FIRST ACTIVITIES OF EUROPEAN PROJECT "BEN": BIOMASS ENERGY REGISTER FOR SUSTAINABLE SITE DEVELOPMENT FOR EUROPEAN REGIONS

F. Cotana, G. Cavalaglio, P. Bartocci, S. Rinaldi, M.C. Merico
Biomass Research Centre – University of Perugia
Via G. Duranti, 06125 Perugia, Italy
Tel: +39.075.585.3806 Fax: +39.075.515.3321
Email: cotana@crbnet.it; cavalaglio@crbnet.it; bartocci@crbnet.it, rinaldi@crbnet.it; merico@crbnet.it

ABSTRACT: The main objective of the Intelligent Energy Europe Project "BEn" (Biomass energy register for sustainable site development for European regions), sponsored by Executive Agency for Competitiveness and Innovation, is to support local communities energy planning trough the development of a regional energy register indicating local energy sinks as well as biomass potentials for energy production. Data collected will be displayed in a web based geographic information system. Moreover the project aims at the creation of regional biomass networks, which will collaborate to the project, and at the development of a master plan for sustainable bioenergy planning including guidance for management and financing biomass energy investment. Four model Regions have been selected for the project. The paper focuses on the first activities of this project, with particular attention to Italian partner work, Biomass Research Centre. Main tasks regard Umbria Region Register development and Umbria Bioenergy Network activities. CRB is collecting data on biomass use and availability in the territory and is implementing the register; the Network, coordinated by CRB, has selected a list of project regarding bioenergy actions development in the region; between these actions CRB will select two specific actions to implement during the project.
Keywords: action plan, Geographical Information System (GIS), sustainability

1 INTRODUCTION

The Intelligent Energy Europe Project "BEn" (Biomass energy register for sustainable site development for European regions), sponsored by Executive Agency for Competitiveness and Innovation, coordinated by the UMSICHT Fraunhofer Institute of Germany, aims to support local communities energy planning trough the development of three fundamental tools:

- regional bioenergy networks with the participation of public and private local actors involved in bioenergy sector;
- regional energy register indicating local energy sinks and bioenergy potentials plants;
- strategic energy master plans which identify regional bioenergy needs and potential and technical and financial guides.

These three tools will lead to the definition of local energy planning and to the implementation of bioenergy actions. The list of participants is shown in table I. BEn project considers four European regions from United Kingdom, Italy, Poland and Germany which will play the role of model regions and where start the experimentation of chosen tools.

The project arose from the National and European energy sector objectives in the production of renewable energy (target of 20% of energy consumption in the EU by 2020) and in transport sector in the use of biofuels or renewable fuels (target of 10% of final energy consumption in the EU by 2020) [1-3].

Table I: BEn project participants

Participant	Country
Fraunhofer Institute UMSICHT	Germany
Biomass Research Centre	Italy
European Centre for renewable energy	Austria
Rural Development Initiatives	England
Institute for ecology of industrial areas	Poland
Win Emscher-Lippe	Germany
Gostynin Lake District Tourist Communes association	Poland

Table II: National overall targets from renewable sources in 2020 [1]

Country	2005 renewable source	2020 renewable source
Denmark	17.0%	30%
Germany	5.8%	18%
Spain	8.7%	20%
France	10.3%	23%
Italy	5.2%	17%
Austria	23.3%	34%
Portugal	20.5%	31%
Finland	28.5%	38%
Poland	7.2%	15%
Sweden	39.8%	49%
United Kingdom	1.3%	15%

Table II shows some national targets from renewable sources in final consumption of energy in 2020 [1-3].

2 MODEL REGIONS

Figure 1 shows the location of the four model Regions selected for the project.

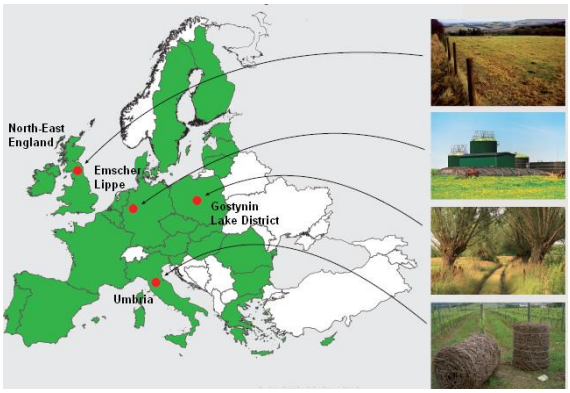

Figure 1: BEn project model Regions

2.1 North east England

The North East England Government Region is the most northern administrative region on the east coast of England with its centre in Newcastle upon Tyne. With a population of 2.5 million, concentrated mainly in the south, it covers 8500km^2 and offers a variety of landscapes including vast sparsely-populated upland areas in the north. The region has a proactive attitude towards bio-energy with many new initiatives and investments in recent years.

2.2 Emscher-Lippe Region

The Emscher-Lippe Region forms the northern sector of the Ruhr conurbation in Germany. It encompasses about 1000 km² and is named after the rivers Emscher and Lippe. About one million people live in the cities of Gelsenkirchen and Bottrop and in the Recklinghausen administrative district. The region continues to be Germany's premier power producer and has acquired a reputation as a competence center for renewable and biomass in particular.

2.3 Umbria

The Umbria Region is located in central Italy and the landlocked territory is mainly hilly and mountainous. The region covers an area of about 8.500 km^2 and has a population of 900,000, with 43% living in urban areas and 57% in rural areas. The economy is based on agriculture, industry and tourism: main crops are olive trees and vineyards; industrial areas are concentrated in the two provinces of Perugia (the chief town) and Terni.

2.4 Gostynin Lake District

The Gostynin Lake District includes the western part of the Mazowsze province and three communes in the province of Kujawy-Pomorze. The region comprises 11 communities and 3 cities. It is characterized by natural lakes, parks, the Vistula River and the Włocławek Reservoir. The region has a high potential in biomass production (forestry and agriculture). Biomass is already used for heat production, and there is growing interest in this energy source. The region serves as a model example of renewable energy development in Poland.

3 DESCRIPTION OF THE WORK

BEn project is divided into seven work packages. WP1 (Project Management), led by UMSICHT, regards financial and administrative organization. In particular the project management board, created for the coordination activities, controls:

- appropriate administrative and financial management;
- monitoring and evaluation of project progress;
- timely development of project deliverables, milestones and reports;
- sufficient contingency for achieving project objectives within time and budget;
- co-operation and communication among all project partners;
- successful project consortium meetings;
- cooperation with similar projects, such us MAKE-IT-BE and BioEnerGIS;
- networking between the local networks.

WP2 (Establishment and Maintenance of Regional Bioenergy Networks), led by Institute for ecology of industrial areas, regards the creation and implementation of local bioenergy networks in the model regions. The different actors in the regions are identified and invited to the network, that meets regularly. The average size of each regional network is around 15 persons, mainly biomass producers, users, technology providers, administration, and financial institutions. The network is involved in the creation and composition of the strategic plan, in the development of the energy registers and in the implementation of the actions.

WP3 (Development and implementation of bioenergy registers in model regions), led by UMSICHT, aims to build the regional registers through the collection of different kinds of data, such us biomass sources and energy sinks. It will be based on open source geo-information technologies (GIS) and will be available for the public and local players via the internet. The register will assist the optimisation process of biomass production, biomass conversion and energy consumption through identifying suitable locations for bioenergy projects. Within the project the web based biomass energy register portal is being developed and applied for each model region and will be made available to further European regions. Figure 2 shows the architecture of GIS.

WP4 (Development and implementation of Bioenergy Master Plans), led by Rural Development Initiatives, regards the development of four bioenergy master plans in collaboration with local stakeholders in the partnering model regions. The documents will include guidance for management and financing of biomass energy investments to support sustainable bioenergy planning. Main steps of the development of regional biomass master plans are:

- SWOT (strengths – weaknesses – opportunities - threats) analysis of the current situation of the biomass market in the region;
- evaluation of existing policies;
- planning and support for implementation of selected biomass actions;
- publication of clear and accessible technical, financial and management guides on biomass use.

WP5 (Implementation of specific actions in model regions) is the operative part of the project; starting from the regional network activities in combination with the use of bioenergy register and biomass master plan, two bioenergy actions will be agreed and assist in the four model regions.

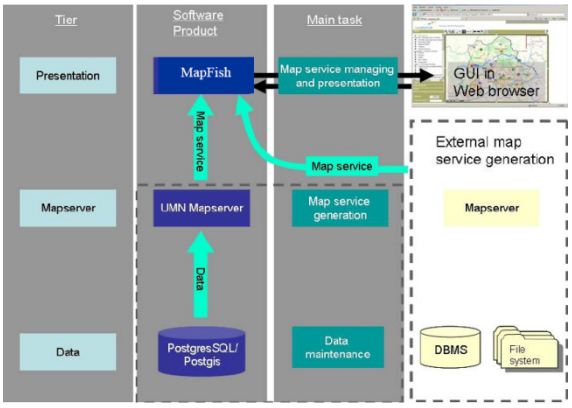

Figure 2: GIS architecture [4]

WP5 leader is the Italian partner, Biomass Research Centre (CRB).

The bioenergy actions will be focused on two main topics:

- Implementation of the concept of sustainable bioenergy utilisation in the regions;
- Optimisation of existing bioenergy plants and initialising of bioenergy projects in the region, e.g. feasibility studies, optimisation of material flows and resource management, training measures, increased combined heat and power use.

WP6 (Communication and dissemination), led by Win Emscher-Lippe, consists of:

- installation of a web portal with forum (www.ben-project.eu) available in four languages (English, German, Italian and Polish);
- elaboration of promotion materials (flyers, brochures, slide presentation, posters);
- dissemination actions on a European, national and regional level;
- training sessions on the use of the energy register.

WP7 (Common dissemination activities), led by UMSICHT, regards the relationship between the project members and European Commission. [4]

4 FIRST ACTIVITIES OF THE REGIONAL BIOENERGY NETWORKS

During the first year of activities the main goals of WP2 have been:

- definition of the requirements and criteria of regional bioenergy networks;
- identification of existing regional activities;
- establishment of active bioenergy networks.

In all the four model regions the networks have been created, coordinators were established to lead the network structure and relevant actors were identified and invited.

BEn project was presented and the biomass register was recognized as a very useful tool. All the actors are participating in the activities regarding the data research for the register and in the discussion regarding the identification and implementation of bioenergy actions.

4.1 Umbria Bioenergy Network

The first regional network meeting took place on March 16, 2009. The network coordinator chosen was CRB. Three working groups within the network were created: technical financing and management support, legislative and administrative support, formation & information. During the meeting regional needs and barriers for the renewable energy development were identified. Bioenergy actions in the region were discussed. Table III shows the composition of Umbria Bioenergy Network. The list shows a good composition of the network, which includes:

- private companies working on the bioenergy chain (from biomass harvesting to bioenergy plants planning and building)
- public bodies and research institutions engaged in energy and bioenergy policies;
- financial companies interested at bioenergy projects;
- agriculture associations.

Table III: Composition of Umbria Bioenergy Network

Company/Public body	Contact person
ENEL	Missaglia C.
Laboratorio Scienze Sperimentali	Mingarelli P.
Enerma S.r.l.	Ciappelloni D.
Baccarelli Nazzareno S.A.	Baccarelli L.
GAIA Energia e Servizi	Coen Carlo
Azienda agricola Monte Malbe	Pignatel Giorgio
GESENU SpA	Sassaroli G.
Regione Umbria	Giovagnotti E.
Santucci & Partners S.r.l.	Riccardi F.
Fondazione Istruzione Agraria	Cotana S.
Studio Energia S.r.l.	Burzacca G.
ARPA Umbria	Rossi A.
Umbria Innovazione	Massoli A.
Cantine Giorgio Lungarotti	Persia A.
TISS. Srl	Goretti M.
Comune di Deruta	Battistelli
Organic Oils	Matticari G.
Dipartimento di ing. industriale	Fantozzi F.
Bio-net Srl	D'Alessandro B.
Tetra Engineering Srl	Calzola M.
Consorzio Ipass	Rossi F.
Coldiretti Umbria	Arcangeli S.
Confagricoltura	Monacelli A.
Confed. Italiana Agricoltura	Sposicchi A.

The following actions were fulfilled during the period:

- first network meeting was organized on 16.03.2009. Definition of the role and aims of the project, network structure, partners specific competences was discussed. It was proposed to create 3 working groups (were established): technical financing and management support; legislative and administrative support; formation & information;
- second BEn network meeting was organised on 12.10.2009 with participation of public and private sector from the region (15 participants). GIS energy register, data availability and Master Plan were discussed. First draft of SWOT Analysis for Umbria Region was examined;
- third BEn network meeting was organised on 20.04.2010. First GIS bioenergy data were shown; the list of possible actions have been discussed and a first action has been selected (project BiPlaN described in the next chapter);
- cooperation of working groups to elaborate specific partners objectives based on questionnaire results was initiated;
- financial resources for biomass development in the region were identified;
- list of bioenergy actions was established;
- data collection concerning biomass use and availability was started;
- identification of regional needs and barriers to renewable energy development;
- discussion about bioenergy actions in the Region.

Next steps for the network are to choose two specific bioenergy actions, to organize some training course for the use of the register and to organize next network meeting in November 2010.

5 FIRST ACTIVITIES OF THE BIOENERGY REGISTER

Main activities of the work packages were:

- definition of a list of use cases in order to define the data content of the register;
- development of a methodology to collect data of biomass availability and energy sinks, starting from existing backdrop maps;
- first design and development of the register architecture, starting from Emscher-Lippe region.

5.1 Development of a methodology to collect data

CRB together with UMSICHT has developed a methodology to collect biomass availability data. The goal of the work is to provide a methodology that will deal with the following biomass classes:

1) straw;
2) prunings;
3) woody biomass (coppice and high forest);
4) manure;
5) sawmill residues;
6) vegetable oil extraction residues;
7) exhausted frying oils.

The aim is to estimate the potential availability (theoretical potential). This means the maximum biomass production, depending only on environmental conditions and on biological potential of biomasses. This means that no technical potential or ecological potential are taken into account. For each kind of biomass, coefficients will be used, describing biomass yield per unit of main product.

5.2 Prunings methodology

As an example is shown the methodology regarding prunings.

1) Surface individuation

Using different data sources the surfaces interested by orchards (comprised olive trees and vineyards) cultivation will be individuated (Corine data [6], European Statistics [7]), expressed in ha;

2) Main product production estimation

The average quantity of fruits produced per surface in the interested region will be estimated (t/ha);

3) Coefficient individuation

The average ratio between prunings and fruits are individuated (expressed in tons of prunings / tons of fruit). Umbrian coefficient are reported in table IV;

4) Residue production estimation

Multiplying the surface individuated at point 1 for the main product individuated at point 2 and then for the coefficient individuated at point 3, the productivity is obtained (expressed in t/year). The above mentioned methodology can be summarized with the following formula:

$$Prunings = surface * fruit * c \qquad [8]$$

Where:

- Prunings is the production of prunings mass (t/year);
- surfaces are the surfaces cultivated with orchards (ha);
- fruit is the fruit mass produced (t/ha);
- c is the ratio between prunings and grape/olive (tons of prunings/tons of fruit).

Table IV: Regional coefficient used for prunings availability estimation [8]

Province	Vine coefficient	Olive coefficient
Perugia	0.17	1.48
Terni	0.25	1.56

The advantages of this methodology are:

- this methodology can be used both for vineyards and olive trees as well as for orchards;
- Corine data allow to estimate also in areas that are smaller than those considered in the NUTS region classification;
- this methodology has been already used in [8];
- even if there are not coefficient specific for each area, giving different main product yields different residual yields can be achieved.

The disadvantages of this methodology are:

- Corine data are not so precise when they are referred to small surfaces.

6 FIRST ACTIVITIES OF THE DEVELOPMENT OF BIOENERGY MASTER PLANS

Main activities of the work packages were:

- development of a baseline data collection for all the model regions;
- implementation of a SWOT analysis of the regions in collaboration with the bioenergy networks;
- definition of the structure of the Master Plan (figure 3);
- first draft of the financial, management and technical biomass guides.

Next paragraph describes on detail the Umbria Region SWOT analysis developed by Biomass Research Centre in collaboration with the Umbria Bioenergy Network.

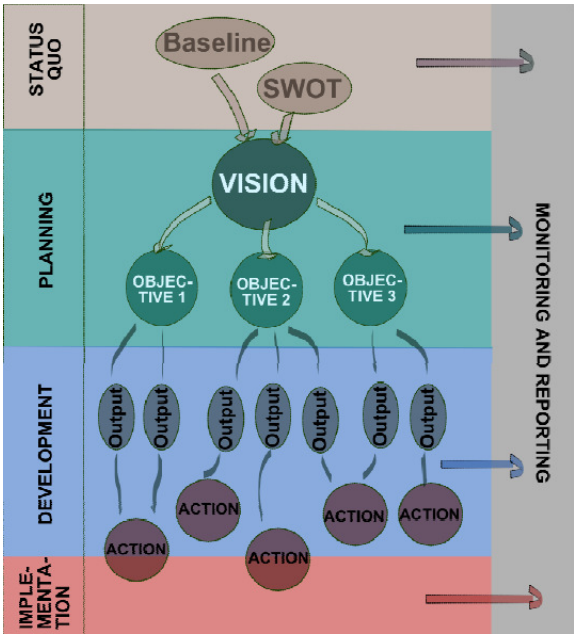

Figure 3: Phases of Master Plan development [5]

6.1 Umbria Region SWOT analysis

SWOT analysis of the regional situation in regard to bio-energy market in Umbria evidenced that bioenergy sector could have a large expansion thanks to biomass availability and biomass plant technologies, but the development is blocked by difficulties during plant authorization process and opposition of the population.

The strengths highlighted in the analysis are:

- region location in the centre of Italy allows to have a favorable soil and climatic conditions for the biomass production;
- rural settlement pattern is widespread in the region;
- familiarity with the bio-energy generation technologies in the region;
- lifestyle trends, wood fuel in fashion;
- qualified staff, work labor available;
- available education programs in the field of energy: financed or co-financed training opportunities;
- local energy agencies;
- abundant and accessible biomass resources;
- biomass production/supply chain best practice examples: vine and viticulture company Lungarotti, logistics platform Montemalbe (wood chip production);
- cooperation between biomass producers within communities;
- presence of biomass technologies in the region;
- easy accessible technical information;
- research and development activities in the region, cooperation between research centre and biomass business from the region.

The weaknesses highlighted in the analysis are:

- confusion between biomass and waste: biomass plants construction opposition;
- specific energy infrastructure deficiency for the coverage of energy demand;
- great distance from the sea and consequent lack of shipping links. Deficit road connected to the low efficiency primary road network; moreover secondary road network (forest type) is a problem for the transfer of biomass truckload;
- local authorities inaction in biomass field: complicated procedures to obtain funding and grants. There are several advantages but not completed from bureaucratic point of view;
- the construction of income statement for a biomass plant is very difficult: all the items are sure except the cost of raw material. It's impossible to carry out an assessment on the progress of biomass price;
- few events and training for public and decision makers;
- excessive sensitivity to environmental issues involving many requests for additional information and tests.

The opportunities highlighted in the analysis are:

- energy industry trends, competitive market;
- good quality of available biomass;
- good average sizes of agricultural fields and forests;
- new concept for the farmer: energy becomes a product of agricultural activity:
- realization of bio-energy platforms for the biofuel production.

The threats highlighted in the analysis are:

- inaction to obtain results to regulate procedures for financing and lending for new biomass plants;
- national problem: significant dependence on foreign energy market;
- biomass price: extremely variable.

7 FIRST ACTIVITIES OF IMPLEMENTATION OF SPECIFIC ACTIONS

Main activity of the work pakage regards the discussion of possible actions in each region and the best tools to identify the bioenergy projects. The fundamental tool, in compliance with the energy register and the master plan, is the bioenergy network and his members. CRB have implemented a questionnarie as a supporting tool for the discussion; the questionnarie consists of six main actions categories that could be developed:

- optimization of existing plants;
- new power plants feasibility studies and designing;
- realization of bioenergy infrastructures;
- high training courses on bioenergy;
- laws proposal for biomass power plants authorization, managing and building;
- support for the elaboration of Regional Bioenergy Plan.

Each network defines a list of possible concrete actions where choose two specific ones.

In particular Umbria Network has just selected a list of possible actions and among these a first action has been approved, "project BiPlaN".

7.1 Project BiPlaN

The discussion inside the regional Network evidenced the necessity of bioenergy infrastructures for biomass plant developing and supplying. Only a few biomass producers are available on the territory so it could be useful for the Region to plan, on the base of biomass needs and availability, some bioenergy platforms.

Project BiPlaN, Bioenergy platform Network, consist of the following activities:

- feasibility study about regional biomass potential and availability, by means of register data and existing bioenergy platforms;
- feasibility study about number, location and capacity of the bioenergy platforms;
- planning of the bioenergy platform.

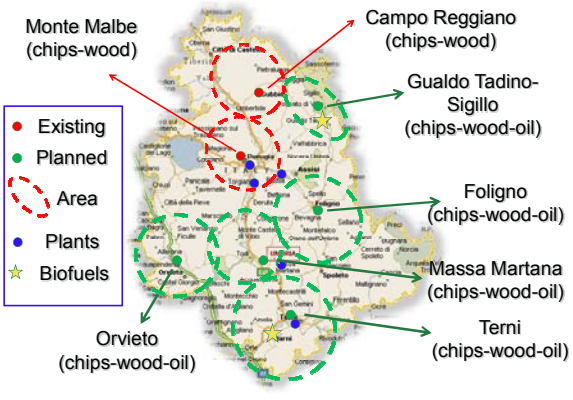

Figure 4: Project BiPlaN

The project is just started during the last regional network meeting and an hypothesis of platforms distribution has been proposed during the discussion with the partners, as shown in figure 4.

8 CONCLUSIONS

First year project has been a very productive year. Regional bioenergy Networks have been created and are a very active part of the project. Regarding the biomass register, the architecture of this tool has been projected and the methodology to evaluate biomass availabilities has been developed. Also the structure of the Master Plan has been implemented and the SWOT analysis of the regional situation in regard to bio-energy market have been completed. Finally, the discussion about concrete actions is started and is continuing in all the networks; in particular, Umbria Network is working on one of the actions, "project BiPlaN", that proposes the realisation of a network of bioenergy platforms for biomass plants supplying.

9 REFERENCES

[1] Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, (2009).
[2] 2003/30/CE Directive of the European Parliament and of the Council on the promotion and use of biofuels in transportation, (2003).
[3] Communication from the Commission, Biomass action plan, (2005).
[4] BEn Technical Progress Repost N° 1, Grant Agreement No. EIE/07/595/SI2.499697, (2009);
[5] Deliverable 4.1: Structure of Master Plan, Grant Agreement No. EIE/07/595/SI2.499697, (2009);
[6] http://terrestrial.eionet.eu.int/CLC2000;
[7] http://europa.eu.int/comm/eurostat/;
[8] F. Lucia, Potenzialità dei biocombustibili solidi nelle province italiane: metodologia e stima", Thesis, (2004);

10 LOGO SPACE

Sponsored by:

Intelligent Energy Europe

BEn Project Logo:

BEn Team:

Rural Development Initiatives Ltd. (RDI)

Biomass Research Centre (CRB)

European Center for Renewable Energy (EEE)

Gostynin Lake District Tourist Communes Association

Institute for Ecology of Industrial Areas (IETU)

Fraunhofer UMSICHT

Fraunhofer Institute for Environmental, Safety, and Energy Technology UMSICHT

WIN EMSCHER-LIPPE GMBH

WiN Emscher-Lippe GmbH (WiN)