A GLOBAL NETWORK ON BIOENERGY – OBJECTIVES, STRATEGIES AND FIRST RESULTS

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ABSTRACT: In order to promote the sustainable use of biomass in Latin America and other emerging countries it is the general objective of this Thematic Network to establish a transnational forum of Knowledge Centres (Universities and R&D Institutes) and SMEs from Latin America and other emerging countries and the European Union. The activities of the Thematic Network include the analysis of existing energy policy frameworks, the assessment of energy demand and biomass resources, the analysis of available bioenergy technologies and systems as well as the development and implementation of policy options for the promotion and deployment of bioenergy. The main focus will thereby be on the promotion of small- and medium-scale decentralised bioenergy systems and the large-scale implementation of bioethanol production and generation of heat and electricity based on sugar cane and other suitable biomass resources including agro-forestry residues.

Keywords: bio-energy policy, sustainable use of biomass, bio-ethanol

1 INTRODUCTION

Good management of resources, alleviating poverty and improving the socio-economic conditions of living as well as the identification of sustainable technical and economical schemes are key objectives for research and development efforts in emerging countries and the EU partnership with emerging countries. Projects focussing on scientific co-operation and policy research in general and especially in the field of renewable energies are of great importance today, as the European Commission recognises that the creation of suitable policy frameworks is required prior to the development of more advanced technologies in order to successfully tackle the main challenges of sustainable development.

In the past the political dimension and the international role of science was often limited to specific fields like aviation and space, nuclear energy and oil. Today, it is agreed upon that science forms the 4th pillar of External Relations together with the fields of politics, trade and international co-operation. Therefore, scientific co-operation and the linkage of scientists, decision makers and entrepreneurs in Thematic Networks is expected to gain an ever increasing importance in the relation between the European Union and countries from Latin America, Asia and Africa.

In order to contribute to these objectives this Thematic Network is funded by the European Commission in the framework of the specific research and technological development programme 'Confirming the International Role of Community Research'.

2 OBJECTIVES AND STRATEGIES

The main objective of this global Thematic Network is to establish a transnational forum for the promotion of sustainable use of biomass in Latin America and other emerging countries. This network of 48 institutions (Knowledge Centres and SMEs) from 24 countries worldwide is set up to face urgent needs for improved and regionally adapted bioenergy applications.

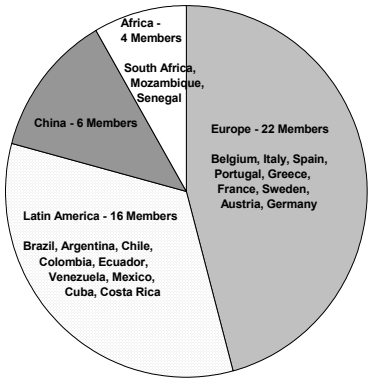

Figure 1: Membership of the Global Network

The focus of the project will thereby be the identification of technological objectives and the development of policy options to boost deployment of decentralised biomass production and biomass based energy generation. Concerning the large-scale promotion of bioenergy and the realisation of significant benefits from the deployment of modern, efficient and sustainable

bioenergy systems in Latin America and other emerging countries the following key Thematic Priorities have been identified and will be addressed during the implementation of this project.

2.1 Analysis of the energy policy framework

In order to facilitate the elaboration of suitable policy options for the promotion of bioenergy it will be essential to directly address existing national and regional energy policy frameworks and to assess benefits and drawbacks of existing bioenergy programs.

Energy policies in emerging economies should aim at the strengthening of energy and power infrastructure, the diversification of economy in order to reduce the dependence on petroleum and the exploitation of alternative energy sources including renewable energies.

The contribution of bioenergy to the realisation of these objectives can be significant due to the large potential of biomass resources. Moreover, the production of liquid fuels from biomass can help to reduce the dependence on petroleum especially in the important sector of transport, and small-scale decentralised biomass power generators can improve the energy supply of remote villages in rural areas.

2.2 Assessment of energy demand and biomass resources

The assessment of quantitative and qualitative energy demand of various actors in society will address the specific needs of villages, families, SMEs, industries, transport and public infrastructure (hospitals, schools, tourist resorts etc.). Special emphasis will be given to the assessment of current and future primary energy consumption of the heat, electricity and transport sector as well as the demand for high quality fuels for transportation. Additionally, an analysis of local market prices for various energy sources will be performed and economic opportunities, income generation and local rural development options will be identified.

The present and future resources for the use of biomass will be assessed in order to indicate possibilities to meet demand with locally available resources. An important aspect to be addressed is an increased availability of biomass resources. This can be achieved by an enhanced recovery of various agro-forestry residues and the plantation of dedicated crops on surplus, marginal soils.

2.3 Analysis of available technologies and systems

Suitable and practicable technologies and systems for bioenergy production will be investigated for application in emerging countries. Relevant technologies and systems will be selected on the basis of maturity of the technology, cost-effectiveness, simplicity of maintenance, social acceptability and the impact on development.

Moreover, the benefits in comparison with conventional energy supply and the possibility of local production of the technology will be taken into consideration. The main aim is thereby to develop efficient and cost-competitive solutions for the conversion of biomass to energy services and the focus of the activities of the global network will be on the following thematic priorities:

- Small, medium and large scale biofuel (e.g. bio-ethanol, vegetal oil) production
- Small, medium and large scale cogeneration and trigeneration
- Small and medium scale biogas and charcoal production
- Gas generation from agro-forestry residues
- Combustion and co-combustion technologies; Low pollution stoves
- Technologies for the conversion of biomass crops and residues in pellets and briquettes
- Integrated Bioenergy complexes in emerging economies
- Comparison with conventional energy supply with respect to cost-effectiveness, simplicity of maintenance, social acceptability, impact on development

2.4 Development of policy options for the promotion of bioenergy

Based on the identification of the energy policy framework and the technical conditions to meet the demand with local resources, policy options for the promotion of bioenergy will be elaborated. In order to indicate sound technical solutions, an involvement of local authorities, project responsibles, decision-makers on the one hand and the Network of Knowledge Centres and SMEs on the other hand has to be assured. The following thematic priorities will be addressed in the framework of this global network:

- Potential and barriers for CDM (Clean Development Mechanism) projects, Joint Implementation and carbon trading
- Strategies for biomass trade (e.g. biofuels)
- Analysis of successful projects/programs (best practice) of biomass use in Latin America, China and Africa including problems faced and overcome
- Programs for the use of modern biomass fuel in the transportation sector
- Promotion of international co-operation (e.g. Int. Governmental Coalition on Bioethanol)
- Potential and barriers for technology transfer and joint-ventures
- Economic aspects of the promotion of bioenergy (financing and loan schemes, credit mobilisation, investment capital, market penetration)

2.5 Implementation of Policy Options for the Promotion of Bioenergy

In order to implement the proposed policy options the global network will assure that they are elaborated in consultation with and are widely disseminated among local authorities, decision-makers, utilities, project responsibles, private investors and communities of highly motivated people.

The network will contribute to the promotion of joint-ventures and technological co-operation activities and to the identification of potential demonstration (best practice) projects.

Emphasis of the network's activities will be laid on the design and screening of Joint Implementation and CDM project candidates as well as the elaboration of training programmes and awareness campaigns in the fields of operation and maintenance, financing and management.

3 PROJECT RESULTS

During the 'kick-off' meeting of the global network on bioenergy in Brussels in March 2002 it was concluded, that the network's activities regarding the promotion of bioenergy utilisation in emerging countries will mainly focus on the following topics:

- Promotion of small and medium scale decentralised bioenergy systems such as advanced pelleting/drying technologies, small plants for co-generation and refrigeration systems, syngas generators, micro-distilleries for ethanol production, charcoal pellets, activated charcoal for water purification. These small-scale bioenergy systems are strongly supported by the European Biomass Industry Association (EUBIA), as the penetration to markets of small scale systems is expected to proceed at a faster pace due to the lower investment level and the reduced required supply of biomass resources.
- Large scale implementation of bioethanol production and generation of heat and electricity based on sugar cane and other suitable biomass resources (e.g. sweet sorghum) and the creation of a global bioethanol market.

In the long term the potential worldwide production of bioethanol is estimated to be at least 2 billion tons per year (t/y), with 0.5 billion t/y from sugar/starch crops and 1.5 billion t/y from lignocellulosic biomass. In order to achieve large market penetration the price of bioethanol has to decrease to approximately 250 US$ per ton. At this price level bioethanol will become an alternative commodity of strategic interest for the transport sector due to its high energy content, its potential contribution to a sustainable energy supply, its socio-economic impact for rural population and its multitude of applications. Thereby, the future market penetration of bioethanol is estimated to amount to 550 million t/y in the transport sector (20% of the present consumption), about 500 million t/y in the heat and power sector (10% of the total worldwide power plants), 200 million t/y for the production of industrial chemicals and several 100 million t/y for domestic markets [1].

Today, the largest producer of bioethanol is Brazil, where ethanol produced from sugar cane is continuously used as automobile fuel since 1975. Figure 2 shows the second largest sugar mill in Brazil with a capacity of more than 6 million tons of sugar cane per year.

Ethanol production in Brazil (14 billion litres) is divided between anhydrous alcohol (6 billion litres) and hydrated alcohol (8 billion litres) and the ethanol consumption in the transportation sector is roughly equivalent to 45% of the gasoline consumption. Anhydrous alcohol is blended with gasoline and used in conventional engines, while hydrated alcohol is utilised as neat alcohol in adapted engines. Ethanol use as neat fuel has declined in Brazil during the last 10 years, whereas the consumption of anhydrous alcohol has continuously increased. Thereby, the total demand for ethanol in the transportation sector has slowly diminished due to structural problems of the Brazilian Alcohol Program (PROALCOOL) and currently no national policy exists ensuring the long-term sustainability of the Program. The reduction of the contribution of renewable energy sources to the Brazilian energy system will continue unless a global effective policy for renewables will be implemented such as the creation of a global ethanol market with the involvement and commitment of a large number of countries. According to the Centro National de Referência em Biomassa (CENBIO), Brazil, it will thereby be necessary to focus on large scale markets (e.g. bioethanol) in order to develop sustainable economies of emerging countries, whereas decentralised, small scale energy systems may contribute to the reduction of poverty in rural areas of the world [2].

Figure 2: São Martinho sugar mill near the city of Pradópolis, State of São Paolo (Source: Copersucar, Brazil)

Additionally, there is a key interest in various sugar-producing countries (e.g. Brazil, Cuba, Mexico, Kenya, South Africa, Thailand) to exploit the large potential of sugar cane bagasse resources for the generation of electricity and heat [3]. Bagasse based co-generation is in line with policies implemented by national governments in order to diversify electricity generation by using indigenous resources. Cogeneration units thereby constitute an attractive option for financing through Clean Development Mechanisms (CDM). In Brazil, for example, among several policies under discussion, the implementation of a large scale co-generation program for the sugar/ethanol sector is regarded as a favourable option for both its environmental and social impact. Furthermore, revenues from electricity sales could lead to a further reduction of the alcohol production costs and accelerate the large scale market penetration of bioethanol [4].

Sugar cane has been grown and milled in the Southern African region for centuries. The Southern African Development Community comprising the sugar producing countries Malawi, Mauritius, Mozambique, Swaziland, South Africa, Tanzania, Zambia and Zimbabwe constitute one of the world's largest sugar producing areas with an average annual production of 3.8 million tons. Figure 3 shows the Merebank alcohol plant which is operated by the Illovo Sugar group and mainly produces high quality alcohols for domestic and export markets with a capacity of 40 million litres in 2001.

Nevertheless, there are still mayor constraints to the large-scale market penetration of sugar cane based bioenergy production in Southern Africa. Among these are the state-controlled electricity supply, offering low revenues for the producers of bioenergy and obstructing the access to the local grid as well as the large investment

costs required to up-grade boilers and/or generators for heat and power generation at sugar mills. Therefore, it is regarded as a promising option to take the opportunity to use Carbon Credits to kick-start co-generation in sugar mills operated by Illovo Sugar in Southern Africa [5].

Figure 3: Merebank downstream plant near Durban, South Africa, with an ethyl alcohol production capacity of 40 million litres per year (Source: Illovo Sugar Ltd, South Africa)

With respect to the various options for the implementation of sustainable biomass use in Latin America and other emerging countries it is the aim of this Thematic Network to develop suitable policy options for the promotion of bioenergy, which carefully take into account the specific local and national framework conditions as well as demand and available resources. Thereby, it is essential to combine the expertise of different stake-holders such as policy makers, donors, investors, private sector entrepreneurs and scientists in order to reach truly sustainable and sound bioenergy based development opportunities.

4 EVENTS OF THE THEMATIC NETWORK

The first workshop of the Thematic Network was organized as a Conference Related Event on the occasion of the 12th European Conference and Technology Exhibition on Biomass for Energy, Industry and Climate Protection, Amsterdam, 17-21 June 2002. This workshop constituted a platform for dialogue between the members of the network and interested delegates who were interested to benefit from a group of international experts working on the application of bioenergy in Latin America and emerging countries.

The second project workshop will take place in Durban, South Africa, 19-21 August 2002 and will be organized in close co-operation with the project partner Illovo Sugar Ltd. This workshop will include a technical tour to a sugar mill operated by Illovo Sugar Ltd and the thematic focus will be on 'Bioenergy from sugar cane bagasse' and 'Rural energy – woodfuels, charcoal and household issues'.

5 CONCLUSIONS

This global network on bioenergy has successfully started to establish a transnational forum for the promotion of sustainable use of biomass in Latin America and other emerging countries. The main activities of this Thematic Network will comprise the development of policy options for the large scale implementation of bioethanol production based on sugar cane and other suitable biomass resources (i.e. sweet sorghum) as well as for the promotion of small and medium scale decentralised bioenergy systems, in particular small scale village complexes suited to perform an integrated full processing of agro-forestry residues and dedicated crops [6].

In order to realise these objectives several workshops and seminars will be organised in the framework of this project. These events will be organised under participation of members of the Thematic Network and interested persons or organisations from Latin America and other emerging countries.

Information on project activities including workshops and seminars are available at the project website www.bioenergy-lamnet.org and at www.wip-munich.de and www.etaflorence.it.

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