BIOMOB

# BioMob

## Biomass Mobilisation

2009 - 2011

Shannon Development
*Delivering a Better Future*

BSC SME

MOHER TECHNOLOGIES

midt regionmidtjylland

innova

EUBIA

University of Rousse

AARHUS UNIVERSITY

RUSE MUNICIPALITY


BIOMOB

# CONTENTS

# Executive Summary

**Biomass refers to renewable energy coming from biological material such as trees, plants, manure, and municipal waste. The overall concept of BioMob is the development of research-driven clusters for biomass-mobilisation. The challenge is to identify appropriate biomass synergies between regions, research themes and enterprise opportunity. There were four regions in the project: Mid West (Ireland), Mid-Jutland (Denmark), North Great Plain (Hungary) and North Central Region (Bulgaria) representing the full range of biomass challenges, with each region providing a development organisation, university and private company.**

***BioMob was structured around six "work packages", or groups of activities.***

**Regional Challenges** focused on biomass mobilisation in the regions and gained a deeper understanding of the RTD implications of biomass. Overall recommendations included: establish new types of cooperatives or clusters in energy plant branches or in energy processing capacities; establish and expand local energy systems (in supplying of heat, electricity, waste management, agricultural/forestry market, local and outer transport); marketing and education on the use of biomass.

**International Benchmarking** provided case studies, showing how "business utilisation chains" (BUCs) contribute to the development of biomass and synthesizing some of the most central lessons learnt from comparing these cases. The different case studies represent different modes of organisation that relate to the diverse natures of the BUCs: single stakeholder, one link in a chain and cooperatives. These three types of case studies generated conclusions about four issues: whole-chain perspectives, stakeholders, involvement of RTD and rural development.

**Action Plans** had two parts: Individual plans were prepared in which each of the regions set out its strategy for mobilising biomass. The Joint Action Plan (JAP) focused on collective plans ensuring the establishment of appropriate collaborative support structures and knowledge transfer activities between the participating regions in biomass mobilisation, particularly on exploiting the strengths of biomass, innovation in biomass supply chains and proposals for a network of biomass regions

**Business Development** brought final delivery of results to biomass enterprises in each region, linking the project outcomes with enterprises and potential users in the regions. The local and trans-national results were systematically introduced to groups of firms, and customised to the growth strategies of individual enterprises.

**Exploitation** identified proposals prepared to the level necessary to respond to opportunities presented by the availability of, for example, national funding or structural funds, including a manual of good practice in the mobilisation of biomass through research-driven clusters.

**Dissemination** generated a range of activities at local and European levels on biomass mobilisation. This activity included mentoring and university-university exchanges as well as university-industry linkages.

# 1. Project context and objectives

There were four regions in the project: Mid West (Ireland), Mid-Jutland (Denmark), North Great Plain (Hungary) and North Central Region (Bulgaria), with 13 partner organisations, drawn from development organisations, higher education and the private sector

**BioMob Partnership**

| Participant | Country |
|---|---|
| Shannon Development | Ireland |
| Moher Technologies | Ireland |
| University of Limerick | Ireland |
| Mid West Regional Authority | Ireland |
| INNOVA Észak-alföld | Hungary |
| College of Nyíregyháza | Hungary |
| Bio-genezis | Hungary |
| Samsoe Energy Academy | Denmark |
| University of Aarhus | Denmark |
| Region Midtjylland | Denmark |
| University of Ruse | Bulgaria |
| Ruse Municipality | Bulgaria |
| Business Support Centre for SMEs - Ruse | Bulgaria |

Technical support was provided by EUBIA, the European Biomass Industry Association and by three external experts.

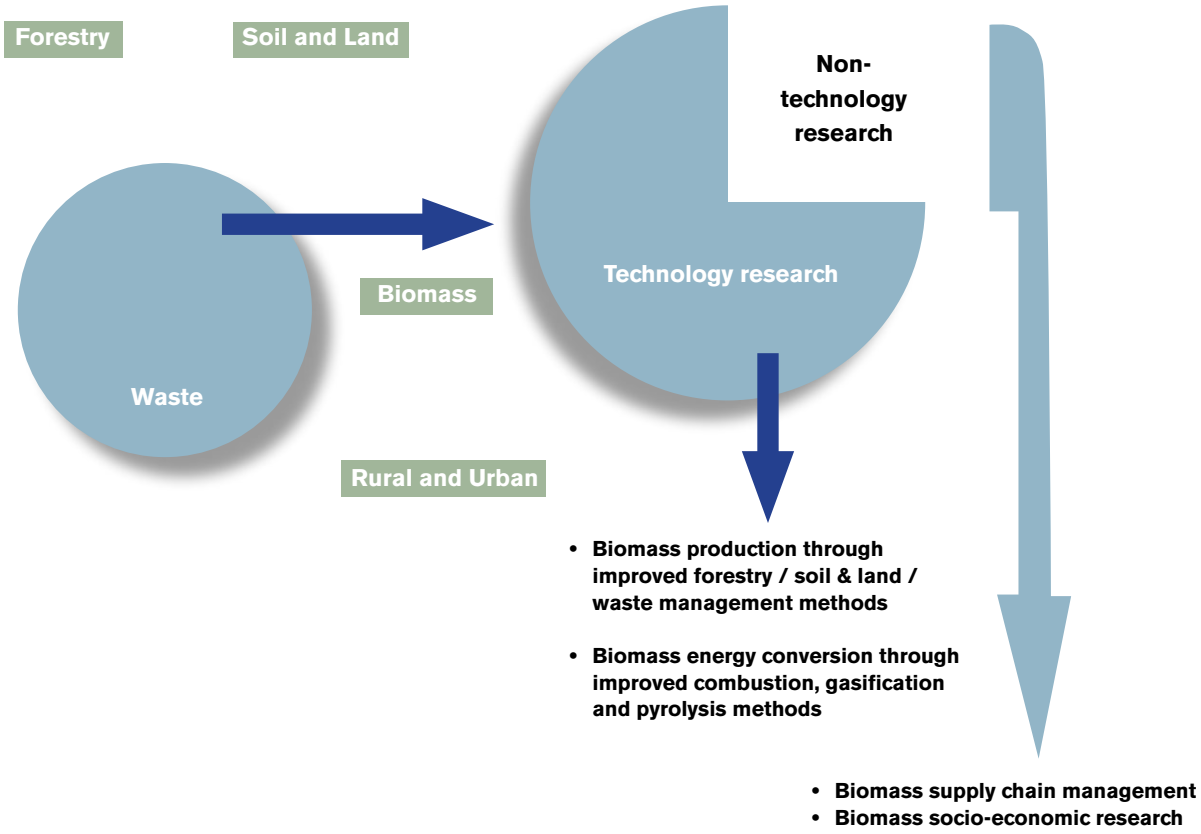
Biomass refers to renewable energy coming from biological material such as trees, plants, manure, and municipal waste. Using various transformation processes such as combustion, gasification, or pyrolysis, the biomass is transformed into biofuels, bioheat or bioelectricity and used for energy production purposes. Biomass is a carbon-neutral renewable energy feedstock.

Biomass originates from forest, agricultural and waste streams:
Forest and wood-based industries produce wood, which is the largest resource of solid biomass. The sector covers a wide range of different biofuels with different characteristics - wood logs, bark, wood chips, sawdust and more recently pellets. Pellets, due to their high energy density and standardised characteristics, offer great opportunities for developing the bioenergy market worldwide.

Agriculture can provide dedicated energy crops as well as by-products in the form of animal manure and straw. Available land can be used for growing conventional crops such as rape, wheat, maize etc. for energy purposes or for cultivating new types of crops such as poplar, willow, miscanthus and others.
Biodegradable waste is the biomass that can cover several forms of waste such as the organic fraction of municipal solid waste, wood waste, refuse-derived fuels and sewage sludge.

The overall concept of BioMob was the development of research-driven clusters for biomass-mobilisation. The project had a strong business focus and its ultimate goal was to see knowledge-based enterprises grow and thrive in the biomass sectors. This will support the sustainable use of biomass. At a time of intense demand for renewable energy, real possibilities exist for the transformation of regional economies through the commercialisation of applied research in the mobilisation of biomass. The challenge is to identify appropriate biomass synergies between regions, research themes and enterprise opportunity.

***BioMob Scope of Research Agendas***

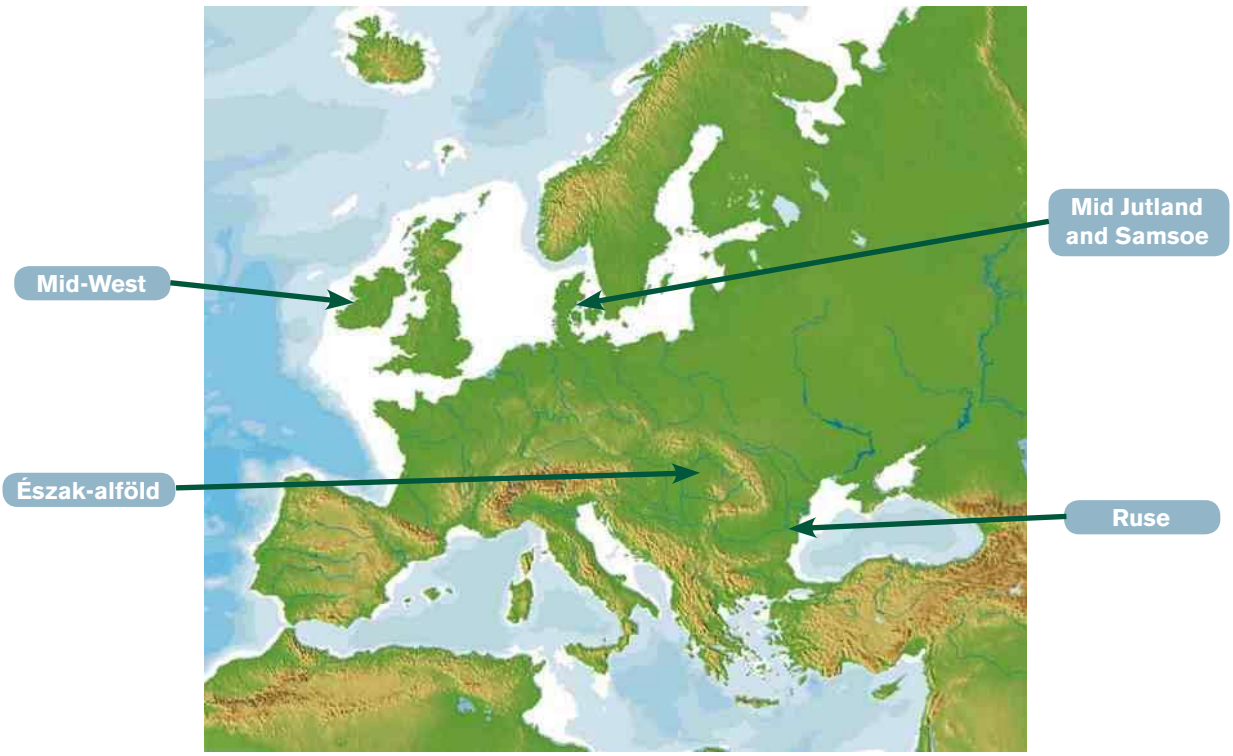



The required step-change in the creation of new enterprise in the biomass sector is dependent upon an optimised transfer of knowledge between research centres and entrepreneurial companies. The transfer of knowledge from research institutions to companies needs to be intensified. Furthermore, while much of renewable energy research is undertaken in urban areas, rural areas are the main producers of biomass. This geographical separation of research from production thus militates against fully exploiting the potential of rural areas to act as producers of biomass. By integrating more forcefully research with production of biomass, BioMob aimed to mobilise the productive capacity of rural areas for biomass.


*The BioMob Partnership*

Since the start of the industrial age, populations and prosperity moved towards sources of energy. The challenge in a 21st century context is to rapidly switch farming enterprises from food production to biomass production, and to do so in such a way that the benefits which accrue stay in the local economy, that they stimulate and are complementary to local knowledge-based employment and, furthermore, that proximity to cheap energy is used as a means of attracting inward investment and countering the threat of local population decline. Mobilisation of biomass can thus provide a vital development stimulus

**Location of the BioMob partners**




The origins of the BioMob project lie in the CORE-Business project, completed under the Intelligent Energy Altener programme over the period 2003-05. CORE-Business produced a replicable methodology for using economic argument to overcome the social and socio-economic barriers to deployment of renewable energy. The major constraints for mobilisation of biomass were identified by CORE-Business. In particular, there was no harmonisation and little consistency between the regional strategies, support frameworks and management practices that are facilitating biomass production in rural regions. This concluding point of CORE-Business was the starting point of BioMob. The BioMob project thus proposed to develop a Joint Action Plan for the mobilisation of biomass. It focused on the selection and optimisation of research agendas for research-driven clusters in regions that are rich in diverse forms of biomass.

# 2. Main Results

***Introduction***

The main results of the project were structured around three leading “work packages”:

**Regional challenges:** profile of the biomass resources in each region and analysis of the biomass capabilities for research; identification of the regional deficit between the biomass resources and the RTD capabilities.

**International benchmarking:** analysis of organizational innovation in biomass production and utilisation, especially on the interlinking between authorities, RTD capabilities and biomass resources.

**Action Plans** aimed to show how the Biomass-RTD deficit can be resolved in each region, based on the outputs of the Regional Challenges and the International Benchmarking, leading to the collaborative view of the Joint Action Plan

## 2.1 Regional challenges

The aim of this action was: to profile the biomass resources in each region; analysis of the biomass capabilities for research; identification of the regional deficit between the biomass resources and the RTD capabilities.

### 2.1.1 Biomass resources

There is no significant difference among the physical areas of the four analyzed regions, but in the share of agricultural land the Mid West (IR) is in more unfavorable position compared with the other regions. The area of forests is similar to each other. Taking into consideration the typical yields per hectare in plant growing and in forestry as well as the number of inhabitants (solid and liquid municipal wastes), theoretically the greatest potential could be expected in the Hungarian region of North Great Plain. Financial and technical conditions, as well as alternative ways of utilization, can modify to a considerable extent the available amount of biomass for energy purpose in practice.

**Characteristics of biomass potential in the 4 regions**

| | North Great Plain (HU) | Mid Jutland (DK) | Mid West (IR) | North Central Region (BG) |
|---|---|---|---|---|
| Area (,000 ha) | 1812 | 1309 | 1506 | 1497 |
| Agriculture ( ,000 ha) | 1277 | 792 | 560 | 1020 |
| Forest (,000 ha) | 218 | 136 | 139 | 357 |
| Population (,000 people) | 1502 | 1250 | 550 | 924 |
| Energy consumption (PJ/y) | 80 ? | 158 | n.a. | n.a. |
| Biomass consumption (PJ/y) | n.a. | 17 | 0,2-0,3 ? (14 MWt cap.) | 4,5 |
| Biomass potential (PJ/y) | 56 | 44 | 0,75 ? (209 GWh) | 69-79 |
| Agricultural solid wastes (PJ/y) | 42 | 9/6,4 | 0,05 (14 GWh) | 50-60 (4,9 M t/y) |
| Animal wastes (PJ/y) | 4 | 8/0,3 | 0,16 (43 GWh) | 14 (3855 GWh) |
| Industrial and municipal wastes (PJ/y) | 4 | n.a. | 0,01 (234/146 th t/y) | 0,1 (18 th t OM) |
| Energy crops (PJ/y) | n.a. (114 ha SRC*) | 17/1,7 | 0,13 (35 GWh) | 1 (40/40 Ml bioethanol) |
| Forest (PJ/y) | 6 | 10/8 | 0,43 (117 GWh) | 4 (1100/960 GWh) |
| Typical (conventional) bioenergy products | all but bioethanol | heat, biogas biodiesel | heat pellet/briquette | heat pellet/briquette |

### 2.1.2 Industrial and financial resources

The industrial resources in the North Great Plain (HU) are typically small- or medium sized enterprises, most of them produce pellet or briquette, but there are several examples for stove-factories and integrators of energy plants, also. In Mid Jutland, (DK) there are biodiesel- and biogas plants as well as bio-fuelled district heating systems; turnkey establishment of biomass-fired boiler plants, cogeneration systems and biogas plants; specialization within the boiler technologies (combustion, waste heat recovery) and the connected activities (soot blowing); holdings for low use of energy in the production and transport processes; complex energy supply (heat, electricity, water) for municipalities. In the Mid West (IRE) there are boiler and district heating network installers, boiler equipments suppliers, biobriquette producer from sawdust raw material, wood chip and fuel wood suppliers, waste contractors, specialised on-site energy recovery systems for disposal of poultry litter. In North Central region (BG) there is substantial production of biofuels.

Financial resources are significant in each of the regions, comprising tax incentives, investment supports, government policies, supplemented by EU programmes.

### 2.1.3 RTD capabilities

***North Great Plain (HU):*** The majority of biomass related research is concentrated in the University of Debrecen. The biomass research is mostly focused on the following activities: enhancement of biogas production; utilization of remote sensing techniques and geographic information for biomass production; demonstration and economics of use of liquid biofuels: clean and energy efficient vehicles in mobility initiatives for local integration and sustainability; biomass use for energy purpose and the future prospects in rural development. A second research centre connected with biomass operates in this region in the College of Nyíregyháza. Projects of their research include: mineral nutrition of energy plants; investigation of the cultivation problems of energy willow; investigation of the utilization of biofuels in internal-combustion engines; investigation of the biogas utilization for energy purposes

***Mid Jutland (DK):*** Energy-orientated research is concentrated in the regional technology centre on bio-energy (CBMI, founded 2006). This has a facilitating and coordinating role in building network cooperation among the relevant actors in R&D activities on bio-fuels in the region and creation of projects and initiatives that will evolve into commercial technologies and processes. Main activities are: technical information and news - website, electronic newsletters and printed leaflet (e.g. a standard biogas "cookbook" for combined ownership models of biogas plants); "CBMI TOPIC" with relevant articles and reports such as short notices, heavy research reports or popular articles; selection and composition of different organic materials on the basis of economy, sustainability and practical application in the biogas process production of biogas for fuel cells improvements to the physical process in biogas plants in order to increase productivity

***Mid West (IR):*** The Carbolea Research Group (University of Limerick) may be the most important element of biomass-related research in the area, including: evaluation and development of biorefining feedstocks and technologies; diesel miscible biofuels from the residues and wastes; analysis of Irish waste materials; novel catalysts for the dry reforming of methane to syngas and hydrogen; evaluation of agricultural feedstocks and biorefining technologies; pyrolysis/gasification unit; biochar production, characterization and plant growth trials, formic acid derived from biomass for catalytic olefins hydrogenation. The Shannon Applied Biotechnology Centre is a new research centre within the Limerick Institute of Technology and has projects with local SME's aimed to deliver added-value bimolecular and improved processing technologies. Tipperary Institute has a particular strength in the field of biomass and bioenergy, especially in sustainable regions.

***North Central Region (BG):*** The University of Rousse has bioenergy-related special fields in: improvement of energy plant production (stimulation of seed production after pre-sowing electromagnetic treatment; impact of the agro-technical terms on the rapeseed production under different soil treatment); Use of alternative fuels (biofuel production from rapeseed oil; pre-esterification of triglycerides of rapeseed oil; fuel from renewable sources in combustion systems; economical and ecological indices of diesel motor engines working with different kinds of fuel; integrated power farm.

### 2.1.4 Biomass-RTD deficits

Based on these findings the characteristics of biomass related supply, demand and research in the four regions can be evaluated in Table 2.

**Key factors of biomass activities**

| | NGPR (HU) | CDR (DK) | MWR (IR) | NCR (BG) |
|---|---|---|---|---|
| **Most significant unutilized biomass resources** | | | | |
| Agricultural solid wastes | xx | | xx | xx |
| Thinnings | xx | xx | xx | ? |
| Cereals for bioethanol | x | x | | |
| Energy plantations | x | | x1 | x2 |
| **Investments under constructions** | | | | |
| Biogas plants | x | x | x | x |
| Biodiesel factories | x | | | x |
| **Operating factories** | | | | |
| Biopellet/biobriquette plants | xx | | x | xx |
| Small-scale boilers | xx | | xx | |
| CHPs | x | | | |
| District heating | x | xx | x | |
| Biogas plants | xx | xx | | |
| Biodiesel plants | xx | x | | |
| Bioethanol plants | | | | xx |
| Biomass suppliers | | x | xx | |
| Machinery producers | x | xx | xx | xx |
| Plant installers | | xx | xx | |
| Complementary activities | x | xx | xx | |
| **Areas of most important RTD activities** | | | | |
| Biomass production | x | xx | x | xx |
| Direct burning | x | xx | x | |
| Biogas | xx | xx | x | |
| Alternative motor fuels | xx | | xx | xx |
| Education/advisory | xx | xx | xx | x |

*Remarks:* xx: most considerable resource, or activity x: existing resource or activity
1: in wetlands 2: in contaminated areas ? probably recommendable

The gaps between the present situation and future possibilities are different across the regions. The unfavorable factors are very similar in case of North Great Plain (HU) and North Central Region (BG). These include poor awareness for education of potential local users. Also the capital intensive nature of investment/production, the lack of financing as well as subsidized costs of other energy sources (natural gas, electricity, district heat) may make them economically unviable, especially in the least developed areas where they could be established. In the Mid West (IR) the dominance of small scale consumers and the relatively low agricultural area limit the size of potential market; however this factor may also promote local utilization. In Mid Jutland (DK) technologies based on cereals straw burning are commonly used, but simultaneously collecting and use of rape straw as well as producing other energy crops are fallen into the background. Thanks to the most effective advisory and informatics system, biomass potential is better utilized and more specified in both the latter regions.

Major differences between the four regions are:

| Biomass sector | Share of energy potential (Range across the regions) |
|---|---|
| Thinning and by-products of plant production | 50% to 90% |
| Animal and municipal biodegradable organic wastes | 7% to 20% |
| Energy crops and plantations | 15% to 20% |

The recommendable use of energy plants, based on natural conditions and connected RTD:

| Recommendations | | |
|---|---|---|
| **Area** | **Recommended plants** | **Recommended research areas** |
| North Great Plain (HU) | herbaceous energy plants, SRC, oil plants, maize | Complex system of algae-based energy production and of biogas plants biogas and biodiesel use in local public transport |
| Mid Jutland (DK): | rape seed, cereals | Foulum biogas plant related to any type of biogas production<br>Biomass combustion technologies and production of the connected biomass |
| Mid West (IR): | herbaceous energy plants in wetlands | Supply, technology and use of diesel miscible biofuels<br>Natural products for bioactive substance |
| North Central Region (BG): | oil plants, grains | Pre-sowing electromagnetic treatment for higher biomass yields<br>Motor use of biodiesel |

Overall recommendations included: establish new types of cooperatives or clusters in energy plant branches or in energy processing capacities; establish and expand local energy systems (in supplying of heat, electricity, waste management, agricultural/forestry market, local and outer transport); marketing and education on the use of biomass.

## 2.2 International benchmarking

### 2.2.1 Innovation

The benchmarking exercise focuses on the benchmarking analysis of organizational innovation in biomass production and utilisation, especially on the interlinking between authorities, RTD capabilities and biomass resources. The underlying hypothesis of the report is that the further away the biomass network is from the dominant fossil-energy-based networks, the more demanding are the innovation processes of the marketing of the new energy products.

Analytically we will distinguish between three different kinds of innovations: 1) incremental innovation 2) novel innovation and 3) multifunctional innovation, ranked in order of increasing distance to existing energy utilization networks.

#### *Incremental network innovation*

An example here is the production of biodiesel from rape or sunflower oil, which is readily introduced into the fossil energy consumption systems. In a chain perspective, only the refining process from rape oil to diesel needs development. The primary production of rape oil is based on well-established technology, knowledge and practice. Vegetable oil is available on the market and no special arrangements need necessarily to be taken. On the outlet side biodiesel is a marketable product that can substitute diesel made from fossil fuels and it can readily be used in various kinds of diesel engines, although it depends on a policy regime that supports the utilization, either by directives or tax incentives.

#### *Novel network innovation*

The production and utilization of other kinds of biomasses for energy consumption becomes much more complicated from a network perspective, such as willow and miscanthus. New knowledge and infrastructure is needed for these on how to plant, grow, harvest, store, market, and convert into energy carriers for the market outlet. To develop such chains, a whole range of actors need to adjust to each other more or less simultaneously to obtain the full bioenergy potential of the utilization chain. An investment in any of the links relies on investments in the other links also.

#### *Multifunctional innovation*

To complicate matters, many types of biomass may not be commercially attractive from a pure energy marketing perspective and from a reduction of emissions perspective alone. However, they could be very attractive including other aspects, like the harvesting of biomass as part of a nature conservation and landscape management practice. The income from the sales of the bioenergy produced may not come near to covering all the expenditure involved in harvesting and transportation; however, from an overall economic perspective, there may be a net benefit. It takes a much more complex organisation and systems of redistribution of added value in the biomass utilization chain in this kind of innovation, to provide the necessary incentive for the full range of stakeholders to participate.

The more multifunctional the utilization of biomass becomes, the larger the possible synergy effects and possible net gain, seen from a general value-adding perspective. At the same time, it also means that it has to be more locally/contextually embedded to obtain these synergy effects, both in terms of utilizing the different forms of energy produced: thermal, chemical and electricity from kinetic energy, and in terms of avoiding energy waste in processing and transporting the biomasses, for example drying and pelleting.

### 2.2.2 Nine case studies

Case studies were used in the project. The benchmarking exercises focuses on how the organisation of these “business utilisation chains” (BUCs) and the involvement of public authorities and RTD bodies contribute to the development and success of biomass and the report synthesizes some of the most central lessons learnt from comparing these cases. Each case study represents a distinct and identifiable BUC.

Nine strategic case studies were selected:

**Tisza wood chips production cooperative, Hungary**

In Hungary (including Észak-Alföld region) the biomass production potential of arboreal woody plants is high and their utilization for energy production has potential. The biomass collecting activity of the recently established "Tisza" Cooperative is progressive and with good prospects for the future. It is not sustainable, however, to supply biomass power plants only with by-products from agriculture, forestry or wood processing. Establishment of new short rotation cropace energy plantations is continuously needed in order to avoid future price increases of incinerated biomass.

**Biomass power plant in Szakily, Hungary**

The South Nyírség power plant's infeed material is from local woody biomass sources such as forestry, cuttings from orchards, wastes from wood industry, city parks, energy plantation etc. which are collected from the region and the surrounding micro-regions. The positive effects of the plant realization can be summarized as utilizing the advantages of the region's agricultural and forestry traditions and biomass. The efficiency of the electric power generation is quite good but the total efficiency could be much higher if the waste heat was utilized as well.

**Swedish salix programme**

The area of willow plantations has decreased in Sweden. Many plantations were terminated or reduced. One reason for this could be that the harvesting machines are very expensive and technical problems are in several regions during the harvest (e.g. limited number of harvesting machines, frozen land during the winter making it necessary to operate heavy harvest machines). It is promising, however, that a more flexible bundler harvester and new willow cutting head was developed in Sweden. Declining salix growing in Sweden could also be due to high price of cereals, and reduced economic incentive of the government.

**Nyírbátor biogas plant, Hungary**

This plant in Nyírbátor was the first industrially sized biogas plant in Hungary. The basic materials for biogas production are provided by the agricultural and food industrial by-products from surrounding plants and by collected dead animal carcasses from the various places of the country. The basic materials, which are fundamentally agricultural by-products, are re-cycled back into the agricultural production after energy production. The biogas plant would be able, because of its size, to supply the local largest crop trading dryer plant with biogas. Not far from the plant can be found a crop mixing plant, whose high heat demand could be also covered with biogas.

**Biomass CHP plant in Güssing, Austria**

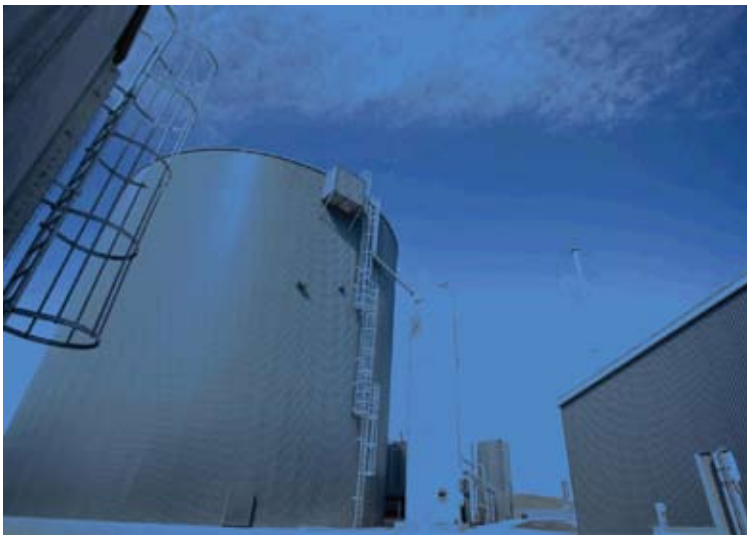
The plant produces heat and electricity from local raw material. The development of the CHP plant was initiated by the mayor and the local community. The positive effects of the plant can be summarized: complete energy supply by biomass for the city of Güssing is realized; utilization of local resources; sufficient local biomass is available; energy supply became independent from oil price; attracting industrial activities to the region; income for the local wood farmers, income for the municipality from local business tax; local job creation in the region; low gaseous emissions, no liquid emissions, ash only from the combustion

**Biogas production in Germany**

Biogas production in Germany has developed with the large-sized animal husbandry. These farms have several different manure removing systems. The effect of the live stock in the farms was to increase the methane emissions from the manure, which means a greenhouse gas emission. Biogas could thus be produced from the manure in large volumes. The basis of these opportunities hence led to the development of some similar biogas plants next to the farms, which could use up the manure and the other wastages. Biogas production is thus frequently in a small plant size, which is environmentally friendly with substantial energy output

### Astra Bio Plant, Bulgaria

This is a modern biodiesel production plant with inputs from sunflower and rape crops. The production process comprises the extraction of crude oil from sunflower seeds and rapeseed crops supplied by farmers from the adjacent region, the refining of the crude oil and finally its conversion to biodiesel by means of esterification. The social impact comprises mainly of creation of new jobs and increasing of the income of local farmers. 120 persons are employed in the biodiesel production plant. In addition, 30 farmers are working on cultivation of oilseed plants.



*Biogas plant in Denmark.*

### VERBIO group, Germany

The VERBIO group is one of the leading producers and suppliers of biofuels in Europe. The company has developed its own processes and innovative technologies for the production of biodiesel and bioethanol. It supplies its products directly to European mineral oil corporations, mineral oil traders, independent gas stations and haulage companies. VERBIO employs a "multi-feedstock strategy": a variety of crop types for the production of bioethanol – depending on available supplies on the agricultural market. The preferred crop is grain: rye, wheat and triticale.

### Miscanthus production, UK

The miscanthus industry in UK has shown a very rapid expansion in recent years. The driver has been a combination of enthusiastic companies promoting the crop, farmers who were willing to try something new and a positive attitude from the government to. Most of the straw is going to power plants. There seems to be a good cooperation and exchange of experience between the producers and the end users of miscanthus. The economy for the farmer in producing miscanthus straw seems to be comparable to cereal production, one of the benefits is that a miscanthus crop can spread the workload on the farm over the year, and give a more efficient use of the machinery.

The different case studies represent different modes of organisation that somehow relate to the different natures of the BUCs. In the following we will describe and discuss some of the features and advantages/disadvantages of these organisations, in three types: one stakeholder, one link in a chain and cooperatives

### *One stakeholder BUC*

Here the chain of operation from biomass to electricity is organised internally on the farm, and no other stakeholders are involved in the ownership and internal management of the biogas production. Small farm-based biogas plants are an example of a simple organization with few links and actors involved in the chain from biomass to electricity, but on the other hand this particular structure represents a BUC dominated by a single stakeholder and is therefore very vulnerable to changing conditions.

### *One link in a chain BUC*

In two of the cases we find organisations or companies that could be labelled as a link in the BUC. By this we mean companies that operate in an existing market and technology on the biomass input side and in an existing technology on the energy output side. However, the energy production process can be driven by financial support and legislation. The BUC is novel innovation in the sense that it has given rise to a new supply channel and the utilization of biomass resources, where some of these recourses would not have been utilized without the plant. On the other hand, the plant lacks novel network innovation, for example the construction of a CHP plant to obtain a much higher use efficiency of the input energy. So this case is an example of a potential multifunctional innovative BUC that lacks public support so that it can establish a district heating system. A related issue is the need for RTD bodies to support the implementation of newer and more effective, but also more demanding, technology.

### *Cooperatives BUC*

The involvement of entrepreneurs with cooperatives seemed to be a good organisational platform, both because it was owned by the farmers and because it had the entrepreneurial capacity to overcome the challenges. One of the main advantages of this organisation compared to one-stakeholder plants is that it is much more multifunctional in its operations. The plant can utilise a whole range of inputs and has the opportunity to mix the input to optimise the energy production and to solve environmental problems simultaneously. The organisational strengths are that it involves heterogeneous actors representing different interests.

### 2.2.3 Conclusions

These three types of case studies generated conclusions about four issues: whole-chain perspectives, stakeholders, involvement of RTD and rural development.

#### A whole-chain perspective

Multifunctional and sustainable development of biomass utilisation chains seems to require not only novel technological innovation, but also novel development of energy chains and infrastructure. This stimulates simultaneous development within all links of the chain, from the production of the biomass, via harvest, storage, transport and to the conversion into various forms of energy and utilisations such as district heating and industrial production

#### Stakeholder involvement of the BUC

One important tool in the promotion of sustainable development of BUC is the regional involvement of various kinds of stakeholders by establishing multiple driving forces. There are two means of doing that – one is to create incentive structures at all links of the chain, and the other is to involve different stakeholders with different interests.

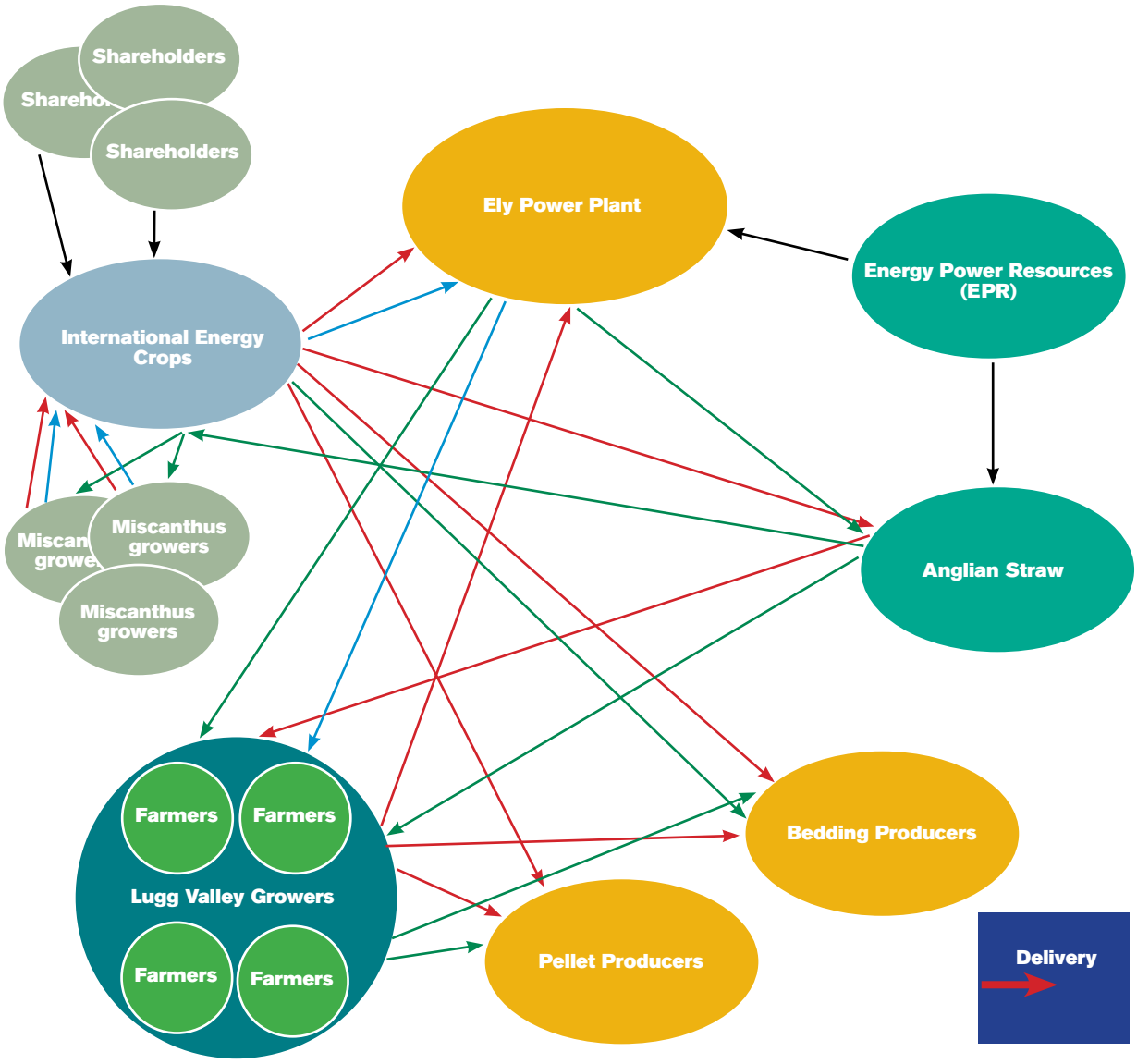
#### Involvement of RTD

The involvement of RTD bodies is important for the development of a BUC but is not a simple matter, mainly for two reasons. Often, RTD activities were not converted into practice because of the lack of public support for commercial developments. The other reason for non-involvement of RTD is the lack of connection between research and practice. In the case studies, it was reported that several research studies had been conducted, but none of the stakeholders could give examples of any of these research results being exploited in practice.

#### BUC - Multifunctionality, sustainability and rural development

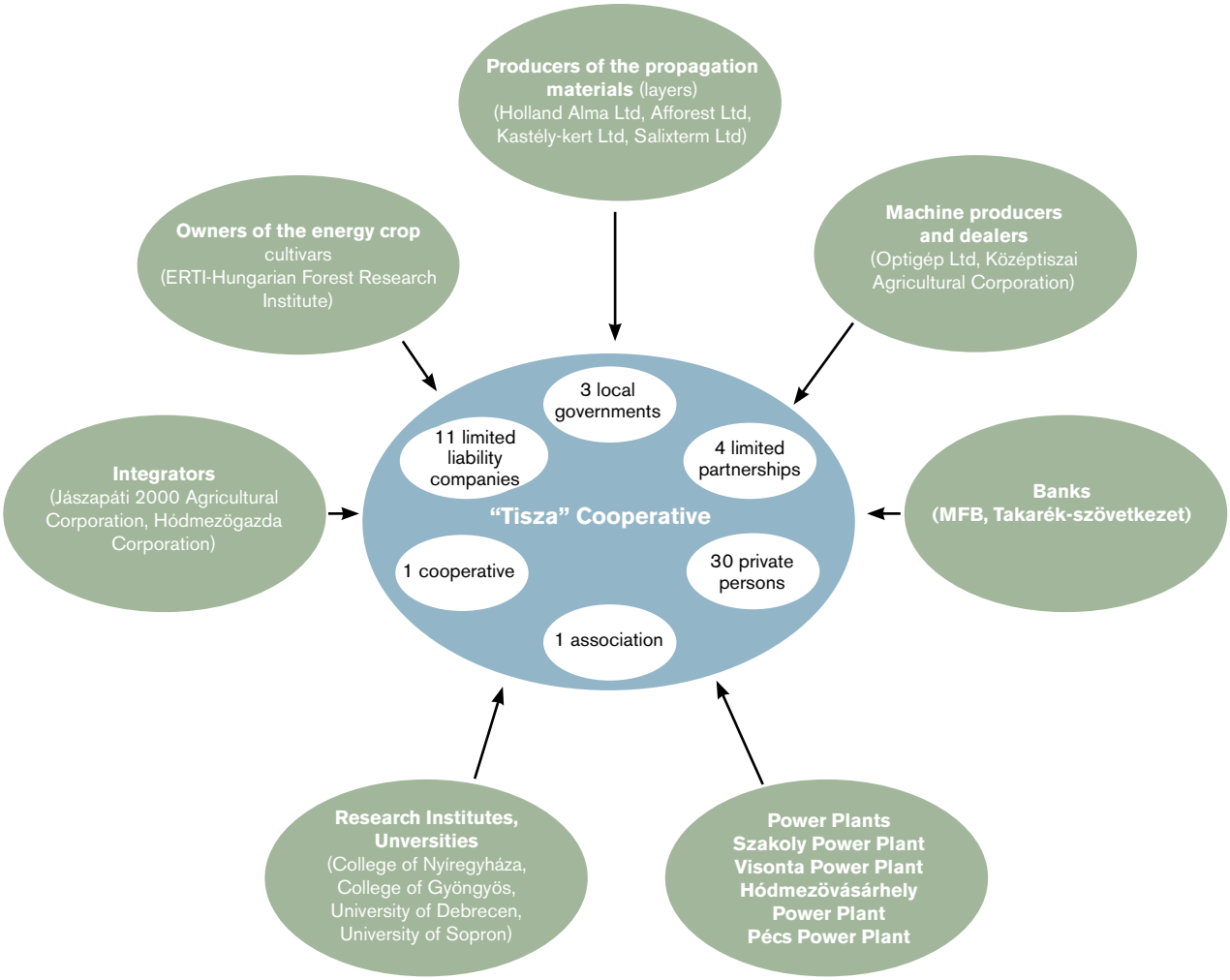
In summary the main challenges for the development of novel, successful and sustainable BUCs are that they have to be: multifunctional in the use of land and biomasses, involve the whole supply chain, be embedded in local resources and communities and thus contribute to rural innovation.

**Example of a Biomass Utilization Chain (BUC) from the UK**




**Actor organisation map for Miscanthus**

## Example of a Biomass Utilization Chain (BUC) from Hungary



## 2.3 Action Plans

The Action Plan aims to show how the Biomass-RTD deficit can be resolved in each region, based on the outputs of the Regional Challenges and the International Benchmarking, leading to the collaborative view of the Joint Action Plan

### 2.3.1 Regional Action Plans

***Samsoe in Mid Jutland***

The Mid Jutland region has significant potential for creating business and to reap the derived effects in relation to energy and environment on biomass. One reason is that the region has a range of natural resources with untapped potential in relation for renewable energy. The region houses 1/3 of Denmark's agricultural land and 1/3 of the livestock production. Similarly, the region has many businesses in the area: e.g. primary production, manufacturing and service in addition to strong knowledge environments.

Samsoe is a "renewable energy island" already utilizing almost half of the island's available biomass. Samsoe is undertaking a mission to become fossil-free in 2030 – to function as a test bed for the overall national Danish goal of becoming fossil-free in 2050. The remaining biomass resource on Samsoe will have to be utilized to cover the major remaining challenge – transportation. Samsoe has substantial experience in organizing local stakeholders in energy projects building on local acceptance and ownership of energy production facilities – in the past mainly wind turbines and district heating. For Samsoe, central to utilization of a varied biomass input is the establishment of a multi-functional biogas plant producing fuel for the local ferry.

The biogas plant must be able to treat all forms of organic materials that will be available on the island, and could produce several different fertilizer products. This places special requirements for the construction concept. The facility will include at least two lines (one conventional and one organic). It should also be able to handle all types of biomass, both liquid as solid, and it must have the capacity to sanitize certain products, while it must be prepared for expansion. Finally, the facilities could upgrade the produced biogas to natural gas quality, either under pressure or in liquid form, depending on the customer's requirements. A large biogas plant will thus be the heart of all future management of organic waste and other biomass as well as acting as a redistribution centre for energy.

The biogas is to be upgraded and used as fuel for a new ferry, built in the spring of 2011 and commenced in the autumn between Sælvig (Samsoe) and Hou (Jutland). The ferry is prepared for the use of natural gas or purified biogas. The ferry company is currently building ferries that are able to run on LNG (Liquid Natural Gas). The cost of upgrading biogas to LNG has to be investigated further and will have to be incorporated in a business plan for the biogas company. As an alternative operating the ferry on non-upgraded biogas could be explored.

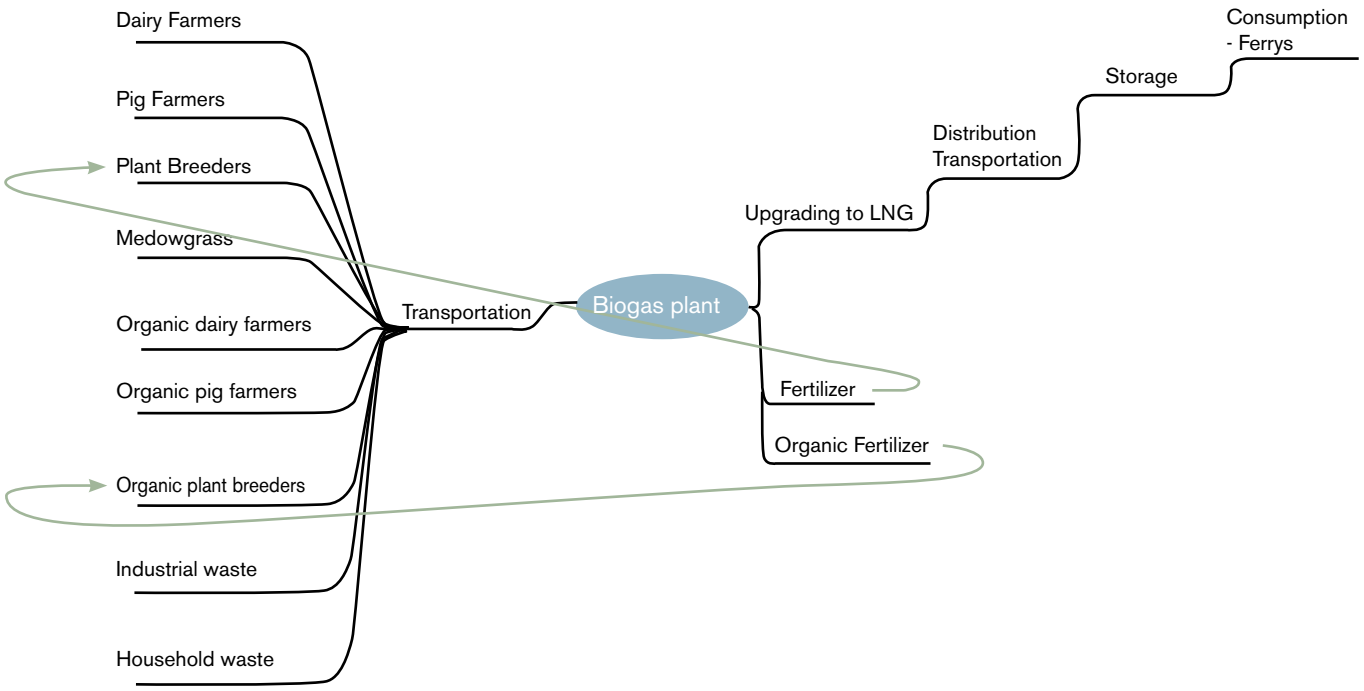
*Plants for Biomass*

The ferry will be able to absorb a maximum of around 2.4 million m3 of methane.
Depending on how the process heat of the biogas plant and heating to upgrade to be produced (with its own engine generator sets or straw heat from the existing district heating systems) will be needed between 90% and 75% of the above biomass resources. When establishing the sale of biogas to the ferry a separate biogas stand at the harbour will be able to add more costumers. This makes it possible to gradually adapt and convert local transportation to biogas. Especially heavy vehicles - mainly buses and domestic trucks – have potential for biogas operation.

The technology design of a biogas plant is largely dependent on the available biomass resource.

The aim will be to choose a biogas plant design that can handle a variable resource input. The economy of the system must be assessed. The interlinked dependency of several aspects must be investigated: (1) farmers increasing/decreasing their livestock or growing a suitable amount of crops for the biogas plant, (2) local entrepreneurs and the ferry company converting to biogas having conversion costs and a demand for supply security, and (3) the biogas plant running at low enough costs to be able to sell biogas cheaper than fossil fuel.

**Samsoe biogas supply chain**




***Ruse***

The overall function of the Ruse plan is to give the stakeholders information on the geographical and economical status of the region, to show the resource potential and opportunities for business development in the field of biomass, as well as the utilization of the cooperation and networking capacities of the three major actors (research institutions, companies and development organizations for the mobilization of biomass).

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The Municipal Strategic Development Plan of Ruse 2007-2013 is based on the results of a complex analysis of the processes and trends of development of Ruse municipality in midterm plan and is pursuant to the National Regional Development Strategy and Regional Development Strategy for Ruse region. The aim is to reduce waste and increase quantities of recycled and recovered waste and the introduction of effective Waste Management Systems. Programmes, projects and activities to implement and consistently cover the whole territory of the municipality from the centre – the city of Ruse to villages and are detailed in the municipal program for waste management. On the other hand, the objective includes implementing energy efficiency and recovery of degraded land and reducing erosion processes with a view to safeguarding the ecological balance.

*Sprouting wheat*

Development of innovative small and medium processing plants and upgrading of existing material and technical base are supported. The process of cooperation of agriculture producers, processors and research units will be encouraged. A further concern is the introduction of innovations in production, processing and marketing. Skills development and knowledge transfer of new technologies, renewable energy sources, bioenergy and organic farming products will be supported. Farmers and other land users will be assisted to implement methods to protect the environment and the natural resources.

The proposed actions should include but not be limited to:

- Activation of links between researchers, producers and end-users of biomass resources;
- Organisation of campaigns focusing on promoting best practices of biomass utilisation and national and regional incentives for enhanced use of renewable energy sources;
- Study the potential economic and environmental benefits of decentralised renewable energy systems and biomass utilisation technologies and equipment expedient for SMEs and small and medium farms;
- Support for joint research including as well regional companies producing biomass;
- Attracting scientists from other scientific organisations in partnerships at regional level, including young PhD students;
- Active dissemination of research results to companies and users of biomass resources;
- Development of projects for utilization of biomass resources not only from agricultural sources, but also taking into consideration the use of municipal biomass waste

However, several bottlenecks limit this:

- Researchers' qualified labour is still underpaid compared to similar experts at European level. This makes it unattractive to young scientists, encouraging a continuous brain drain;
- The region has proven potential in applying scientific methods to increase yields of crops but lacks scientific and research capacity in the field of high-tech RTD: the region needs to address efficient and economically viable processes and technologies for biomass utilisation;
- Current biomass projects are all aimed only at the "big business" and there is no tendency for practical actions to scale down to projects suitable for SMEs and/or individual farmers;
- Additional research infrastructure is needed to address the specific needs of companies and meet global challenges;
- To date, a structured regional development plan for use of biomass resources does not exist, thus there are no practices or lessons from previous experiences that can be identified.

In conclusion, in view of the dramatic rise of crude oil prices and upward trends in the price of refined products, alternative recycling procedures take on a new value and we believe that state-of –the-art recycling processes should be thoroughly studied and pilot project(s) should be elaborated and implemented based on the specific features of the region and the EU regulations.

### *North Great Plains*

The energy consumption of the North Great Plain region has been examined in comparison with the characteristics of energy consumption in the other regions. The data suggests that, in Hungarian energy production, fossil energy sources dominate with a proportion of approximately 70%. The data also suggests that the proportion of renewable energy sources is still very low. The capacity of the fossil power plants of the North Great Plain region is almost four times higher than the capacity of the renewable power plants, and while 95 MW energy is produced by a few hydrocarbon power plants, the 25 MW is distributed among 10 power stations using renewable energy. Most of the latter are based upon bio-gas, with two wind generators and almost half of the energy is produced by the hydroelectric sources.

The evaluation of the data on the generation of energy from bio-mass has been made considerably difficult by the fact that neither the county nor the region has any standardized statistics of the quantity of the energy used. However, the structure of the energy consumption of the region is not different from the national average. The structure and regional distribution of energy use has considerably shifted towards imported natural gas. There is a significant increase in

two areas: household heating and electric power generation. At present more than 60% of the energy used for heating in the households is imported

The biomass potentials originating from forestry, agriculture, food wastes, MSW and waste water sludge have been estimated in the North Great Plain region. Crop production has the largest potential in the region. Due to the decreasing trends in livestock, the biomass potential from animal husbandry is not very significant. The most important energy source in the region is natural gas, utilized primarily for heating. The most economical solution is therefore replacing some of the energy source by an alternative, obviously with biomass which is available in the region in substantial volumes.

Based on this situation and discussions with local experts we worked out an action plan for the region with the following 3 key elements:

**Increase the energy efficiency of institutions and houses**

We examined the natural gas consumption in family houses in the region. The heat consumption trends of family houses in the region are very unfavourable, most of the houses being "close to average" category in the Hungarian rankings. The improvement of energy efficiency in all the municipality and public buildings and also in 50 % of the family houses is a reasonable objective and should be the first to be realized. Based on statistical data and consultations with experts, we made a cost estimation of modernization of houses heated by gas in the region. To be able to make the calculations we averaged the buildings as 65 m2 houses. We calculated the insulation need and the replacement of doors and windows. The estimated specific cost of modernization is 2.5 million HUF/house.

**Establishing new energy plantations**

As a result of the increase of institutions' and houses' energy efficiency, the natural gas consumption can be decreased. To replace thus natural gas with energy plants requires around 50-80,000 hectares area. The total area of the NGG region is 1,772,865 hectares. 80,000 is only 4.5 % of the total area. There are 100,000 ha – 140,000 ha fallow areas in the region which are not utilized for intensive cultivation. This is far more than needed.

**Utilization of biomass for heating instead of imported natural gas**

Replacement of natural gas based heating by biomass based heating (wood chips, straws) would lead to employment of 4 000 people for 10 years, development of local industry and increasing income for the local municipalities from local business tax.

***Mid West***

The Mid-West Bio-Energy Action Plan states that to deliver the 2020 heat target, a capital investment of €148 million is needed in biomass equipment and about 700 commercial scale biomass installations over the next 11 years. This will equate to about €13.5 million invested and over 60 schools, hospitals etc. converting to biomass each year until 2020.

To promote this level of demand there are six proposed short term priority actions:

- Biomass Revolving Loan Scheme: whereby a fund be established that offers 100% interest free loans for biomass equipment
- Market awareness\segmentation
- Research and development into new biomass conversion technology
- Biomass CHP
- Development of policy support
- Form an Industry Partnership Biomass Group

The principal resources in the Mid-West Region examined in the plan are:

**Forestry**

Traditional analysis of wood supply and demand, centred on wood removals from forests and wood input to industries, is inadequate. A more complex approach, based on comprehensive wood resource balances, is necessary. This requires original research and data gathering, notably the following: (a) Unrecorded sources of wood supply (trees outside the forest, logging residues, and post consumer recovered wood) and use (wood energy in private households and small CHP plants); and (b) Input/output conversion factors for wood-using industries.

On the supply side data weaknesses were found in: woody biomass outside the forest, post-consumer recovered wood and used logging residues. On the consumption side, little or weak information was found in particular on wood use for energy, as well as conversion factors (calculating wood raw material equivalent from units of products).

Wood supply from new sources should be expanded, notably through expansion of the area used to grow wood (whether or not this area is considered "forest"). Wood supply from existing sources (forest and non-forest) should be expanded, e.g. through higher wood removal

*Miscanthus*

**Miscanthus**

On the nutrition requirement of this crop comparatively little is understood. Trials are being conducted to gain a better understanding, and more trials will be required. Due to large leaf areas and deep-rooting systems, the rate of water-use is higher compared to traditional annual crops. There is a need to develop a prediction yield model to account for miscanthus yield losses due to water deficits in dry years and during cold or frost spells.

**Willow**

Much more work is required on the various willow clones and their yields on commercial farms in Irish climatic conditions. Of especial importance will be studies of the optimal applications of herbicides for weed control, and research is needed into willow disease control such as rust and beetle infestations which represent the major biological threats to willow plantations. The main extra cost associated with willow is the increased harvesting costs. This may reduce over time as specialised machines are developed.

*Sprouting wheat*

**Grass**

A new report carried out on behalf of Bord Gáis has proposed that at least 7.5% of Ireland's natural gas could be supplied using grass and waste. Anaerobic conversion processes could provide enough natural gas to heat the equivalent of 300,000 Irish homes per year. Once the renewable gas is cleaned and upgraded it can then be used locally or piped into the national grid for distribution. Research will need to be carried out on cost analysis to ensure that the energy input in growing and harvesting the grass, plus transport cost of grass or silage to the anaerobic digester plants, plus operational cost, is lower than the energy potential of the biogas produced.

The region has sufficient biomass resource to meet its targets; however, this resource and the targets are totally dependent upon energy users converting to biomass. Whilst there is a fuel price incentive to convert to biomass fuels, the capital costs of biomass systems create a significant barrier. The current economic downturn and difficulties in obtaining credit appear likely to make this the key issue for market development of biomass in the short and medium term.

### 2.3.2 Joint Action Plan

The Joint Action Plan was agreed around three key issues:

***Exploit the strength of biomass***

The partners are agreed that biomass is an under-utilised resource in all the regions. Agricultural solid waste, forestry, thinnings, cereals and energy crops are in good supply but have not been exploited to the extent that is possible. The reason for this is that there are several 'structural' factors in each of the regions that hold back biomass from achieving its full potential.

***Innovation and biomass supply chains***

The development of the biomass supply chain is not a simple task, it takes a whole array of simultaneous efforts, from producing harvesting, transportation, storing, processing, to utilisation, sale and distribution. Our present energy systems

are built and organized around primary fossil fuel, mediated in easy transportable forms such as coal, oil, gasoline and electricity. In more recent years also natural gas pipelines have been established in many areas. The closer the bioenergy carriers comes to one of these fossil based forms the easier it is to adjust to the existing energy network and market. However, what may be seen as optimal from a traditional energy network perspective is not necessarily optimal seen from a resource optimisation point of view of the potential bioenergy production.

### *Network of biomass regions*

During the project, the issue of international networking with other biomass regions attracted considerable discussion: how to share the results of the BioMob project with other projects? develop new projects for the BioMob partnership? use venture capital funds for sustainability of project results? join a network and create a specific working group of BioMob partners? establish a network organization, but which model to follow? EUBIA, the European Biomass Industry Association, have confirmed that a “Biomass Regions” network could have significant potential in developing the regional-biomass approach further. EUBIA proposes to develop this approach further.

*Observing an experimental what field.*

# 3. Potential impact

## 3.1 Impact on business

One of the overall objectives of the BioMob project is delivery of results to biomass enterprises in each region, thus linking the project outcomes with enterprises and potential users in the regions. This seeks to demonstrate the systematic introduction of biomass business strategies to groups of firms, and the customisation of biomass-related business cases to the growth strategies of individual enterprises.

The enterprises which were identified through this process were as follows:

In **Mid-West Region** (IRL): Hotel and leisure complex currently using a 0.8MW natural gas heating installation in the process of considering a switch to woodchip; similar hotel and leisure complex currently using a light fuel oil heating installation in the process of considering a switch to woodchip; gasification project seeking to attract a supply of municipal solid waste which is currently being sent to landfill

In **Észak-Alföld Region** (HU): 2MW district heating scheme project which is considering the use of a woodchip biomass solution and comparing it with a fossil fuel (natural gas) solution; similar district heating scheme but with lower installation costs.

In **Ruse Region** (BG): A business which is currently disposing of MSW-using landfill is considering the use of two biomass solutions: either combustion or gasification; A similar business but where the gate fees for the disposal of MSW are increased from the very low level which is currently charged in Bulgaria.

In mid Jutland, the Agro Business Park has developed a biogas feasibility calculation model.

The results of each model run were then considered and compared with the existing or conventional solutions (usually fossil fuel energy sources in the case of the ESCo (energy supply company) model and landfill as a means of disposing of municipal solid waste in the case of the feedstock model).

*Measuring properties of Biogas in Hungary.*

The financial planning tools developed within BioMob clearly assisted the establishment of the business cases for these projects and identified the most sensitive input parameters, thus helping project promoters to focus on the key financial inhibitors and facilitators of their businesses.

The following were identified as key parameters in these business plans:

- The ESCo model for heat supply is shown to compete with 'own and operate' solutions, particularly if the risk associated with the latter is taken into account;
- The current low price of natural gas weakens the economic argument for the uptake of biomass;
- The default capex for gasification is about 20% higher than for incineration;
- Operating costs are about 10% higher on the incineration option than for gasification. Project financing costs are similar;
- The potential to realise cash from other by-products such as char (gasification) and the cost of ash disposal (incineration) have a strong influence on the business cases;
- As a consequence of the above, legislation on emissions and ash disposal strongly influences the profitability of projects;
- There is at present substantial country-to-country variation in the gate fees for municipal solid waste disposal to landfill and to biomass plant. This has a substantial negative impact on business cases for waste-to-energy projects in Bulgaria and Hungary. It is understood that legislative changes are in progress and these should mitigate this effect.

## 3.2 Exploitation

### 3.2.1 Regional funding proposals

EU member states submitted their National Renewable Energy Action Plan (NREAPs) in 2010 and should in the coming years implement these national strategies to comply with the Renewable Energy Source (RES) directive.

Current challenges and opportunities in the four regions North Central Region (Ruse, BUL), Mid-West Region (IRE), North Great Plains Region, (HUN) and Central Denmark Region (DK) are significant. Examples of funding opportunities of suggested actions that could be taken to overcome these hurdles through research and technological development as well as specific measures have been identified.

Measures can – and should – be taken at the EU level, the member state levels and local regional level. The weak parts of the supply chains should be identified and directed incentives should be applied to solve the barriers and create a positive opportunity for investments in the sector. This can create substantial amounts of new green jobs in the regions. Many useful measures and funding opportunities are available directed towards parts of the supply chains, but still also many barriers exist, e.g. administrative procedures and lack of planning that should be solved at the member state level.

*Maize.*

Local stakeholder networks are very important for biomass supply chain development and the relations to and support from local authorities is crucial. This factor accounts for the general political support and is often also reflected in the smoothness of administrative procedures, permits etc. The active development and use of local stakeholder networks can make things easier. Several regions have emphasized the need to develop and establish Public-Private Partnerships (PPPs). Also the energy supply companies should become part of the solution. Adequate structures and institutions should be developed for efficient and flexible research and technical development, including innovation to make efficient use of international funding for cooperative projects to increase knowledge transfer, as well as national and EU support for specific investments.

It can be concluded that public investments and funding of initiatives have substantial potential in creating new jobs and other societal benefits. This could be achieved through market development, cooperation, PPPs, RTD and innovation. The public sector reflects the political will to reduce dependency of fossil fuels and reduce climate gas emissions. This should lead the way with investments and an implementation framework. When the market has been opened and the legislation and support schemes are ready, the private sector will follow and release the full potential and give broad and long term societal return on the investments.

### 3.2.2 Replication

From the findings of the BioMob partner regions, it is clear that, compared to some other branches of renewable energy, the potential of biomass is significantly under-developed. This is due in large part to the mismatch between the feedstocks, user demand and technological capability. In some regions, abundant feedstocks are going unused due to lack of industrial involvement, uncoordinated supply chains and a lack of education and understanding of the economic facilitators and inhibitors. In other regions, cutting-edge biomass-related RTD is finding little or no uptake by local industry which, in an economic crisis, is starved of investment funds and likely to adopt the most conservative established technology (such as combustive biomass). BioMob has sought to point the way to regional mobilisation of biomass, building on the triple-helix model of the Regions of Knowledge programme, and by demonstrating the socio-economic advantages of a coordinated approach to biomass mobilisation.

Perhaps the foremost lesson learned is that, on the one hand, subsidies and incentives, including public procurement initiatives, are essential for kick-starting the take-up of biomass as an energy source (and the consequent stimulation of RTD activity). But, on the other hand, clear business cases must be established to warrant the necessary investment by both public and private entities. In an attempt to help both private enterprise and those involved in public sector procurement to justify investment, simple ‘level playing field’ economic calculations must be made to clearly show the benefits of the biomass alternative in comparison to conventional fossil fuel solutions.

### 3.2.3 Investigation of possible structures

The feasibility of becoming a Knowledge and Innovation Community (KIC) in the European Institute of Technology (EIT) was examined. The partners' aspiration to become a KIC in the EIT was scrutinised and compared with other options for an on-going collaborative structure. Main other areas examined beside EIT Climate KIC are EGTC, BioCLUS project cooperation, Biomass Excellence Programme, Interreg and FP7 funds opportunities, venture capital opportunities and other relevant possibilities. The main questions of the investigation were the following: share the results of the BioMob project with other projects? develop new projects for the BioMob partnership? use venture capital funds for sustainability of project results? join a network and create a specific working group of BioMob partners? establish a network organization, but which model to follow?

## 3.3 Dissemination

### 3.3.1 Local dissemination

Seminars and workshops were the preferred method of local dissemination and resulted in substantial discussions and local reviews of the BioMob implications. Overall, there were 22 workshops involving 409 participants across the four partner areas. Through the mass media there were 24 publications in the partner areas, including press releases, published reports and public presentations. Most significantly, there were two television broadcasts and four radio broadcasts featuring BioMob.

Key topics addressed by the local workshops included:

- Mobilizing biomass to energy in a possible biogas project
- Innovation and solutions in biomass technology
- Elaboration on a biogas project with the local stakeholders
- Pre-sowing treatment of rape seeds
- Presentation of a preliminary mapping of locally available biomass resources to the local stakeholders.
- The development of demand: convince key stakeholders in the public sector
- Presentation of a preliminary master plan on the utilization of biomass
- Biomass industry has developed but there is weak market demand.
- The possibilities and limitations for plant fed biogas plants
- Regional User Group Meeting - To inform the participants about the BioMob project, its aims and tasks.
- Inform the regional stakeholders and the members of the user group about the draft of the Regional Action Plan
- The First Energy Day for Municipalities event
- Session organized under the First Energy Day for Municipalities event,
- To overview the programme of BioMob and to discuss the dissemination.
- Session organized under the ENERGOexpo 2011 - IX

A series of local publications and presentations were also made on these topics.

*Mobile system for measuring biogas experiments.*

### 3.3.2 Mentoring and Exchange

Overall, there were 4 major exchanges, one in each of the partner areas, with 41 presentations on the biomass sector, providing for a very fruitful mentoring and exchange programme. Examples below are given of the topics followed at each of the sessions.

| University of Ruse | College of Nyíregyháza |
|---|---|
| Sunflower and rapeseed | Potential of biogas production |
| Biofuels | Base and additive materials on the biogas production |
| Biomass production from grains | Environmental impacts of biogas |
| The structure of production systems | Double phase biogas production |
| Training in the field of bioenergy | Social aspects of the use of renewable energies |
| Growing miscanthus | Plant protection |
| Rape seed processing | Chips production in willow plantations |
| Biochar from miscanthus | Cultivation of energy plants |
| Uses of liquid biofuels | Nutrient re-supply of energy plants |
| Bio diesel fuel production | Research experiences |
| | Renewable energy sources |

| University of Aarhus | University of Limerick |
|---|---|
| How to grow willow | Overview of the DIBANET Project |
| Crop harvest methods | Catalytic olefins hydrogenation |
| Biomass pretreatments | Thermochemical conversion of feedstocks |
| On-line measurements of the biogas process | Uses of near infrared spectroscopy |
| Biomass production and environmental improvement | Liquid Biofuels |
| Biotechnology perspectives in miscanthus | Research proposals available for funding |
| Harvesting natural areas for biogas | Biomass enterprise |
| Greenhouse gas emission from energy crops | |
| Incentives for biomass use | |
| Willow yield in commercial production | |

*Exchanges of research and information were an important part of the BioMob project.*

### 3.3.3 EU Dissemination

Members of the BioMob partnership made a poster presentation at the 18th Biomass Conference (Lyon, 2010)

In November 2010, the visit by the President of Ireland to Samsoe was marked by a presentation on BioMob to the President. . The event was recorded on Irish national television via RTE news and reported on in newspapers in Ireland and Denmark. The information was disseminated at EU level to the Cabinet of the Commissioner for Research Marie Geoghegan-Quinn and to Irish policy-makers in Brussels via EUBIA.

A joint paper on biomass and regional development was presented to the European Biomass Conference (Berlin, 2011), in collaboration with two other FP7/RoK projects: BIOCLUS and RESGEN. From the experience of the three projects, three issues emerged as being of special importance to the linkage of biomass with the regions: strategic research and innovation agendas, decentralized sustainable energy solutions and regional innovation. The paper recommended that future development in the linkage of biomass with regional development concentrate on these three issues.


*The BioMob project made presentations to the European Biomass Conference.*

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***This report, including any errors or omissions, is solely the responsibility of the partnership.***