Position paper on biomass for the ACP-EU Energy Facility

Biomass is the oldest and the most used source of energy in African, Caribbean and Pacific countries. It is today a major economic sector and offers strong opportunities for development. However, too little attention has been paid in the past to biomass energy in terms of investments and policies.

The purpose of this paper is to give some elements of guidance for promoters of biomass projects (mainly for household uses) to be co-financed by the ACP-EU Energy Facility.

1. Biomass energy: general context

The lack of sufficient accessible reliable and affordable energy is a major break for ACP countries to achieve the MDGs by 2015. Biomass energy, mainly through wood and charcoal, represents approximatively 80% of the total energy consumption in Sub-Saharan Africa, and up to the equivalent of one third of the total household economy. Biomass energy sources are available locally, renewable and of wide origins, giving therefore the opportunity to be used for fuels, power production and products that would otherwise be made from fossil fuels.

The use of biomass energy is linked with a strong potential and opportunities in terms of economic development and improvement of livelihoods. However it has been seldom considered within national policies or ODA actions. Because the availability and uses of biomass energy resources are strongly dependant on an important number of factors (including generation capacity, management of the resource, supply, traditional uses, demand and efficiency of uses), it is considered as a complex area. However, the alternatives in the sector of household energy are often less convenient and more expensive, and are therefore limited.

Energy policies have to bring about a better balance between large scale investments and sustainable energy systems for the poor. On this regard, support from the international community should promote a stronger focus on:

- Energy access to non-electrical energy needs, in particular on energy for cooking
- Informed energy planning considering all sectors concerned in order to maximize the effect of development initiatives
- Market opportunities which derive from and encourage development of the poor

Sources of biomass energy: Wood is the largest biomass energy resource used today but biomass sources include also tree and grass crops and forestry, agricultural, and urban wastes. These wastes (as well as industrial and liquid municipal ones) can also be transformed into biogas through a biomethanation[1] process. The biogas can be upgraded[2] and used to generate power or process heat on commercial basis.

[1] Production of methane gas by the biological breakdown of organic matter in the absence of oxygen.
[2] Gaseous biofuels or biogas can be upgraded to Substitute Natural Gas (SNG) and "blended" with natural gas in any mixture or be processed into "green" Compressed Natural Gas (CNG) thus becoming directly available as a powerful and very clean-burning liquid fuel to be used in gas-engine vehicles.

This paper is mainly focussing on biomass as a source for household energy, but is also considering biomass for power generation. Liquid biofuels are here excluded as they are considered in a specific paper.

2. Why supporting activities in the sector of biomass energy?

Importance of biomass as source of energy: Investments in access to energy, which were already under the existing needs, have dropped in quantities and are focused on electricity production and distribution as well as on petrol exploitation. However, in rural areas of ACP countries, the available biomass has a major potential as an energy source. There are both strong needs and opportunities to involve biomass energy within energy investments in ACPs.

Biomass is by far the main source of household fuel in Africa. In comparison, biomass accounts for about 3% of final energy consumption in OECD countries. In Sub-Saharan Africa, biomass is used by a large majority of the population to meet its energy needs, from a 68% in Kenya and up to a 94% in Burundi. Also, 80 to 90 per cent of the residential energy needs of low-income households are met by traditional biomass, mostly fuel wood or charcoal.

Internationally, the total number of people relying on traditional biomass as a source of heating and cooking fuel went from an estimation of just under 2.4 billion people in 2002 and should reach 2.6 billion in 2030 (increase of 8%). This figure is due to the important growth of biomass use in Africa, as the number is to increase from 646 to 996 million in the same period (54% increase). Indeed, Africa is the world's largest consumer of biomass energy through firewood, agricultural residues, animal wastes, and charcoal.

Biomass energy misuse consequences: The widespread use of biomass as energy source has proved to present severe unwanted side effects on the health of the consumers and on the environment.

Traditional fuels being burnt under inadequate conditions cause 1,5 million deaths per annum (mainly due to respiratory diseases caused by high concentration of particulate matter and the high level of carbon monoxide) and the mismanagement of the natural resources leads to deforestation and desertification.

Low income households are particularly sensitive to the **economic impact** of household energy and alternatives to biomass energy are not easily affordable for them. They tend to use the most economic fuel for their energy needs, notably thermal. The cost of fossil fuels is volatile and, as electricity heating, often prohibitive.

3. Challenges in the sustainable use of biomass

Despite that the use of biomass concerns a major part of the population in developing countries and the current demand of energy (mainly for heating/ cooking) could be satisfied by this mean, it has been only marginally taken into account by national and global players.

The difficulty of building integrated suitable actions from different stakeholders responds to different factors:

- The **variety of effects** of the actual uses of biomass resources, which are cross-sectoral (health, economical, environmental) and often under-estimated
- The difficulties to understand the dynamics of the sector due to **the limited reliable data** available and the lack of documentation or statistics on low income use
- **Lack of institutional skills** in terms of financial and human resources which lead to have a marginal role on terms of quality control and regulation

Among the consequences of this complex situation can be found that:

- The sector receives **low priority and a limited attention at a policy level** and it is most of the time not regulated, not organized between the high number of intermediaries and actors (producers, dealers, transporters, consumers...) and strongly an informal sector
- **Planning is difficult** and planning efforts can be mislead by wrong estimations
- It is also considered **not attractive to investors from the private sector**. This is mainly due to its low cost, and long time frame before seeing benefits (notably when involving resource management systems)

On view of these circumstances and the **importance of biomass as energy source the main challenges to achieve a sustainable use of biomass are:**

- Include biomass in national energy strategies and perform informed planning (to maximize the effect of development initiatives such as access to energy).

  Several economic sectors must be considered when designing strategies on the sector of biomass. To plan sustainable and efficient ways to exploit natural resources linked to energy uses it must be taken into account the whole chain from biomass production to it final use, in order to attain the maximum efficiency on its production, transport, supply, transformation, technology and use
- Identify market opportunities which derive from and encourage development of the poor

On the other hand, the sustainability of this energy source is threatened by disproportionate uptakes coming from the urban markets. Whereas the uptake of wood locally would therefore not be the major cause for deforestation, feeding urban markets often does not allow the resources to be renewed.

The energy transition that is currently happening in many countries, together with population growth in cities, involves an increase in charcoal use. It is therefore important to develop scenarios of supply for the future, but also to improve the too often poor performance of current efficiency of the whole charcoal chain.

Notably, end-use efficiency for most traditional fuels is low. A high concentration of fuels is needed to produce a low level of energy, and a significant share is wasted. Traditional cooking methods use only 10 to 15% of the energy potential from the combustion of wood. Techniques using improved stoves can upgrade this figure to between 50-95%, saving up to 80% of the overall family financial resources dedicated to energy. Using improved boilers and stoves also improves indoor air quality and diminishes effects of smokes and dust on health. Improving the wood fuel used in the stoves and boilers also helps to lower local emissions e.g. by ensuring that the wood has been sufficiently dried before burning. Some efficiency improvements can therefore be achieved through **education** of households.

4. Possible actions with the Energy Facility

To overcome the vicious cycle of poverty, energy programmes have to strengthen existing practices improving the household economy. Successful approaches should be identified and scaled-up, providing a long-term support, to be guaranteed through the possible commitments of the local private sector / micro-entrepreneurship. Within the scope of the Energy Facility, projects should mainly focus on 1°) improving governance systems and 2°) access to modern energy services.

Within the sector of biomass energy, governance supportive actions are necessary both at the local and national levels but mostly should be as integrated as possible, taking into account all stages and actors of the sector. Such activities, in parallel to the Governance position paper, include but are not limited to:

- planning activities;
- natural resource management and exploitation for energy purposes, including the guarantee of sustainable supply of biomass resources, management of forests and of renewing the capacity of production of wood;
- scenario development that will balance supply with demand and defining adapted schemes for the provision of peri-urban areas and reaching sustainable and efficient uses of biomass for energy purposes;
- development of adequate managing capacities from the responsible authorities, with transparency and accountability;
- defining incentives for sound behaviour, rewarding sustainable practices;
- setting up adapted regulation schemes;
- ensuring links at horizontal level with other sectors.

Public authorities (local/national) should be strongly involved in the coordination of the activities. Community based management remains essential so as to allow populations to control the resources to which they are economically linked. Profit going to entities which have no responsibility for the maintenance of the resource would lead to unsustainable systems. Ideally, actions should be achieved after the definition of a global policy for household energy.

Sustainable forest management schemes should be set up and promoted to ensure that wood resources for energy and other purposes are available in the foreseeable future. **Improved sustainable management of forests and wood resources** is possible for example through the set up of a legal framework on sustainable forest management and on the use of biomass for energy purposes. Reducing the impact of wood uptake on deforestation does not mean to stop exploiting the forest resource, but probably to change actual exploitation methods, which can be seen as a long and complex process.

Infrastructure development may be needed to create an efficient supply chain for biomass, including an increased supply of biomass resources, the professionalization of the charcoal value chain, including the efficient processing of biomass (can also be done with pellets and briquettes) to improve fuel quality, to enable transport of the local biomass to power plants or to the domestic users, and to monitor and control charcoal flow.

Technology/experience transfer for the increased access to renewable energies is also an area to be developed. For instance, **technological skills** can be improved. There are few producers using other than traditional biomass energy technologies (e.g. modern brick and

charcoal kilns, improved boilers and stoves), due to a lack of knowledge about their availability, and also on the advantages they represent for the consumers. Exchange of **experiences,** if well within the scope of the Energy Facility, can be used to develop e.g. (this list is not exhaustive): practical and institutional capacity, strategies and mechanisms for scaling up services or marketing channels, and support mechanisms such as financing incentives.

On the production side, specific projects for improving access to energy services can consider a variety of technologies and biomass energy sources, when complying with the EF priorities and context (notably, local to national scale and targeting vulnerable populations) and that cost-effectiveness and sustainability of the resource is fully ensured.

Examples of such technologies include, but are not limited to:

- **Biopower**, or biomass power, is the use of biomass to generate electricity. There are strong opportunities and advantages to use biomass power in ACP countries: sustainable resources can be available locally (e.g. agro-industrial residues), of which very little is currently used for power generation in Africa, and it allows the diversification of the energy supply. .
- **Co-generation plants** (combined heat and power plants) are an efficient way to produce both electricity and heating, as long as there is sufficient heat demand and a district heating network can be established.
- **Biogas** technology, allowing the transformation of agricultural and other organic residues and wastes into energy, can be used for producing electricity or heating (i.e. heat for cooking and electricity for lighting). It is seen as being particularly suitable to rural areas as it relies on a simple, well-known process (methanisation) and its own leftovers can be used for fertilisation purposes. Nevertheless, some examples show that this technology is also adapted to peri-urban contexts e.g. in Kibera, in the suburbs of Nairobi.

Energy saving is a major concern and can be obtained through the continuation and increase of programmes aiming at reducing the consumption of wood for fuel. For instance, **efficiency** can be improved and bring substantial benefits for the households. **Improving carbonisation methods** reduces the quantity of wood needed to produce charcoal. Good practices are well identified, and can dramatically increase (up to double) the yield of charcoal produced in carbonisation with simple techniques, easy to implement, and at no extra cost. Integrated **improved stoves and boilers** projects, including services, marketing and household education strategies, offer the opportunity to maximise impact at different levels, as described above (health, environment, access and household economy).

Finally, **biomass alternatives of wood fuels** (e.g. pellets and briquettes from wood and vegetal residues) should be promoted, according to the local capacity for changes (e.g. GPL maybe more suitable for peri-urban areas, other biomass sources as fuels need to be produced/available locally). The use on a large scale of agro-industrial waste for the production of briquettes and pellets can also be developed as a substitute for charcoal.