals (MDGs)

Access to modern energy services is considered a prerequisite for economic development and to improve social conditions. In particular, affordable access for the poorest swathes of society remains a barrier to eliminating poverty and achieving the MDGs. Box 1 below shows how energy services are linked to the MDGs.

Box 1. Energy Services and the Millennium Development Goals²	
MDG 1 Extreme poverty and hunger	Energy inputs such as electricity and fuels are essential to generate jobs, industrial activities, transportation, commerce, micro-enterprises and agriculture outputs. Most staple foods must be processed, conserved and cooked, requiring heat from various fuels.
MDG 2 Primary education	To attract teachers to rural areas electricity is needed for homes and schools. After dusk study requires illumination. Many children, especially girls, do not attend primary schools in order to carry wood and water to meet family subsistence needs.
MDG 3 Gender equality	Lack of access to modern fuels and electricity contributes to gender inequality. Women are responsible for most household cooking and water boiling activities. This takes time away from other productive activities as well as from educational and social participation. Access to modern fuels eases women's domestic burden and allows them to pursue educational, economic and other opportunities.
MDG 4 Child mortality	Diseases caused by unboiled water, and respiratory illness caused by the effects of indoor air pollution from traditional fuels and stoves, directly contribute to infant and child disease and mortality.
MDG 5 Maternal health	Women are disproportionately affected by indoor air pollution and water- and food-borne illnesses. Lack of electricity in health clinics, illumination for night time deliveries, and the daily drudgery and physical burden of fuel collection and transport all contribute to poor maternal health conditions, especially in rural areas.
MDG 6 Combat HIV/AIDS	Electricity for communication such as radio and television can spread important public health information to combat deadly diseases. Health care facilities, doctors and nurses, all require electricity and the services that it provides (illumination, refrigeration, sterilization, etc) to deliver effective health services.

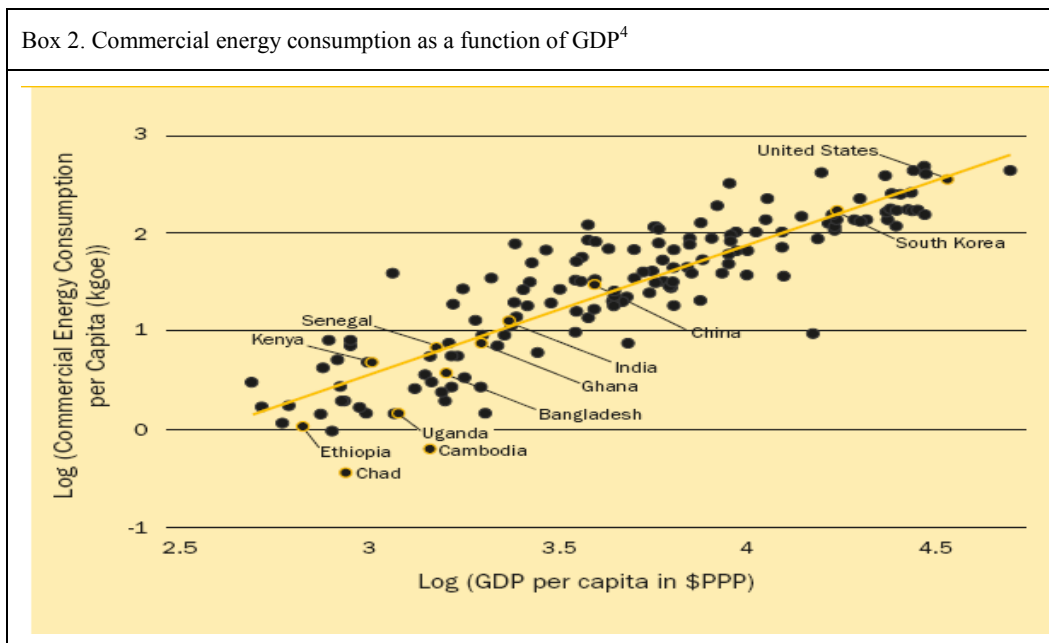
¹ COM(2009) 39 "Towards a comprehensive climate change agreement in Copenhagen"

² The Energy Challenge for Achieving the Millennium Development Goals, UN (2005)

MDG 7 Environmental Sustainability	Energy production, distribution and consumption has many adverse effects on the local, regional and global environment including indoor, local and regional air pollution, local particulates, land degradation, acidification of land and water, and climate change. Cleaner energy systems are needed to address all of these effects and to contribute to environmental sustainability.
MDG 8 Global partnership	The World Summit for Sustainable Development called for partnerships between public entities, development agencies, civil society and the private sector to support sustainable development, including the delivery of affordable, reliable and environmentally sustainable energy services.

Energy and economic development

Providing energy services³ is essential to overall development rather than being an end in itself. Most economic activity requires energy, and no country in modern times has substantially reduced poverty without massively increasing its use of energy. Economic growth creates jobs and raises incomes, including for the small and medium-scale enterprises that are the main source of jobs for the poor. Energy is an important input in agricultural production. Box 2 illustrates the link between per capita GDP and per capita use of commercial energy.



³ Energy services include heat for cooking, illumination for home or business use, mechanical power for pumping or grinding, communication, cooling for refrigeration, etc. Modern energy services, i.e. electric lighting, gas heating etc., is used opposite to traditional energy services such as biomass cooking and kerosene lighting.

⁴ Energy Services for the Millennium Development Goals, UN Millennium Project (2005)

The three aspects of the energy challenge

Access to modern energy services

Overall, in developing countries, 1.6 billion people still lack access to electricity and 2.5 billion people use traditional biomass for cooking⁵. Four out of five people without access to electricity live in rural areas of the developing world, mainly in South Asia and Sub-Saharan Africa. Access to electricity in rural areas is lowest in Africa, with an electrification rate of only 19% (Sub-Saharan Africa 8%), while the electrification rate in rural South Asia is now at 45% and rising. East Asia, mainly due to China in the 80's and 90's, managed to dramatically reduce the number of people without access to electricity. Sub-Saharan Africa is the only region where the total number of people without access to electricity has increased steadily, and is projected to continue to do so. For this reason, it makes sense to place a greater focus on Africa. Of the 2.5 billion people depending on biomass as their primary fuel for cooking, over half of these people live in India, China and Indonesia; however, the proportion of the population relying on biomass is as high as 90% in parts of Sub-Saharan Africa.

Energy security

The threat of interrupted gas supplies recently experienced by Europe is an indication of the vulnerability of our society to energy shortages. In developing countries, energy security is threatened not only by the availability and price of fossil fuels but also by other factors. Variable precipitation due to climate change affects hydro-power generation. Poorly interconnected small national systems with low reserve capacities increase the vulnerability. Insufficient resources to maintain existing systems exacerbate the situation. It is essential, when trying to expand access to electricity, to keep sustainability of supply in focus.

Climate change

Energy-related global CO₂ emissions are increasing due to rising fossil-fuel use, with the major increases coming from emerging economies such as China and India and from the Middle East. Africa, and in particular Sub-Saharan Africa, only contributes to global CO₂ emissions by a very small percentage, and would continue to do so even if the basic needs of the population, that is electricity for lighting and modern fuels for cooking were provided to all those who currently rely on traditional fuels. Renewable energy systems do help address climate change, but for Africa they are essential to provide sustainable and secure energy. Protection against high oil prices further supports a focus on renewable technologies.

2. GENERAL APPROACH TO THE ISSUE

Modern energy services concern the provision of electricity, modern cooking fuels and efficient stoves for traditional wood fuels. Access to sustainable and affordable energy services, and not only the provision of energy technologies or infrastructure, should be in the focus of development cooperation. Improving energy efficiency should be given

⁵ IEA, World Energy Outlook (2006) p.419, p.567

proper attention as a cost-efficient way of providing additional energy services within given resource constraints and without negative environmental impact. The different characteristics of rural, urban and peri-urban areas in terms of population density, energy demand and distance to an existing grid are factors that must be considered on a case by case basis in the design of energy access programmes.

Urban and rural areas

Access to electricity is unevenly distributed between urban and rural areas, and the low overall access rate in Africa is partly explained by negligible service coverage in rural areas, where most people still reside. While the average access rate in urban areas in Africa is about 70%, the access rate in rural areas is only 19%, and in many sub-Saharan countries as low as 1-3%. Access for the poorest people is particularly low, and the inequality is increasing over time.

In urban areas, which are home to an increasing proportion of the population, connection to the grid typically does not constitute the same problem as in rural areas, although many utilities struggle with a large back-log, and reliability and efficiency are huge problems. Peri-urban areas pose particular problems as they have a largely informal sector and poorly organised public services, but with a more aggregated demand than in rural areas.

Models for increased access

Many governments in developing countries, through their public utilities, do make concerted efforts to increase access to electricity for their population by expanding national electricity networks. This is supported in national programmes as the basic model for increased access. However, the limited size of many national networks, and the dispersed population, particularly in countries in Sub-Saharan Africa, makes decentralised off-grid and mini grid solutions⁶ important and necessary for providing electricity in isolated and rural areas. As the load grows, connecting a local grid to the national networks becomes increasingly economic. Therefore, decentralised off-grid and mini grid solutions are vital, both to ensure equity and to help extend the grid.

Unsustainable use of traditional fuels

While energy sector activities can contribute to protection of the environment (notably through sustainable management of water and forest resources), unsustainable energy practice can be a cause of environmental degradation, deforestation, indoor and outdoor pollution and climate change.

In rural areas, poor people spend a disproportionately large amount of their time and income on inadequate energy services. Traditional biomass fuels will continue to dominate for many years. Although it is not a main cause of deforestation, it has two main disadvantages, the labour and time spent by women and girls in collecting these fuels and the detrimental health effects of indoor use. Indoor air pollution is considered responsible for 1.3 million deaths annually in developing countries⁷, which puts it on the

⁶ Centralised means connected to the national or a major electricity grid. Decentralised means either connected to a small local grid, or individual solutions such as solar panels supplying one building.

⁷ IEA, World Energy Outlook (2006) p. 419-430

same level as malaria. A main problem, in many developing countries, is the unsustainable use of traditional cooking practises (mainly charcoal, but also fuel wood, used in urban areas) which may be a major cause of deforestation close to the urban area.

3. FOCUSING ON KEY AREAS AND PUTTING IN PLACE THE RIGHT CONDITIONS

A. Key areas

A1. Local solutions for sustainable energy services

Local solutions are important for areas which can not be reached by the national grids due to high cost or for other reasons. Rural and isolated areas, located away from national grids, constitute a market where decentralised solutions are the only realistic choice. Many peri-urban areas pose special problems, which may be addressed notably by concerted local initiatives providing for suitable organisational and management arrangements.

In rural areas, where electricity supply is based on diesel generators, sustainability has often been a problem, even more so as oil prices rise. Therefore, sustainable local solutions, based on renewable energy, should be preferred to solutions based on fossil fuels. Sustainability must include economic, environmental, and social points of view, and the solutions must be adapted to local conditions. It is essential that local authorities and other local actors engage actively in planning and implementation for proper ownership.

Renewable systems, implemented at local level, would not only provide modern energy services to communities, they would also generate jobs during construction, and could be a source to new businesses. Using energy more efficiently can make decentralised systems more sustainable economically.

Successful implementation requires local bodies, the private sector and civil society to be brought aboard. Local bodies are important where central resources are insufficient, and to deliver services that satisfy the real needs of rural people and their communities. Engaging the private sector is equally important to provide the required skills and to make additional financial resources available. In difficult peri-urban areas, engaging with relevant local actors is key to successful implementation.

Local, sustainable solutions, implemented by local actors and engaging the private sector must be given an increasing role in EU development cooperation.

A2. Renewable energy technology

Renewable energy provides for sustainable energy supply in terms of energy security and contributes to mitigating climate change, noting though that providing the population that currently lacks access to modern energy services with electricity and modern cooking fuels to meet their basic needs would only marginally add to current global CO₂

emissions⁸. Protection against higher oil prices is another reason for emphasising renewable technologies.

Many developing countries and Africa in particular, have a huge potential for renewable energy, which is only marginally utilised. The intensive development of renewable energy worldwide is driving down costs⁹, which should make renewable energy increasingly attractive also from a purely economic point of view. Advances in ICT technology can support its integration into local grids.

The choice of renewable energy technology (hydro-power, wind, solar, biomass, geothermal or locally produced bio fuels), system design and back-up would depend on local conditions. Hydro-power in Uganda, wind power in North Africa and solar power on the island of Niue are all examples of locally adapted renewable systems. Providing increased cooperation in research, focusing on the adaptation and adaptability of renewable technologies to developing country conditions, would improve sustainability, as would extend EU initiatives promoting the uptake of low carbon technologies to developing countries.

Renewable energy in decentralised solutions, technology transfer and applied research into renewable energy must be a key component of EU development cooperation.

Renewable energy systems, implemented at local level, are the key to solving the energy access problem in rural areas. However, there are barriers to renewable energy development, which need to be addressed. These include insufficient or non-existent policy and legal frameworks, financial barriers and lack of capacity. Proper government policies and targets are important for creating an enabling environment to mobilise resources and encourage private sector investments. The absence of low-cost, long-term financing is considered one of the main obstacles and the lack of local capacity another. The importance of technical know-how and trained manpower is to be emphasised.

EU development cooperation must step up efforts to systematically address the various barriers to implementing renewable energy.

A3. Energy efficiency

Improving energy efficiency, thereby liberating generation capacity, can be a simple and economic way to make modern energy services available to new customers. Improved energy efficiency, in existing and new installations, will help improve the security of energy supply and combat climate change. The efficiency of power generation can be increased for example by co-generation, and electricity distribution can be made more efficient by reducing losses. This would further benefit the development of rural areas through electrification. Improving end-use energy efficiency is often the far-most cheapest way of making additional power available and for reducing overall emissions.

Establishing national or regional action plans for energy efficiency, taking advantage of EU efforts in this field, could help to first identify the key actors and the main barriers and drivers for more energy efficiency, followed by appropriately designed policy

⁸ Energy Services for the Millennium Development Goals, UN (2005), p. 31

⁹ IEA, World Energy Outlook (2008) p.164

measures. Improving awareness on the part of policy makers, entrepreneurs and energy consumers about the methods and benefits of energy efficiency is crucial. Collecting and exchanging information on the state of energy efficiency initiatives through local or regional networks is one way of learning about best practices and disseminating information on successful energy efficiency measures to other interested countries.

Improved energy efficiency should be mainstreamed in all EU energy development cooperation work.

A4. Modern cooking fuels

For most people living in poverty in developing countries, the main energy demand is for cooking. However, the widespread adoption of more efficient and modern cooking devices and fuels is slow. Alternative fuels and technologies, such as LPG, efficient cooking stoves, and biogas technology, are available, many initiatives have been taken¹⁰, but implementation has so far been slow and scale-up limited, particularly in Africa. Forest management and rural wood markets are the key to insuring sustainable wood supply.

The importance of modern cooking fuels should be emphasised in EU development cooperation, in particular boosting the public energy and forestry policies and the capacity of the local private sector.

B Putting in place the right conditions

B1. Appropriate frameworks

Having the right national framework and planning process is important to rapidly deploy decentralised energy systems based on renewable energy. Developing countries typically do not integrate energy in national planning processes. In particular, access to modern energy services and improved use of traditional biomass have received little attention in national planning documents or donor supported programmes. Cross-sectoral analyses must be carried out to identify priority energy needs and the optimum resource mix. Designing and implementing appropriate sustainability schemes for bio fuels are also needed.

More support to partner countries to develop the right frameworks and integrate decentralised energy sources in a sustainable way into their planning of the energy supply mix is needed.

Proper government policies and targets are important for creating the right conditions to mobilise resources and encourage private sector investments. Box 3 indicates successful cases where national policies were improved.

¹⁰ IEA, World Energy Outlook (2006) p.432-434

Box 3. Successful implementation of energy programmes

Several successful cases can be identified, where strong national policy and planning has generated the desired results:

- a) In 2006, the Moroccan government launched a national debate on energy, followed by a national plan. Targets set were 20% of electricity production provided by renewable energy in 2012. This gave a push to the wind energy programme, which had been developed in several phases since the 1990's. Currently, wind energy contributes to 2.3% of Morocco's electricity supply.
- b) A clearly defined government policy on the use of bagasse for electricity generation has been instrumental in the successful implementation of cogeneration in Mauritius, with plans and policies being worked out over the last decade. Currently more than 20% of the country's electricity generation comes from bagasse.
- c) Tunisia and South Africa provide examples of large scale, cost-effective electrification programmes at rates that can achieve national coverage in two to three decades. Low-cost technical designs, pre-paid metering and decentralised planning contributed.

B2. Developing local capacity

An important objective is to engage local actors in the energy development agenda through local authorities, communes or co-operatives, and through partnerships with the private sector. Civil society should play an important role. However, rural people and the local organisations that represent them, often lack the capacity to develop and articulate their needs. Capacity is also weak when it comes to planning, designing and managing energy service delivery programs to respond to these needs. Enhancing human capacity at the local level through energy-related education, training, and research will be key to successfully implementing local energy projects.

Institutional support initiatives to improve local capacity should be encouraged. Successful models of cooperation that give a key role to EU and African local authorities in development do exist in areas such as policy development, marketing, and the provision of drinking water.¹¹ This should form the basis for intensified cooperation that strengthens local democratic governance, improves national frameworks and sets up local twinning arrangements.

EU development cooperation should focus more on engaging with local authorities and other local bodies in energy development, and on strengthening of local democratic governance. Models of cooperation may include twinning arrangements and employing other institutional support programmes at various levels.

B3. Financing models

The lack of low-cost, long-term financing is considered one of the main obstacles. EU development cooperation should also address these issues in a systematic way. Public finance alone will not be able to deliver all the investment required to increase access to

¹¹ COM(2008) 626 Local Authorities: Actors for Development

modern energy services. *In particular, EU development cooperation must strive to attract international, national and local capital¹² and engage the private sector.* This will require finding innovative financing mechanisms and setting up the right framework. The financing schemes should be adapted to the local scale of action, whether training, capacity building or empowerment of the local communities. Initiatives and business models suitable for scaling-up should receive particular focus.

4. WORK AT EU LEVEL

The EU Energy Initiative (EUEI) launched at the [World Summit on Sustainable Development \(WSSD\)](#) in Johannesburg 2002 works in partnership with the private sector, financial institutions and civil society to improve the energy situation in partner countries. The EUEI is an important mechanism for EU donor coordination on energy, in accordance with the Paris and Accra Agendas. COOPENER, which was the first EUEI instrument, focused on policy support and capacity building on sustainable energy services for poverty reduction in developing countries.

The EUEI has been instrumental in developing the Africa-EU Partnership on Energy, which was launched at the EU-Africa Summit held in Lisbon 2007, and is now being implemented. The Partnership will advance the issues of energy security, access to energy and climate change. In addition to providing a forum for high-level dialogue, the Partnership is currently producing a road map, which will identify action to integrate energy markets, create the conditions to attract investments, increase cooperation in renewable energy, mobilise increased financing, capacity development, technical assistance and technology transfer.

In the National Indicative Programmes under the 10th EDF, a number of countries have chosen energy as their focal sector and energy is now included in several Regional Programs. Two new instruments have been created to complete the EU integrated framework of financing instruments for the energy sector: The ACP-EU Energy Facility¹³, targeting increased access to energy services in rural and peri-urban areas, and the Infrastructure Trust Fund for Africa¹⁴, providing support for regional projects on interconnection, power generation and power trade. The first Energy Facility, launched in 2006 and operated mainly through call for proposals, has supported 74 projects across Africa reaching out to 6,7 million beneficiaries.

The Commission is prepared to step up its coordinating role and its support, providing additional resources under the 10th EDF Intra ACP indicative programme to launch a second Energy Facility and to replenish the Infrastructure Trust Fund,¹⁵ and will provide coordination and support for the Africa-EU Partnership on Energy. The Commission is also launching a number of targeted initiatives on climate change, financed under EU Budget. In line with the Paris and Accra agendas¹⁶, all work is prepared in close

¹² Including contributions by the African diasporas

¹³ http://ec.europa.eu/europeaid/where/acp/regional-cooperation/energy/index_en.htm

¹⁴ http://www.eib.org/projects/regions/acp/infrastructure_trust_fund/index.htm?lang=-en

¹⁵ 200 million € for the Energy Facility and 300 million € for the Infrastructure Trust Fund

¹⁶ <http://www.acrahlf.net/>

cooperation with EU Member States, and facilities are open for co-financing by Member States. Coordination within the framework of the EU Energy Initiative will be continued.

The proposed Energy Facility, to be launched under the Czech Presidency of the Council of Ministers of the EU, will support innovative projects aiming at increased access to modern energy services in rural, isolated and peri-urban areas in ACP countries, through a call for proposals and through targeted actions. The facility will focus on renewable energy, work with decentralised actors and the local private sector, and concentrate on local financing gaps and capacity constraints. It will be anchored in national and regional strategic frameworks and within clearly defined strategies and priorities set by the ACP partner countries.

The EU strategy for the energy sector is closely linked to the strategy to address climate change. Climate change mitigation aspects need to be integrated in all energy sector programming and the possible consequences of climate change must be considered when designing energy interventions. Investment in tackling climate change must be significantly stepped up. Low carbon strategies will be important for the most developed African countries. A large part of these investments will be made by developing countries themselves. Developed countries will however need to significantly increase their support to developing countries. The Clean Development Mechanism (CDM) developed under the Kyoto Protocol, which is a possible source of additional financing for renewable projects, has not been widely applied in Africa. Finding appropriate mechanisms for carbon financing, applicable to developing countries, will be an important challenge to the coming climate negotiations during the upcoming Copenhagen meeting¹⁷.

The EU instruments on climate change under the "Environmental and Natural Resources Thematic Programme, including Energy", financed under EU Budget, complement the regional, national and local instruments and are available in all developing countries. These instruments are open to all developing countries, and not only ACP.

The Global Energy Efficiency and Renewable Energy Fund (GEEREF) is an innovative financing instrument, set up as a global public-private partnership, designed to maximise the leverage of public funds. GEEREF is tailored to the specificities of regional energy efficiency and renewable energy markets offering new risk-sharing and co-funding options for various commercial and non-commercial investors, and helping CDM projects to take off in Africa and elsewhere.

The Global Climate Change Alliance (GCCA) reaches out to the countries least responsible for, but most affected by global warming. The programme focuses on five areas: implementing concrete adaptation measures; reducing emissions from deforestation; helping poor countries benefit from the global carbon market; helping poor countries to be better prepared for natural disasters related to climate change; and integrating climate change into development cooperation and poverty reduction strategies.

¹⁷ UN Climate Change Conference (COP15), Copenhagen, 7-18 December 2009. <http://en.cop15.dk/>

5. CONCLUSIONS

This Staff Working Paper has sought to highlight the importance of making a concerted effort within the EU to step up action on energy development cooperation in order to facilitate increased access to sustainable energy services at local level. Among the lines of action to be pursued are:

5.1. Focus on modern energy services

EU development co-operation in the energy sector must focus more on providing modern, sustainable energy services in rural and isolated areas, in particular in Sub-Saharan Africa if the continent is to achieve the Millennium Development Goals. The provision of electricity services, in particular for productive uses, stands out as the key challenge, but more must be done to support efficient and sustainable use of traditional biomass in developing countries and switch to modern cooking fuels in urban areas.

5.2. Synergies with climate change policies

The need for economic, environmental and social sustainability makes renewable energy the preferred solution at the local level. In many developing countries renewable energy sources are available in abundance. The intense work on energy by EU Member States, which include agreed targets on shares of renewables, increased energy efficiency and reduction of CO₂ emissions, provide an ideal background for development cooperation, adapting technology transfer, incentive mechanisms, and research to also benefit developing countries. Carbon credit financing mechanisms, such as the clean development mechanism, could be developed to benefit developing countries to a larger extent.

5.3. Involvement of local actors, civil society and private sector

EU development cooperation should focus more on involving local authorities in energy development, and in strengthening relevant local democratic governance. Decentralised solutions, based on renewable energy, could be implemented locally, by bringing local communities, the local private sector, and civil society on board. Models of cooperation between local authorities in EU and Africa may be implemented based on recent EU experience. They should include twinning arrangements and use other institutional support programmes at various levels, including the development of local level capacity for designing and managing energy service delivery programmes.

Making more funding available for investments, in particular from the private sector, will be critical for scaling-up. EU development cooperation in the energy sector should support the development of legal frameworks and business models that would attract private capital, where appropriate leveraged by public funds and, inter alia, involving financial institutions.

5.4. EU development cooperation instruments

The new ACP-EU Energy Facility, with a focus on local renewable energy, will be the key instrument to address the challenge of access to energy. The Facility will provide a way to make energy readily accessible, and to implement new models for decentralised cooperation. It will be an innovative and catalytic instrument, designed to trigger action

and use Member States' capacity where possible, in line with the Paris and Accra Agendas. The Facility will take advantage of new methods for cooperation under the 10th EDF and work with local actors and the local private sector among others. It will be complemented by other instruments under the integrated framework, including those targeting climate changes, and will be open to Member States' contributions.