

Comparative analysis of barriers, opportunities and needs of promising market segments

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Task 4.6 REPORT

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Executive summary

The following document is a report comparing all eleven national summary reports from Work Package 4 (WP4) of the Bioenergy4Business Project funded by the European Union. WP4 focuses on barriers, opportunities, and needs of promising segments of the biomass heating systems market.

Eleven countries took part in WP4: Austria, Bulgaria, Croatia, Finland, Germany, Greece, The Netherlands, Poland, Romania, Slovakia and Ukraine.

Project partners had to complete a number of tasks (described below), inter alia identify and interview stakeholders from three groups: demand side, supply side and policy stakeholders. In general 317 stakeholders were identified and 118 stakeholders were interviewed for the purpose of the project. Each country organised a national workshop with local stakeholders: 207 of them took part in these seminars.

Based on the interviews conducted and the workshop results the partners have described opportunities, barriers, and needs of biomass use for their country target markets. Most of these are common to all countries and the most frequently mentioned are financial, legislative and informational barriers.

The conclusion reached by all the partner countries is that even though biomass use has great potential, the biomass market still needs further development in all sectors if it is to replace fossil fuels as the leading fuel in the heating sector.

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1. Introduction

The international project Bioenergy4Business promotes the use of solid biomass sources through a fuel-switch from fossil fuels (coal, oil and natural gas), used in commercial sectors for heat purposes, to bioenergy. B4B builds a bridge between policies and markets for supporting the creation of an enabling environment, the use of sound business models and the careful assessment and implementation of bioenergy heat applications in the industrial, commercial, agriculture and services sectors.

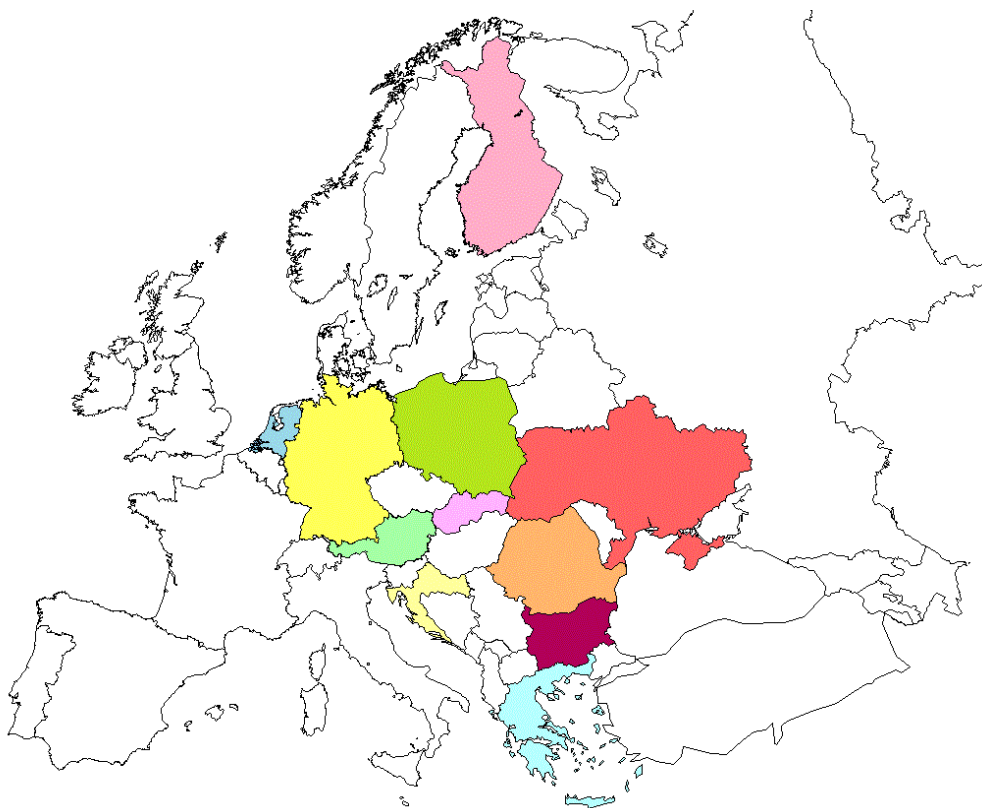
B4B focuses on bioenergy such as by-products from wood-based industries, straw, pellets, forest wood-chips and solid organic waste usable in larger heat-only technologies.

The next stage of B4B is Work Package 4. The objective of WP4 is conducting an in-depth analysis of barriers, opportunities and needs of promising market segments, the identification and establishing contacts and communication channels with stakeholders in the field. Partners were asked to complete the following tasks:

- 🌿 **Task 4.1: Orientation phase:** In the first phase relevant actors are to be identified and consulted: interest-organisations of the most promising commercial market segments, district heating operators, developers and planners, biomass suppliers and its users, decision makers, financial institutions, as well as associations of agricultural, forestry and communities interest-organisations are to be interviewed in the participating countries.

- 🍃 **Task 4.2: Preparation of a base questionnaire for the planned interviews:**
Key issues coming out from T4.1 realisation as well ongoing outcomes from WP2 and WP3 are to be reflected in a questionnaire concerning barriers, opportunities and needs of selected sectors.
- 🍃 **Task 4.3: Interviews with relevant actors** to be conducted by each partner.
- 🍃 **Task 4.4: Analysis of the interviews** by each partner.
- 🍃 **Task 4.5: First national stakeholder workshop:** The objective of this workshop is a national level discussion on barriers, opportunities and needs.

The following document is a comparative report analysing the national summary reports from all eleven countries taking part in WP4.



2. Stakeholders presentation and analysis

2.1 The stakeholders presentation

The main objective of T4.1 was identifying and establishing contacts and communication channels with stakeholders in the field of bioenergy heating. National project teams were to create a contact network with relevant players in interested organisations, industry and administration. Contacted stakeholders have a key role as multipliers of information, but can also be helpful to the project partners in understanding the position of the most promising sectors. Thanks to these contacts the information on bioenergy heating collected can be communicated appropriately. Partners were to clarify the particular competitive and regulatory situation for biomass heating in investigated power range (more than 100 kW).

Total of **317 stakeholders** were identified. Table 1 is presenting number of identified stakeholders from each partner country.

Table 1 Number of identified stakeholders

AT	BG	DE	FI	GR	HR
42	17	44	16	27	15
NL	PL	RO	SK	UA	
49	38	31	16	22	

The contacted stakeholders were grouped into three individual categories: *demand side*, *supply side* and *policy stakeholders*. Tables 2-4 shows a description of each group along with most frequently mentioned stakeholders (based on national country reports).

Table 2 Stakeholders on the demand side

Demand side	
Description	targeted institutions of promising market segments, of the district heating sector and of associations of communities
Most frequently mentioned stakeholders	biomass consumers, heat providers, residential buildings, engineering factories.

Table 3 Stakeholders on the supply side

Supply side	
Description	biomass fuel suppliers (wood, pellets, straw) and of biomass and agricultural/forestry associations, biomass boilers manufacturers
Most frequently mentioned stakeholders	solid biomass and pellets producers, national management of public forests.

Table 4 Policy stakeholders

Policy stakeholders	
Description	over-regional and regional authorities (e.g. energy ministry authorities, permitting and funding authorities, provincial/municipal energy planning), policy makers and of energy agencies
Most frequently mentioned stakeholders	energy agencies, government representatives (Ministry of Agriculture, Ministry of Economics), associations for energy companies, biomass associations.

2.2 Stakeholders analysis on their knowledge and power

Based on the interviews conducted partners were to distinguish identified stakeholders summarizing their power to affect as well as their knowledge and interest in bioenergy systems.

According to national summary reports, one of the most influential stakeholders is a relevant Ministry (either of Agriculture or of Economics), which is also characterized by the best knowledge and the greatest power among other stakeholders. However, many partners mentioned state governments and energy agencies as very significant stakeholders.

→ **SLOVAKIA** says...

Stakeholders from national entities have a significant influence on the development of the biomass market. They are responsible for the creation of legislative documents on field of biomass, its utilisation and creating of favourable conditions.

Very often biomass suppliers and boiler manufacturers were told to have great knowledge about bioenergy investments, but unfortunately little power in this area. A number of partners said the same was true for energy agencies.

→ **FINLAND** says...

Smaller companies have a limited chance on influencing policy making, they take the rules as granted and apply them into their business. Companies make decisions about whether or not to invest, which is the most concrete and ultimate decision for bioenergy to grow.

The matrix of stakeholders below illustrates the compared results of all eleven national summary reports. It demonstrates the effectiveness of a stakeholders' involvement in project: their power to affect (increasing from bottom to top) and their knowledge and interest in bioenergy investments (low to medium on the left side, high on the right side). The top-right cell of the matrix shows the most influential stakeholders of all mentioned by the partners in their reports.

Please keep in mind that the presented outcome are an average and may differ from respective analyses.

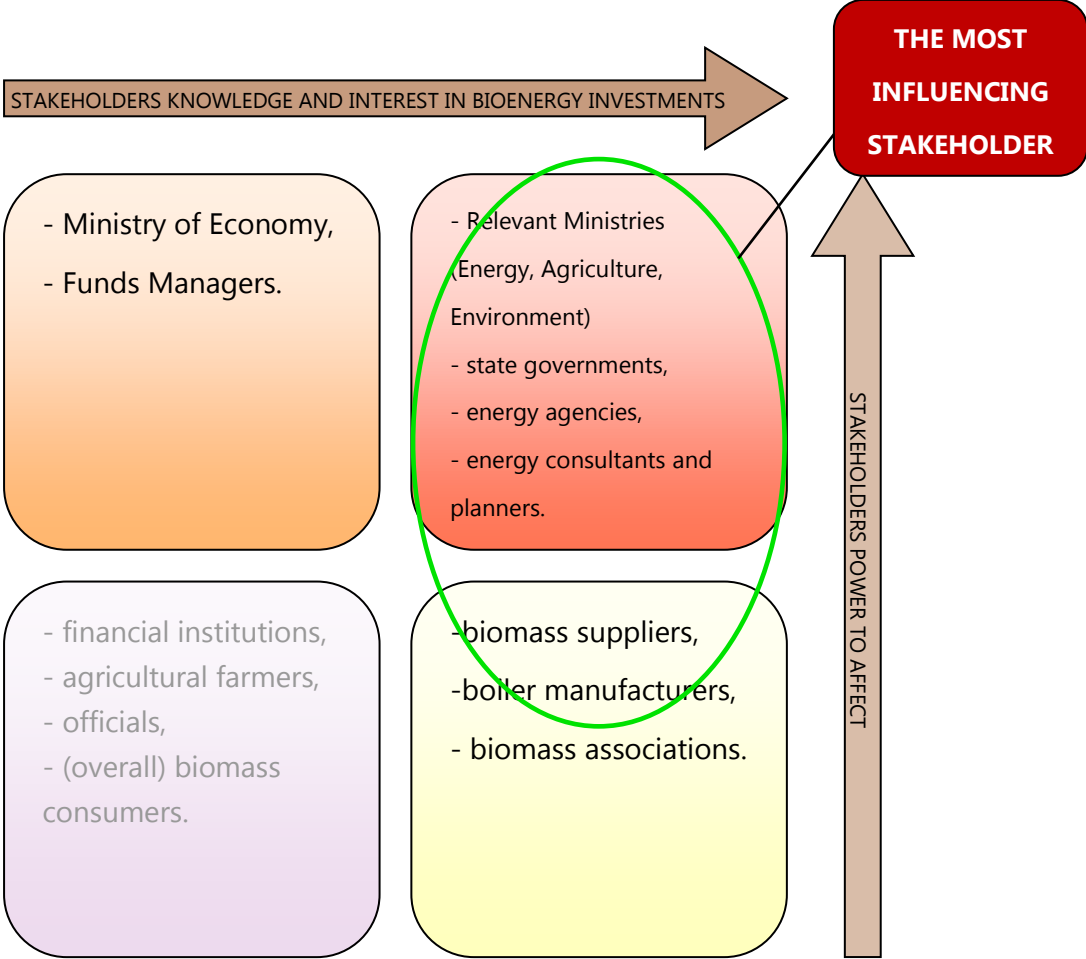


Figure 1 Matrix on stakeholders analysis

2.3 Communication with B4B and within stakeholders groups

According to national summary reports, the interviewed stakeholders expressed great interest in the project. Almost all of the stakeholders have declared their willingness to communicate with others and to share and discuss the results of the B4B project.

The need of communication between supply side and demand side can be noticed. A number of countries mentioned, that contact between these, two groups is very limited, but mostly desired.

→ **THE NETHERLANDS** says...

It became obvious from the interviews that there is a gap between the supply and demand side. The demand side has many questions about the supply side and the supply side does not know the exact needs of the demand side.

On the other hand, communication with stakeholders is not always easy. The example of Greece shows that contact with potential stakeholders should be beneficial to both interested parties, not only project partners.

→ **GREECE** says...

People are not so willing to offer their time when they do not have obvious benefits from this; they are skeptical about giving detail regarding their companies. on the other hand, they usually do not receive any feedback on the outcome of this work.

In general, stakeholders hold the opinion, that the knowledge about biomass use for heating purposes and its benefits should be widely spread so that bioenergy sector can be promoted among all interested market actors.

Currently the main method of communication between stakeholders and national project groups are e-mail messages or telephone calls. These methods are not sufficient to effectively disseminate B4B result to the different branches and communities. In accordance with national summary reports, the following systems of communication were mentioned most frequently to be helpful in improving the dissemination of information about bioenergy:

- ↳ meetings, seminars and debates,
- ↳ online platform,
- ↳ leaflets,
- ↳ advisory centre.

→ **ROMANIA** says...

The most efficient ways to disseminate the results of the Bioenergy4Business project are the workshops and debates. Other proposed mean is the use of a dedicated online platform.

Workshops and debates, as a dedicated means of communication, were mentioned by almost every partner country. Another way for the dissemination of the B4B results are know-how and show-how. According to the Dutch report many farmers are actually interested in using biomass for heating but they want to see and hear from other farmers the pros and cons of this method.

3. Opportunities, barriers and needs

Project partners were asked to conduct interviews with identified stakeholders and to organise national stakeholder workshop concerning opportunities, barriers and needs in the bioenergy sector. The basis of this analysis were summarized answers from interviews and workshop results, regarding all three stakeholders groups: demand side, supply side and policy stakeholders. Table 5 shows the number of interviewed stakeholders in each partner country. Table 6 presents the number of participants who took part in national stakeholders' workshops in each country. In total, 118 stakeholders were interviewed and 207 took part in workshops.

Table 5 Number of interviewed stakeholders

Austria	Bulgaria	Croatia	Finland	Germany	Greece
15	18	13	7	13	-
Netherlands	Poland	Romania	Slovakia	Ukraine	
12	15	10	6	9	

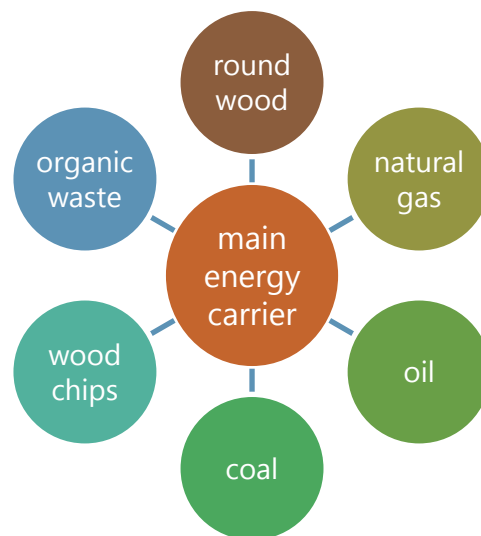
Table 6 Number of national workshops participants

Austria	Bulgaria	Croatia	Finland	Germany	Greece
6	12	19	11	5	20
Netherlands	Poland	Romania	Slovakia	Ukraine	
36	34	39	5	20	

3.1 Opportunities

3.1.1 Demand side

Many different representatives of demand side were interviewed. Depending on it, various energy carriers were mentioned; however, most frequent answers were natural gas and fossil fuels. Practically every country reported that the high relevance of heating costs was mentioned. A concern about rising prices can be noticed.



- 6 Generally biomass as an energy carrier is perceived very positively. It was revealed that this positive perception is the result of the low price of the fuel but also, due to understanding that biomass can be an alternative to currently used fuels, particularly natural gas and coal.

↳ The main means necessary to attract biomass fuels for self–production of heat are subsidies and other financial incentives.

It was noticed that if biomass is to be competitive compared to currently used fuels, some additional incentives should be introduced, for example tax exemptions.

It was also mentioned, that social awareness should be raised in order to convince potential users that switching to biomass is worth it.

↳ The main benefits associated with biomass utilisation are as follows:

↳ reduction of CO₂ emission,

↳ energy independence and security,

↳ cleaner energy and environment,

↳ waste management,

↳ contributing to fulfilling National Renewable Energy Action Plans.

↳ Interviewed stakeholders hesitate between fuel switching and building new biomass facilities, although they consider both solutions. The final decision usually depends on local conditions and is based on individual circumstances.

Austria:

Austrian Energy Agency has interviewed 7 demand side actors: six representatives of target markets (hotel buildings, residential buildings, commercial buildings (car service facilities) and agricultural buildings (greenhouses) and representative of association of communities.

Actors consider costs as a very important topic, as the most part of heating is based on oil heating or district heating. In general, there is an interest in solid biomass fuels for heating, which is due to expected cost savings, sustainability considerations and local value added.

Solid biomass use depends to a certain extent on spatial conditions, such as the available space for storage of the fuels used. In general energy efficiency of new buildings is

increasing, hence the importance of operational expenditures decreases in relation to capital expenditures. Having said this, investment subsidies for boilers and storage and boiler rooms might help to improve the competitiveness of biomass boilers. A reliable and smooth maintenance service and a reliable supply of spare parts and wearing parts, at reasonable prices, are of course also a precondition.

Bulgaria:

Two demand side actors (representing DH companies) have been interviewed by BGBIOM. The main energy carrier in Bulgaria are fossil fuels. Biomass is positively perceived, but it still deserves attention as an instrument for managing the ecological problems. As means that are necessary to attract biomass fuels for self-production of heat, interviewees underline financial instruments – stimulation of the use of bioenergy and sanctions for GHG emissions. They mention also the availability of good projects.

Croatia:

EIHP has interviewed six demand side actors (investors, biomass and DH plant planners, user of biomass and biomass boiler manufacturer). Interviewees say that general perception of biomass is very important. Public sector and wood industry had expressed the main interest in using biomass, but these sectors still need to be attracted by, for example, subsidy system a national level. Croatia is forest rich country therefore the use of biomass at local level has a strategic importance and brings environmental, social and economic benefits.

Finland:

The general perception towards biomass is positive among companies in Finland. However, in Finnish industry there are still a number of companies that have their own heat production plant operating on the fossil fuels. These companies are target groups of this project and still have plenty of potential there as compared to public sector.

Finnish energy and heat production industry aims for a carbon neutral future and it has already done a lot in order to achieve the goal. Nowadays most of the new facilities are using bioenergy.

The switch to biofuels is strongly depending on the economic viability of the project. For the corporate sector to consider changing to using biofuels, it has to be economically profitable. Biofuels being emission free is of course regarded as an important factor and also having an impact on company's image. Biofuel's advantage is that it is domestic and has an impact on employment of surrounding rural areas. Switch to biofuels requires usually replacement of the entire heating system. In the old fossil fuel units only switching of the fuel is not always technically and economically a possible solution.

Germany:

There were three interviews conducted with the representatives of most promising heat market segments: swimming pools, hospitals and nursing homes and hotels.

The main energy carriers amongst all market segments are oil and natural gas. The cost for energy supply are crucial. Due to the fact, that in last time the image becomes more and more important, a switch of fossil fuels to renewable energy resources seems to be favourable in any case.

Hospitals happen to use wood pellets with oil, if there is no natural gas grid. If pellets are a favourable alternative is determined by the price for fossil fuels. Through the use of solid biomass it is possible to save heating costs at some locations. The construction of pellet plants is also possible in urban areas, when the area is limited. For the storage of the fuel external silos can be used. These silos have low space requirement.

The third group of demand actors are hotels. Target markets are primarily new hotels and holiday or adventure hotels, where the use of renewable energy is part of the overall concept. Rural areas often offer enough space for a separate boiler house, fuel bunker and access roads. In addition land prices are low.

Greece:

The main energy source and process used in the most of the companies interviewed was pomace burning and production of superheated steam for drying in 2 and 3 phases. Heat demand is a relevant cost issue or topic and it is of great importance along with this of electricity demand. The perception of biomass fuels is positive to very positive. Reasons behind these: fuel saving, costs issues (the cost of the thermal energy produced (MWh)

reaches the 1/6 of the oil price) and the environmental benefits deriving from the avoidance of oil burning.

What considered as necessary actions to attract biomass fuels for self-production of heat were subsidies for the replacement of the burner, know how in order to achieve fuel savings, connection of the production with thermal production.

Most interviewees think that solid biomass fuels are more viable in the case of completely new installation rather than a fuel-switch at existing energy conversion facilities.

The Netherlands:

Three stakeholders were interviewed by RVO. The main energy carrier in The Netherlands is natural gas. The perceptions over biomass are different and can range from region to region and case to case. While people would accept using wood stoves in a village, in a city this would not be accepted (mainly because of odour and emissions). There is a lot of insecurity related to the supply and price of biomass. Also biomass is more likely to be perceived positively, when biomass is used from local sources, and it is not transported from abroad.

The most important benefit associated with biomass utilisation is the profit. The main interest is to pay less than generating heat from gas. Green image, a low carbon footprint is another issue for the sector. However special attention needs to be given here since some people might not see it as an energy source that is entirely clean.

From the financial point of view, the incentives present in the Netherlands are numerous, however there is a knowledge barrier. It is necessary to have more knowledge, be more aware about what can and cannot be done in relation to biomass.

Poland:

Five interviews were conducted with the demand side actors. Based on the answers, coal remains the main energy carrier in Poland. Personal perception of biomass is very positive in all of the represented branches.

Social awareness should be raised in order to convince customers to use biomass as fuel. It is necessary to explain why biomass is a superior ecological fuel and why we should care about

the environment we live in. Financial incentives should be implemented to support the purchase of new biomass boilers or the repurposing of old units.

The main advantages of using biomass for energy purposes are: reducing low emissions in the region, reducing CO₂ emissions, creating local added value in the region, increasing energy security, lowering environmental costs, improving air quality in the region.

It is more cost-effective to build new biomass installations rather than modernize old coal-based ones. Designing a new plant allows the selection of the right location for the plant and the biomass storage area (so that the noise does not disturb the residents).

Romania:

ARBIO has interviewed 4 stakeholders representing the demand side: two producers of bioenergy, representative of engineering company and producer of equipment for the production of heat and electric energy from biomass.

The main actual energy carrier in Romania are fossil fuels and in specific natural gas (public and private buildings) and gas and coal (DH sector). The interviewed persons recognized that the price of heat is a crucial issue for the customers and the community. The perception of biomass is very positive.

According to the interviewed stakeholders, the means necessary to attract biomass fuels are the introduction of financial incentives, conduction of awareness campaigns, training courses and provision of education that are necessary to inform the public of the advantages of using biomass and a coherent legislation, taking into account EU legislation in the field. Taxation of the pollutant emissions, the use of EU models and policies can also influence the attraction of biomass fuels.

The main benefits associated with biomass utilization are reduction of CO₂ emissions, improvement of land use, waste management, and energy independence, cleaner and cheaper energy compared to fossil fuels

Slovakia:

Interviewed group was primary DH sector, or producers of heat. Main energy carrier marked by all asked was biomass composed primary from wood chips. Biomass as the heating energy

carrier is perceived very positive. This positive perception comes from lower price for fuel and motivation to contribute to better environment condition. In Slovakia the attractiveness of biomass is on good level and doesn't need any other help. Biomass has actually created a functioning market mechanism and don't need a subsidy.

Benefits associated with usage of biomass like a fuel are: decrease of fuel costs, emission savings in big facilities and trade with emission allowances.

Ukraine:

Main actual energy carrier is natural gas, though its price is constantly growing.

Personal perception of biomass as well as perception by institutions is very positive in all represented branches as people understand that biomass can be a real alternative to natural gas, first of all for heat production.

Means necessary to attract biomass fuels for self-production of heat are some tax benefits or other financial incentives. Main benefits associated with biomass utilization are replacement of expensive natural gas by comparatively cheap biomass, development of local economies as the money paid for biofuels does not go abroad but stays in the regions, creation of new jobs associated with collection and supply of biomass and with operation of biomass plants, contribution to decreasing CO₂ emissions and contribution to fulfilling National Renewable Energy Action Plan.

Possibility of fuel switch versus new biomass facilities strongly depends on the local conditions. Both options are possible and viable. If a facility is located, say, in a city centre, the fuel switch is a reasonable option due to existing space constraints. If it is a newly built city district or rural area, a new biomass plant may be a feasible option.

3.1.2 Supply side

- Partners were asked to specify whether their country's biomass supply market is mature or not.
- Figure 2 shows which countries described their biomass supply market as *mature, well developed or well organised*, and which described it as *immature, insecure or not functioning at full capacity*.

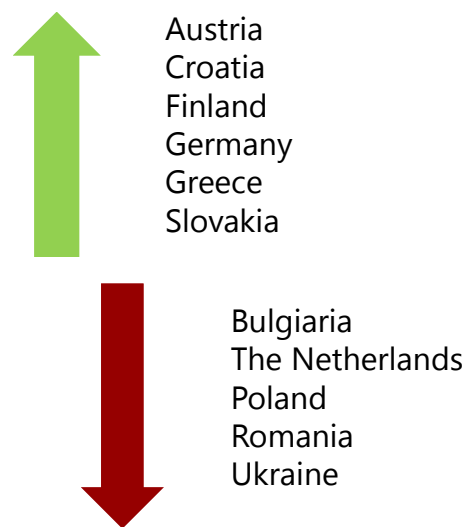


Figure 2 Maturity of biomass supply market

- Actor motivation to build up biomass fuels supply chains is mostly financial. It was mentioned that access to UE funds inspire actors and makes investment potentially profitable. Latter motivations may be reducing cost of biomass compared to fossil fuels and waste and secondary products utilization in an environmentally friendly manner.
- Frequently mentioned means necessary to attract the usage of solid biomass fuels for DH and for public and commercial in-house heat production is an establishment of adequate legislative policy along with taxes for polluting entities.

If biomass is to become competitive comparing to other fuels it is necessary to introduce financial incentives. The need for informational campaigns was also noticed.

- One of the important factors for building up successful biomass supply chains is simplifying supply chains so that they do not become overcomplicated.

Austria:

Austria interviewed four supply side actors (two representatives of biomass suppliers and two representatives of agriculture and forest associations).

Today both markets, wood-chips market and wood pellets market, are mature in Austria. Domestic pellet production is 20% higher than national demand. Connection to other developed markets is good.

The main motivation to build up biomass fuels supply chains is the value added generated by saw mills in producing pellets instead of just selling wood shavings/particles. Before pellets such wood was supplied to particle board industry mainly with a price below 5 Euro/m³.

Solid biofuels are not in public perception currently. Politicians currently like to discuss wind and solar energy rather. Biomass currently is lacking an adequate perception and lobby in Austria. Clear provisions and best practice solutions are needed to tackle topics like limited end consumer storage room, dust, noise and the transport to and filling of the end consumer storage facilities.

Bulgaria:

Three supply side actors (representatives of plants producing solid biomass) have been interviewed by ARBIO.

Both interviewee characterize the biomass market as insecure, unstable, evolving, reacts to political situation. Main actors are state forest authorities, private subcontractors, timber and logging companies, manufacturers of pellets and users - factories, hotels, individuals. According the answers the motivation to build up biomass fuels supply chains is purely

financial, aiming an efficient allocation of the biomass market. Important factors for building up successful biomass supply chains include the proximity of the site to the source of raw material, processing technique, adequate connection with the local forest authority.

Interviewees listed following means necessary to attract the usage of solid biomass: advertising, competitive prices, government policy that encourages the use of this type of heating, sanitary logging program in forestry.

Croatia:

Four supply side actors were interviewed by EIHP (representatives of biomass association and management of public forests and two pellet producers).

The solid biomass market is well organised as wood industry has a long tradition and $\frac{3}{4}$ of national forests are managed by a public company. The main motivation to build up biomass fuels supply chains is the availability of biomass and new economic opportunity. The necessary action needed to attract the usage of solid biomass is economic competitiveness, (mainly the stakeholders are stressing the needs of subsidy system or a binding regulation on the use of biomass).

Finland:

In Finland the biomass supply market is mature, thanks to large traditional forest industry. Energy wood is supplied in conjunction with pulp wood and timber, benefitting also the small-scale players. If the business is profitable, the companies providing wood chips are motivated to build up biomass fuels supply chains also in the future.

Reliable infrastructure is an important factor for building up successful biomass supply chains. It has to guarantee the supply for long periods of time, even in challenging times. This attracts the usage of bioheat in DH and for public and commercial in-house heat production.

Pellets are especially suitable for fuel switch to replace fossil fuels. In addition, they are also good for back up heat production and to cover peak loads.

Germany:

Future potential is seen in the rural areas, where heat demand of the existing buildings is still high despite renovation. Furthermore, the place requirement is adequate for the construction of a bioenergy plant. Several buildings could be connected and supplied by a micro-pipe. The joint planning and realization of a bioenergy project often shows a strong social component, which bring citizens together. The use of solid bioenergy leads to regional economic benefits and creates jobs. Furthermore, the dependence of fossil fuels which are mostly imported from fragile regions can be reduced and so the energy security can be enhanced. Solid biofuels contribute to climate protection due to climate neutrality of the fuel.

The increased demand for energy wood led to a market upturn of rarely demanded wood assortments. This results in a better income situation for the forest owners. By building up a bioenergy supply chain long term trade relations can be established and new means of income can be developed.

Greece:

The biomass supply market for energy purposes in Greece is considered in a good level (rice processing residues, use of silo, biomass burner, production of superheated steam for drying and whitening), in a very good level (wood chips for thermal process) and needs to be upgraded (raw material supply network and pricing).

The motivation for someone to build up biomass fuels supply chain could be management of by products, high availability of raw material, quality of fuel, good knowledge of the market, and demand on biomass products.

Important factors for building up successful biomass supply chains are referred to be: raw material supply efficiency, quality of fuel, energy density related to transportation costs, long term contracts with suppliers, transport distance, biomass prices, procedures, clear quality characteristics of biomass (especially regarding moisture).

The Netherlands:

Five supply side stakeholders have been interviewed.

Biomass market is still an emerging market. The gas distribution system in the Netherlands is very good, therefore replacing it with a new one is rather difficult and not very common. It is

more common to have biomass systems in industries. The biomass supply chain is settled but the demand side is constantly moving up and down. At the moment the demand side at big electricity plants is decreased. Last year 70-80% of the available biomass was exported because of no demand.

Important factors for building up successful biomass supply chains are stable policy, steady prices of biomass and sustainability, which has gained more importance in recent years and needs to be addressed in the supply chain.

Poland:

Poland's potential for biomass use is very high. Since 2008 the number of biomass importers and producers has increased. Large installations are supported by UE funds which helps them enter the market. There is a number of prospering, high quality installations. Estimates show that Poland can produce up to 500,000 tons of wood biomass and almost 10M tons of agricultural biomass without redevelopment of agricultural land. Unfortunately, the biomass market is not functioning at its full capacity.

To be profitable biomass needs to be competitive with coal! At least 70% of fuel resources must come from local crops so that they do not have to be transported over long distances. Subsidies for the modernization of old coal boilers contribute to the replacement of coal with biomass. It is essential that small consumers use high quality pellets and large industrial plants use lower quality biomass.

The essential factor affecting the development of successful biomass supply chains are legal regulations. They could control and promote particular courses of actions, but more often they are not effective or serve to protect other interests. They are usually written in such a way, that their interpretation is ambiguous. As a result they limit economic freedom or even hinder entrepreneurship. Clear and unambiguous regulation might help both the biomass market and the national economy.

Romania:

The biomass supply market is immature in Romania. Biomass resources are not valued at the present moment; they are overlapping with other sectors such as production of chipboards

and fibreboards. The main actors involved in the market are wood industry based companies that use biomass for covering own heating needs and sell electricity to the grid.

The main motivations for building up biomass fuel supply chains are (a) to reduce cost of biomass compared to fossil fuels (b) to ensure biomass fuels for production and (c) to use waste and secondary products in an environmentally friendly manner.

The necessary means proposed by the interviewed persons to attract the usage of solid biomass fuels are: establishment of taxes for polluting entities and an adequate legislative policy for promoting biomass heating, implementation of information campaigns as well as implementation of pilot projects so as to contribute to the enhancement of the awareness of other project developers for developing biomass heating projects, development of adequate technologies for collecting, transporting and producing biomass, creation of fiscal and economic incentives and policies for the promotion of solid biomass fuels, involvement of the relevant associations, authorities and equipment producers.

In Romania, the most promising biomass sources, available in large quantities, are by products from wood-based industries, forest woodchips, pellets and straw. The main fossil energy carrier(s) for fuel-switch towards biofuels are natural gas and coal.

Slovakia:

Attractivity of biomass is rising up regarding to rising awareness and lower prices for end customers. Interviewees answer that some technologies installed in DHS for combustion of biomass (straw) are characterized by excessive dust and noise in the area. Logistic of storage and transport is a weakness of lot of facilities. On side of small sources is biggest barrier price for technology for combustion of biomass against the technologies for natural gas. Here will be on place create some kind of subsidy to facilities up to 3 MW_{th} of max. 50%.

Biomass producers were always here, changes were mainly on side of end customers. Pellets was orientated primary on export, home demand was so low. Tendency for improve of domestic market is high. Wood chips was exporting too outside of country, present is supply to domestic heating plants.

Ukraine:

Biomass supply market in Ukraine is not mature yet, it is on a comparatively early stage of its development.

The most important factor for building up successful biomass supply chains is very well thought-out logistics. There must be a reliable supplier, a reliable consumer and all the required machinery and transport to arrange collection, processing, transportation and storage of biomass feedstock (balers, chippers, forwarders, trucks etc.).

In spite of some difficulties and problems, biofuel market outlook is quite positive. A number of draft laws aimed to improve situation in biomass market and biomass-based heat market are now under consideration by Ukraine's Parliament. We believe that at least some of them will be passed and contribute to the development of bioenergy in the country. At that, the main fossil energy carrier for fuel-switch towards biofuels is surely natural gas.

It should be noted that the majority of biomass suppliers in Ukraine tend to concentrate all biomass supply chain (from the land to the end use) in single hands that has incontestable advantages:

- it's more profitable, flexible, controlled, easy to manage,
- reliability of biofuel supply is higher,
- there is no need for contracting services from outside companies,
- as the rule, the price of biofuel/energy for the end user is lower than in case of involving a few different service partners.

3.1.3 Policy stakeholders

🌿 In most countries biomass fuels are perceived positively. Romanian summary report reads, that in their country biomass is poorly understood and not appreciated enough. Even though perception of biomass is very positive, Ukrainian report says that most representatives of their Ministry of Agricultural Policy are against the use of agricultural residues for energy: their position is that all crop residues should be left on field.

- ♣ Policy stakeholders are aware of benefits associated with the replacement of fossil fuels with biomass. The most frequently mentioned advantages are:
 - ♣ pollution reduction,
 - ♣ energy independence,
 - ♣ jobs creation,
 - ♣ use of local resources,
 - ♣ development of local economies.
- ♣ Two of the most frequently mentioned mechanisms for attracting the usage of solid biomass fuels for DH and for public and commercial in-house heat production are: the need for a coherent legislative framework and financial means, such as a support and subsidy systems.
- ♣ The most important factor for the successful usage of biomass instead fossil fuels is creating transparent law and deep cooperation between stakeholders.

Austria:

Four policy stakeholders were interviewed (representatives of authorities).

The usage of biomass in general is welcomed by communities. In Austria many municipalities have reached a high degree of bioheat supply by biomass district heating. Bioheat, especially with heating grids is no simple heat supply solution. Because of its complexity and the barriers encountered biomass district heating is difficult to be realized. There is still quite potential to establish biomass micro grids for supplying settlements or a number of larger heat customers (e.g. hotels and multi-storey residential buildings).

There is couple of important factors for successful usage of biomass instead of fossil fuels. Offers subsidising solid biomass require transparency of benefits for the region. Local politicians and society need to be convinced first. A high support for solid biomass utilization without regional availability of biomass questions benefits for local society. The economic soundness of biomass plants subsidised must be secured. There must be an economic environment that allows a reasonable profit in the mid- to long-term. Environmental

problems must remain within reasonable limits. These limits shall be on the same or even higher level than for conventional plants.

Bulgaria:

Six representatives of policy stakeholders have been interviewed by ARBIO: representatives of Energy Agencies, Regional Energy Centres, Regional Inspectorate for Environmental Protection and Water, Municipality, and South Central Forest Agency.

According to the answers, biomass fuels are perceived positively. Mentioned benefits associated with replacement of fossil fuels by biomass are neutral in terms of GHG emissions, contributing to energy production, lower costs, use of local resources, reducing dependence on imported fuels.

To attract the usage of solid biomass, there is a need to educate people in respect for national energy interests. To find mechanisms for attracting users to biomass heating systems, for example with regard to energy efficiency. To buy electric power of cogeneration plants only in case of heating public and other buildings.

Croatia:

Five policy stakeholders were interviewed by EIHP (two Ministry representatives and representatives of public administration, energy agency and chamber of commerce).

According to the answers, perception of biomass fuels in Croatia is very positive. Also there is an interest to use the existing biomass stock as locally available fuel, in particular to switch from heating oil use.

Finland:

Bioenergy use supports the regional strategies and development programs. It has positive effect on employment, rural livelihood and energy self-sufficiency, hence it is regarded very important.

The state level targets are actively present in regional development work when funding decision for bioenergy projects are considered. Climate conditions in Finland are such that heat is needed constantly most of the year. Also the security of energy supply is often mentioned in favour of domestic bioenergy.

Taxation related to energy wood and investments play an important role for companies, even more important than subsidies. The taxation should be predictable for longer time periods. Solid, and liquid, biofuels are largely preferred over the fossil ones due to environmental factors, meaning good outlook for the bioheat.

From regional planning point of view there is a strong interest to promote bioenergy plants over fossil fuel plants. There should be a holistic approach, taking into account also e.g. mobility issues in general.

Germany:

In the first place measures to increase energy efficiency are needed. The usage competition for wood will also rise abroad prospectively, so that a long-term security of supply at moderate prices is doubtful.

With the new Marktanreizprogramm (MAP) which came on line on 1st April 2015 the Federal Ministry of economics and energy supports the construction of larger heat generation systems and heating networks to supply heat generated from renewable resources. The target groups are property owners, companies and municipalities. Beside federal support programs the development of bioenergy use is promoted by county-specific supporting programs, e.g. the Bavarian program "BioKlima".

A possibility to enhance the potential is to cultivate short-rotation coppices. Especially nutrient-poor soils which are not suitable for energy crop cultivation in the north of the region are usable to cultivate short-rotation coppices.

Greece:

There are no opportunities for policy stakeholders.

The Netherlands:

Four policy stakeholders have been interviewed. In the country the perception of solid biomass differs, some perceive biomass positively, some negatively. On one hand, biomass is considered a clean, renewable energy. On the other hand, it is considered dirty and people are afraid of the source of biomass, its sustainability. People are afraid of negative impacts, such as deforestation.

In general, the use of biomass for energy is an important part in the energy mix. The province and municipalities are collaborating on the development of district heating and stand-alone heat supply based on biomass, together with the usage of waste heat from industry and geothermal heat.

Main benefits associated with replacement of fossil fuels by biomass are:

- ↳ main driver for project developers to use biomass instead of fossil fuels is cost reduction,
- ↳ energy independence gives control of the energy supply and energy costs for companies and citizens,
- ↳ the fossil fuels are a finite source of energy, we have to change to other sources of energy.

We can do this with the help of biomass. Another benefit is that through the use of biomass there are CO₂ savings.

Poland:

The most important factor which has a real impact on the development of biomass use is the transformation of national energy policy in its very wide scope. The energy policy should be changed from the ground up, as to facilitate rapid biomass development. Traditional Polish habits for using coal makes the development of biomass difficult.

- Biomass' greatest benefit is its "zero" emission. However while it is true that during biomass combustion earlier absorbed CO₂ is released, we cannot forget that every

action (transport, briquetting, etc.) is very energy-intensive and uses energy fossil fuels.

Biomass makes better fuel than coal taking into account dusts emissions.

- Positive impact of biomass on local economies. The amount of coal used can be reduced and local energy security can be increased.

Romania:

The stakeholders interviewed pointed out that the energy policy of Romania and the strategies for the production of heat, plus the new Heat Law are under debate. The adoption of the new legislation is considered critical.

At the present moment, Biomass fuel is poorly understood and not much appreciated by most people. This is mainly due to the fact that the energy generation options from biomass are rarely discussed in general, and people are not informed. Moreover, biomass used to be the habitual fuel for the households in rural areas, as the fire wood. This situation is expected to change once the new legislation is adopted.

The main benefits of replacing fossil fuels with biomass are: pollution reduction, energy independence; biomass can be found locally and is an excellent solution for small communities; jobs creation.

According to the interviewed persons, the means necessary to attract the usage of solid biomass fuels for DH and for public and commercial in-house heat production are the following:

- ↳ coherent legislative framework dedicated to biomass,
- ↳ identification of co-financing options for biomass projects,
- ↳ networking of the decision makers with the government representatives for the use of biomass,
- ↳ use of best practice examples of the EU in relation to the introduction of biomass heating.

Slovakia:

Interviewed were policy makers and representatives of energy agency. Overview from interviews shows that perception of biomass in Slovakia is very positive. The use of renewable

energy source such as biomass is, brings with it many benefits. Biomass provided a support to quality of environment, GHG reduction, decreasing dependence on fossil fuels. Biomass is one of the prioritized sources in Slovak republic mentioned in Energy policy of Slovak republic. Great potential identified in fuel switch of existing plants of DHS from coal and solid fossil fuels.

Policy stakeholders identified benefits of using biomass like as very good option to increasing employment and decrease dependence on fossil fuel from import. Biomass is very good locally available resource for production of heat and for fuel switch of existing fossil fuels. Decreasing of dependence from fossil fuel have influence on energy self-sufficiency. Production of heat from biomass in case of set good subsidy for technology purchases is cheaper than from natural gas. Often is production of heat from biomass competitiveness (without subsidy) to production of heat from fossil fuels.

Ukraine:

Perception of biomass fuels in the country and stakeholders' organisations is very positive. A peculiarity is that most representatives of the Ministry of Agrarian Policy and Food of Ukraine are against the use of agricultural residues for energy. Their position is that all crop residues should be left on field.

Policy stakeholders are aware of a large role of biomass fuels in DH and in public and commercial buildings in realisation of country energy policy. They understand that biomass plays decisive part in the implementation of NREAP regarding heat production from renewables.

Means necessary to attract the usage of solid biomass fuels for DH and for public and commercial in-house heat production are consistent state policy, improvement of existing legislation, introduction of financial support instruments for producers/consumers of heat from biomass.

Important factors for successful usage of biomass instead fossil fuels are: awareness of all related actors of the state policy in bioenergy sector, understanding and belief in the policy; real action of the existing support instruments and introduction of new ones; improvement and simplification of procedures related with getting permissions, licenses, setting tariffs etc.

3.2 Barriers

Partner countries share most of mentioned barriers, either technical or non-technical alike on demand side, supply side and policy among policy stakeholders. The most frequently mentioned are specified in the Tables 7 - 9 below.

3.2.1 Demand side

Table 7 Barriers on the demand side

Technical barriers	Non-technical barriers
Complicated logistics	High investment costs
Low quality of equipment	Lack of subsidy system
Transport over long distances	Lack of educational campaigns
Low biofuel quality	Not clear legislative framework

Austria:

The main barrier could be regulatory requirements (higher costs) for adaptation of heating and storage rooms.

Hotel industry itself has difficulties to invest into pellets plants. Banks are not in favour of granting loans for hotel industry for long term, as viable guarantees for such long periods are difficult to offer by hotel industry. There is however a huge fuel-switch potential from oil to pellets by contracting solutions.

Quite often the lack of information, lack of overview about available funding mechanisms and the bureaucratic effort needed for the funding request and administration are hurdles for further implementation of biomass-based heating systems.

Bulgaria:

Demand side interviewees mentioned following barriers: the price - biofuels are more expensive than natural gas, Local DHC (EVN) does not see the financial benefits of using wood biomass. Using natural gas or even biogas causes lower final price. Local authorities have no interest on the use of wood biomass advantage is the use of gas. There is a risk with the assessments of the period of redemption and amortization, the provision of raw materials at reasonable prices, its transportation, and the purchase prices of energy. Investments for initial installation - lack of subsidies and credit lines. Lack of real public support for changing fuel by private users.

Croatia:

Technical barriers: the building regulations are sometimes difficult to comply with when implementing a biomass heating system. Logistic of biomass delivery and storage. Lack of specialization of heating system planners.

Non-technical barriers: lack of subsidy system, competition with natural gas and CHP.

Finland:

Investing in the plant powered by biofuels is more expensive option as compared to fossil fuel heating plant. Companies do not often rely on the price development of biofuels and are afraid of possible increases in fuel price. Expensive heating plant investment requires that the future trend of the fuel price is stable. The guarantees needed for investment loans can be a problem, especially for smaller and newer companies. This is common problem in almost every business area due to current economic situation.

Companies sometimes regard bioheating a burdensome process to start. Fossil fuel can therefore be seen as "inevitable" or only choice in some locations.

Germany:

Due to the usually limited financial resources, investments in biomass heating systems have to be more favourable or at least comparable as alternative heat concepts. Investments in expensive biomass heating systems would be borne about other essential new constructions of indoor pools. It is also mentioned that expensive investments have an impact admission charge, but higher prices are not accepted by the visitors. Therefore the financial resources of

the municipality and the political will are decisive for a heat supply of indoor or outdoor pools based on biomass.

Because the cost pressure among hospitals is large, payback period of less than 5 years are expected. The high investment cost of biomass plants and the long payback period are a major barrier. The investment costs in the system technology are still too high and must be reduced through greater funding incentives and reduction in manufacturing cost. The high logistics costs for pellet make often difficult to ensure an economic supply of pellets.

Greece:

The main barriers are as follows:

- uncertainty of the fuel supply,
- cost of the interventions for the fuel swift (replacement of oil heating system),
- low VAT on natural gas (unfair competition).

The Netherlands:

The lack of awareness has been mentioned as a hindering factor. In this sense demonstration plants help raise awareness about the benefits of the projects.

A barrier is considered the costs of investment. Usually an investment is on the long term, for 25 years, and therefore it is necessary to have a good business plan. For that it is also necessary to make sure that the political rules and regulations are more predictable in the long term.

Air quality is a big issue. Odour and smoke can be seen as barriers, especially for businesses. There also legislative barriers concerning the limits on air emissions. These are seen as rather too strict. It is necessary to have more research on whether these strict emission are justified or not.

Poland:

A major technical problem is the quality of heating plant equipment. Biomass boilers must be more durable than coal boilers.

Transporting over 75-100 kilometres is the main reason why biomass is less profitable and less competitive than other fuels.

Storage of biomass. Biomass requires larger storage facilities than coal, which must be additionally roofed in order to prevent the biomass from getting wet in rain or snow. It is necessary to build an additional storage tank for hot water.

Necessity of maintaining the same amount of biomass throughout the year. Humidity of biomass may vary annually.

The use of biomass requires more effort than coal. With high biomass humidity, hopper feeders may not work properly - wet wood chips become elastic and may block the feeder, thus the boilers may require additional supervision.

Romania:

From the point of view of stakeholders representing the demand side, the following barriers are identified:

- lack of education,
- security of supply ,
- complicated logistics,
- high investment costs,
- not clear legislative framework at local and national level,
- access to financing and poor interest of the FIs to provide loans, - reduction of subsidies for the energy crops,
- lack of information campaigns to the population,
- PPP projects found in incipient stage.

It is also pointed out that technical barriers have been overcome. A large number of companies invest in EE technologies, waste management, etc.

Slovakia:

Lot of facilities for production of heat are reconstructed facilities from combustion of gas or coal. In this context the question about viable option for fuel switch at existing facilities or using biomass in new facilities depends on specific conditions for each facility. Conditions are

divided to financial (economical) and technical. If the costs for reconstruction of old facility are higher than build a new facility, then it's economically more favourable build a new facility. Reconstruction of old facility takes much more time, you need to be sure that you have enough space for new technology with all technical equipment, sufficient storage capacity and etc.

Ukraine:

A few main difficulties are as follows:

- "traditional" way of thinking that nothing can't be better than fossil fuels for energy production, unwillingness of changes;
- strong lobby of the use of fossil fuels (especially natural gas) at different levels of authorities;
- lack of professional information and essential high-quality equipment;
- limited amount of wood biomass. Assessments of biomass availability in the nearest future show that amount of wood biomass for energy production will rise but very slightly which may have an impact on the price;
- lack of a qualified personal. Mainly due to new/non-typical activities, low levels of salaries, and non- prestigiousness of such occupations;
- a lot of official circumlocution, especially when connecting to the electric grid (granting the licenses, bureaucracy, preparation of a pile of documents, corruption, etc.);
- the unstable situation in Ukraine discourages potential investors;
- adverse economic indicators of projects at high exchange rate for foreign investors.

3.2.2 Supply side

Table 8 Barriers on the supply side

Technical barriers	Non-technical barriers
Limited storage space	Low level of social awareness
Lack of suitable equipment	Competitive prices of fossil fuels
Lack of sufficient multifuel technologies	Weak legislative framework

Austria:

In the wood-chips sector limited storage space (at existing buildings) and bandwidths in fuel quality sometimes cause problems. Non-technical problems are lack of knowledge (especially among installers, architects) or missing motivation of principal. Regulatory barriers of relevance are locally sometimes strict dust limits in (sub-) urban areas for existing and new bioheat plants.

Currently there is insufficient information for and therefore lack of motivation of potential customers. Successful best practice show cases are another important means for motivating potential investors. It should be clear that projects of such nature are a real business case and have further additional useful value added.

Bulgaria:

Producers of solid biomass say that the main barriers are: lack of information about new efficient technologies for using biomass fuels and lack of possibility to invest in new efficient installation for heating with solid biomass.

Croatia:

No barriers regarding biomass supply.

Finland:

Mentioned barriers on the supply side are: fossil fuel prices (price development of other competing fuels. Currently they are at very low level), transportation distances (there is huge demand for wood chips in certain specific regions, increasing the transportation costs. Of course this increases fuel costs and makes bioenergy less competitive.), biofuel quality (how to guarantee better quality of wood chips. It is very important for the profitability of bioenergy use to have low moisture content of wood chips).

Germany:

Due to the tightening of the emission limits, a higher-quality packaging of the solid biofuel is required. For this purpose the supplier have to invest in costly aspiration and screening

technology, but, due to the current market situation, they have no financial resources to do so.

As the current National Forest Inventory shows, the increase in volume has continued in the recent years. Furthermore multiple studies have shown that a further expansion of energy recovery is possible without competition with food crops and for material use. Nevertheless another obstacle is the public debate about the sustainability of the use of solid biomass fuels.

High-quality fuels must be made available. Within the scope of collaborative projects standards should be developed, which ensure a constant quality and enables an emissions reduction. In addition fundamentals for future verification systems, e.g. certification schemes, will be developed based on a broad consensus of the key actors.

Greece:

Low penetration of biomass in DH.

The Netherlands:

The technical problems can be overcome, however it is a matter of money. A main problematic in the Netherlands, is that the feedstock is heterogeneous. This means the quality is not stable over the seasons and over the suppliers. Some suppliers/traders deliver less quality biomass. Many operators have different knowledge. Because of the differences in opinion, sometimes it can be a problem to have the right feedstock for the right installation, it would be ideal to use installations which can deal with a broad range of feedstock. However, this is not always the case. Providing feedstock for more limited/ specific installations (which is the case most of the times) makes the whole process more troublesome.

There can be problems related to the perception of biomass sustainability. The sustainability of biomass is many times criticized, many times the NGOs are very critical towards using biomass. The discussion is not always balanced in the favour of biomass, even though there are also good answers to the questions regarding the sustainability of biomass or its negative perception.

Poland:

The problem lies on both the supply and demand sides. On one hand demand is regulated by brokers and traders who win the tenders with low prices forcing manufacturers to set low prices for biomass which is often being produced below break-even point. If these manufacturers declare bankruptcy, national biomass production will decrease significantly and it may become necessary to import biomass from abroad.

To make biomass more competitive with other fuels it is important to introduce a carbon tax instead of introducing biofuel subsidies. People who use coal as a heat source should be charged with an additional cost such as additional financial fees. Doing so could stimulate a shift to biomass, increase the market for biomass and other renewables. Instead of supporting groups wishing to change the system, motivating everyone would be a better solution.

Another issue is insufficient social awareness of biomass as a fuel and lack of adequate information about local producers and possibilities of local biomass use.

Romania:

From the point of view of stakeholders representing the supply side, the following barriers are identified:

- the legislative framework that regulates the production of heat and electricity from renewables,
- low level of awareness of the general public, making them reluctant to embrace the new technologies,
- logistics: the concept of biomass transportation to the client in containers is not developed,
- the production and distribution of heat are separated.

Slovakia:

Technical and non- technical barriers on field of heat production from biomass were identified as follows:

Technical: Large scale gasification of Slovakia. People, especially customers, have a low awareness about technologies, they are interested only in price for heat, smell, noise.

Non-technical: Low awareness about environmental impacts, overlong legislative process for the commissioning of facility, weak financing options of project, cross-subsidization of gas prices, storage of biomass – higher security requirements, place.

Other barriers mentioned in interviews were availability of biomass in some regions (limited sources or long distance to sources), on small area concentrated higher DHS using of biomass and then the fuel need to be transporting from longer distances.

Ukraine:

Lack of suitable equipment for biomass harvesting/collecting/transporting. Undeveloped biomass market leads to a low demand for such kind of equipment. As time goes by, the situation could change to the better;

Transfer of best practices from developed countries is vital. Adopt successful experience to Ukrainian conditions will allow to avoid typical mistakes;

Low tariffs for heat energy from biomass. It leads to non competitiveness with heat from NG.

3.2.3 Policy stakeholders

Table below presents barriers mentioned by the policy stakeholders.

Table 9 Barriers mentioned by the policy stakeholders

Technical barriers	Non-technical barriers
Issues with space for biomass storage	High investment costs
Decreasing quality of existing biomass	Lack of interest from investors
	Lack of support system

Comparing barriers in all three groups of stakeholders there are four leading ones:

- ↳ various technical barriers,
- ↳ financial barriers,
- ↳ legislative issues,
- ↳ lack of information.

In countries where the supply market is mature (Figure 2), most of technical obstacles can be easily overcome, as the technical solutions exist and are being widely used. Most of the times it is the money that cause issues. The main problems are high investment and maintenance costs, high biomass price and lack of support systems.

Legislative issues usually come down to bureaucratic nonsense: any investment requires a lot of permissions before it can be built and that can discourage potential investors from developing the biomass market.

Low awareness about bioenergy in general can be noticed in most of the partner countries. Sometimes also old habits or convenience do not allow people to change their mind about biomass.

Austria:

Technical/organisational problems in the multi-storey building residential sector: availability of space for biomass storage, access to buildings by truck- Competition with wood-based industry, competition with other RES, high investment costs – increased competition with oil and gas, plant authorisation, complicated funding applying procedures and delayed transfer of investment subsidies.

Bulgaria:

From the point of view of policy makers and representatives of regional authorities, the main barriers are: lack of interest from the investors, lack of funds for the purchase of heating installation, instability of the regulatory framework, high cost of initial investment, corruption.

Croatia:

The policy makers agree on the necessity to develop a functional support (subsidy) system for use of biomass in heat only systems. Needs to better promote and raise general knowledge on the benefits of biomass use.

Finland:

Mentioned barrier on the supply side is mainly if policy measures are unpredictable and changing over time. Of course the low economical resources at government level can be seen a barrier, too.

Otherwise policy level barriers are not considered to slow the bioheat usage in Finland.

Germany:

High Investment costs lead to long pay back periods which are contrary companies' policy where planning are usually made on a maximum of 4 years. The only exceptions are family businesses that accept even longer planning horizons. This is problematic above all if the owner of the company is a foreign holding company.

The currently low prices for fossil fuels have a negative influence on the demand for bioenergy. Currently there are negative values the relatively low prices for fossil fuels for increased use of bioenergy.

Generally heating supply concepts based on bioenergy are much more expensive than those on fossil fuels. The mayor non-technical barrier is the high investment costs.

The acquisition of solid biofuels from neighbouring countries is doubtful with regard to sustainability issues. Furthermore the competition for wood will also increase in these countries. Moreover biomass should be primarily material used.

Greece:

- difficulty in pricing district heating,

- energy contracts (Difficulties in invoicing thermal energy, there is no price for thermal energy),
- lack of information.

The Netherlands:

As a technical barrier, there has to be enough space for the boiler house and biomass storage. For smaller installations there are no environmental or building permits problems, however for bigger installations there can be authorization problems (and this mainly concerning emissions).

As a non-technical barrier, emission standards in The Netherlands are strict. Costs for emissions measurements are high. Getting additional funds from the banks can also be a barrier. (This is necessary since the subsidies do not cover the whole investment.)

Poland:

The biggest non-technical barrier is the Polish mentality. It is difficult to change habits. Coal is the "national fuel", and has been used for decades. Because of its low price, coal is easily accessible and often chosen as a fuel in household heating. Poles do not have awareness of the consequences of burning coal, how it affects our health and our environment.

A further issue is biomass diversification. It must be decided how much biomass is to be allocated for energy purposes, whether agricultural land can be used for energy crop plantations and whether straw should to be combusted rather than given to animals as bedding.

There are additional legal and administrative barriers. Any investment requires a lot of permissions even before it starts. Poland has many protected areas where installation cannot be built.

Romania:

From the point of view of policy stakeholders, the following barriers are identified:

- not clear and coherent legislative framework,

- lack of information campaigns on the benefits of biomass and DH to the population,
- incoherent and lengthy authorization procedure.

The proposals are that the beneficiaries should get involved in the consultation process, there should be a single point of contact and improvement of the authorization steps.

Slovakia:

Identification of barriers from side of state and representatives from energy agency shows:

Technical barriers:

- high level of gasification in case of Slovakia is one from the most important barriers but with good policy and regulation framework together with rising of customers awareness about financial benefits could help with overcoming of this barrier,
- combustion of biomass fuels product emissions of solid pollutants (expensive technology meeting environmental requirements),
- storage areas (mostly for urban DHS and buildings).

Non-technical barriers:

- regulation on field of heat is not properly tightened, its high, and is space for improvement,
- poorly developed biomass market
- increasing price for biomass
- lower public awareness about financial benefits from local using of biomass

Ukraine:

The main barriers are:

- weak legislation. There is no strong lobby for biomass as a fuel for energy production;
- state policy and tax policy are not always consistent. For example, a couple of years ago there were introduced a number of tax privileges for producers/consumers of biomass and biofuels but last year they all were abolished;
- complicated licensing procedures;

- the procedure for tariffs fixing for heat energy is not correct. The tariff should contain production, transportation, and supply components. Now in most cases the tariff is cumulative.

3.3 Needs

Actions that are needed for a successful introduction of solid biomass in individual groups of stakeholders are presented below. It is worth noticing that either demand side, supply side and policy stakeholders share the same needs: one is a need of



financial aid, some support system that would help the stakeholders and investors to start switching to biomass heating systems. Second need and also possible role of B4B in development of biomass utilisation is a necessity of providing support through information campaigns and raising social awareness about bioenergy heating systems.

3.3.1 Demand side

Means/actions needed for a successful introduction of solid biomass fuels on the demand side:

- b* commitment from local authorities,
- b* governmental financial and legal support,
- b* introduction of new technologies for heating with biomass,
- b* communication between demand and supply side.

Austria:

Better and clearer information, as well as an easier management of the funding requests would help here. Success factors for the use of solid biomass fuels include support instruments, competitive energy costs, or support through the local administration in case of

decentralised district heating systems. There should be guaranteed security of supply and reliability as well as high flexibility and fast reaction times.

Bulgaria:

The actions suggested by stakeholders are: introduction of new technologies for heating with solid biomass fuels, reduction of environmental impact of GHG from heating, increasing energy efficiency.

Croatia:

There is a need of subsidy system implementation and more support from public administration. Also heating system planners should be educated about biomass heating systems.

Finland:

Industrial companies expect that investments in biofuels would be granted state subsidy. Similarly, the use of biofuels is expected to receive a tax relief for a long period of time, so that the confidence in fuel prices would remain.

Other factor needing improvement is the availability of training, information and guidance. Almost all the key actors would benefit of additional information. Together with training the co-operation between the actors should be promoted. It was noted that companies which had not used biofuels and lack of own experiences, the prejudices were higher than for the companies with experience, seeing the use of biofuels as a viable alternative. This would require also some marketing measures.

Germany:

There is a need for financial subsidies and the political will to realize more bioenergy projects in business sector. In order to develop bioenergy heat in swimming pool sector a better information campaign is needed. The frame conditions, which allow an economic operation of solid bioenergy plants, must be clarified. The quality of biofuels must increase. Furthermore there is a need for more stringent standards to guarantee a constant quality of the biofuel. Generally the plant operation is not service-intensive, unless fuel quality is sufficient. The parameters of the relevant standards are not defined clearly. Especially the

norm of the ash content is improvable. There are already strong differences with regard to binder and lignin content. A stronger cooperation of standardization institutes and boiler manufactures would be favourable.

Greece:

- security of supply,
- quality of solid biofuels,
- funding schemes on replacement of oil-heating systems,
- information on new energy conversion technologies.

The Netherlands:

To attract investors to use biomass, there is a need to secure the supply side. Also higher prices of fossil fuels and lower prices of biomass would be valuable. Subsidies would be helpful if they would also be more targeted at wood based small installations (< 500 kW).

Poland:

The biomass market needs to be supported financially so that it can develop and become more competitive. Both the producers and consumers need to be supported. It is essential to utilize biomass exactly where demand is the highest, so that it is not transported over long distances.

We should make biomass economically justified. Only local biomass resources should be used, so that fuel price can remain low. Subsidies for replacing old boilers or buying new ones are recommended.

To increase the interest in biomass burning installations the general population needs to be educated about the harmful substances emission from coal boilers and shown that biomass use can be profitable.

Romania:

The actions that are needed are:

- comprehensive legal provisions to develop the use of biomass,

- governmental and local support in the form of financial incentives, regulations and standards, voluntary agreements, subvention and support schemes, research programs and information instruments,
- investments in public infrastructure,
- motivation by the national authorities to the private sector to invest in the biomass sector.

Slovakia:

Questionnaires shows that in case of consumers, is not need to introduce a biomass like fuel for producing of heat, they know about the benefits from biomass heat. Projects for fuel switch from gas to biomass heating go through lot of reminders from side of people, mayors and other participating parties (they were asking for noise, smell, price, benefits), before operational phase. Mostly primary factor is price for heat produced from biomass. B4B could contribute or could help to rising of awareness about this kind of heat sources. Presentation on place was identified like good examples of communication strategy between project and interesting parties.

Ukraine:

Means/actions needed for a successful introduction of solid biomass fuels:

- introduction of financial incentives for consumers of biomass fuels or for producers of heat from biofuels;
- development of biomass fuels market;
- communication and interaction between biomass suppliers and consumers;
- availability of bank credits for implementing bioenergy projects under reasonable conditions.

3.3.2 Supply side

Means/actions needed for a successful introduction of solid biomass fuels on the supply side:

- there should be a clear law concerning biomass,

- ↳ introduction of working financial incentives for biomass producers,
- ↳ information campaigns, accurately edited for the various target markets.

Austria:

Existing eco-labels (e.g. for hotels etc.) could be supportive, if a certain share of RES has to be achieved, which is not the case yet. Marketing of eco-tourism including sustainable energy supply would also be a supportive measure if it is stressed more and positively. Such labelling would be supportive in other branches as well. People would be prepared to spend some more money for highly sustainable products. Communication channels need to be identified for campaigns and activities.

Perception of politicians is not oriented towards bioheat at all, currently, but towards green electricity (wind, solar, storages). This is something that should change. Satisfied customers and their experiences shall be highlighted before the curtain. Verbal propaganda within a certain branch is also a successful means of marketing.

Bulgaria:

According to the suppliers with solid biofuels the necessary actions are: financial incentives for encouraging people to install new high efficient biomass heating technologies and active intervention of the Ministry of Energetic and the Committee for Energy and Water regulation to improve energy efficiency

Croatia:

Better logistics. More involvement of private forest owners.

Finland:

Needs on biomass supply side are:

- heat entrepreneurs with good know how on the business are quite rare and their skills vary significantly;
- there should be more wood chip terminals, in order to achieve better quality and also certainty for delivery in the long run;
- well-functioning, reliable local wood chip market for security of supply;

- big enough own storage in the plant to have buffer against unexpected situations. Flexibility and certainty;
- technological development can still improve the competitiveness of bioenergy, therefore it needs resources also in the future.

Germany:

A more intensive promotion of local and micro heat pipes including buffer storage is needed. Information campaigns of independent third parties with regional players, who do not pursue own economic aims.

During the constructing planning and the revising of heat supply concepts, the use of biomass has to be considered much more in the future. This should be ensured by appropriate regulations. There are plenty of sophisticated biomass heating plants available on the market, so that tailor-made solutions can be realized. Priority should be given to renewable energies when designing thermal solutions.

Generally with respect to aspects of climate protection resources from domestic sources should be preferred. This goal is not consequently supported by policy (e.g. the certification is insufficient). There is a need for more precise requirements respectively a prioritization of the concerning issues.

Greece:

- new biomass resources to meet increased demand for solid biofuels ,
- cooperation with service providers.

The Netherlands:

Firstly, a stable, constant policy is needed both at EU and national level. This policy needs to stress the need to change from fossil fuels to biomass. A supporting policy therefore, would favour a climate for investment, not only for big installations, such as coal plants, but also for smaller levels/ installations. A stable policy would also translate into a more stable, increasing demand, which is another important factor for building up a successful biomass supply chain.

The issue concerning the demand side is important. The biomass must be supplied as local as possible, keep the lines short with good logistics. If your customer is unreachable by truck or boat for the biomass delivery, it will fail.

Poland:

Client interest will be high if they are to gain profits. Decreasing the purchase tax on pellets and other fuels could be a good solution which would help lower fuel prices. Different types of subsidies (for new boilers, for fuel) can make biomass more attractive. Increased production of pellets and briquettes may lower final price, but there must be enough consumers to buy the surplus.

The legal framework must stabilize. Proper conditions for biomass development should be provided. The biomass market is going to evolve freely when regulation is stable and competitiveness is high.

The right financial conditions must be created, so that more biomass is sold as fuel. Low quality pellets should be used by large industrial heating plants and higher quality fuel should be used by smaller consumers.

Romania:

The actions that are needed are:

- the local authorities should become more influential and more aware of the opportunity represented by the use of biomass,
- clear rules for the production of renewable energy (especially regarding green certificates, financing and incentives),
- creation of agricultural exploitations of a larger size, so as to allow the creation of an integrated chain,
- the application of the Biomass Law to regulate assortments, calorific value, etc.

Slovakia:

Side of supply is, and was still on the market, changes occurred only on demand side (end customers). In all cases the end price need to be acceptable for all parties, environmental acceptable (elimination of noise, dustiness, traffic load and etc.). Biomass is known and demand for biomass is rising up regarding with financial savings from changing of fuel base.

Suppliers see the support of this project on field of rising of awareness in introduction of new technologies on biofuel base. Communication between stakeholders from supply side is working on base of workshops, conferences, projects, etc. The regular contributions in regular conferences, newsletters, mapping of actual situation on market are considered like very good tool and could help in development of biomass utilization.

Ukraine:

Means/actions needed for a successful introduction of solid biomass fuels.

- introduction of financial incentives for producers of biomass fuels;
- development of biomass fuels market;
- communication and interaction between biomass suppliers and consumers;

3.3.3 Policy stakeholders

Means/actions needed for a successful introduction of solid biomass fuels to policy stakeholders:

- ↳ improvement of already existing legislative framework,
- ↳ activation of decision makers at local level,
- ↳ conduction of information campaigns.

Austria:

What is needed is support for plants in rural areas. There, the usage of biomass makes sense as there are low costs of logistics and the value creation chain remains in close range. Furthermore, a support of small plants makes more sense as there are more technical challenges the bigger a plant gets.

Fair and transparent heat supply contracts must be used - better usage of model contracts needed, professional installation of plants.

The subsidy schemes developed for bioheat have to be maintained as long as external cost of fossil and nuclear energy is not taken account for. Investment subsidies are a good instrument to lower high upfront cost of bioheat.

Bulgaria:

According to the opinion of this category of stakeholders, following actions are needed: better information of society about the advances of solid biofuels for heating, assuring better price of solid biofuels than those of fossil ones, assuring independence from traditional suppliers, financial and regulatory support from the state and control of solid biomass fuel quality.

Croatia:

Introduction of a support system, regulation for SRC plantations at national level, information campaigns.

Finland:

Policy level needs relate to secure the conditions favourable and stable for bioenergy. The role of policy makers is not decisive, usually market forces decide the (cost) optimal methods and energy sources. The concern is that new EU-directives (e.g. CAFÉ) could have a negative effect on bioheating.

Also among policy makers, more information is needed e.g. on how bioenergy is produced and what are the related costs. There are also plenty of experienced policy makers who have a good view about the necessary measures, but may have limited resources to implement them.

EU and state funded development projects are important way to increase the use of bioenergy. They have had a huge impact regionally and will be needed in the future, too.

Germany:

A key criterion is that the fuel is available in sufficient quantity and quality. In particular, for operators who require large amounts of fuels, safe, long-term supply is required. The decisive factor is a reliable supply of raw materials. Here it is necessary to establish more professional structures on the supply side, to be able to access the existing potential of solid biomass and to deliver the fuel in the desirable quality.

In addition, a reliable technology is required. Here's the problem, that the offered technology in the power range 100-500 kW need a constant fuel quality. But this cannot always be guaranteed. Consequence is that it always comes back to system failures, and thus the efficiency of the plant can no longer be ensured.

Where possible, the heat generation from biomass should be performed in combination with other renewable Energies (such as solarthermics).

Greece:

- exploitation of the thermal energy produced by cogeneration,
- production licence for thermal energy by the relevant Ministry,
- improvement of the legislative framework for district heating,
- regulation for thermal energy sale,
- licensing for district heating (low disturbance).

The Netherlands:

It would be helpful if the investors were helped with more knowledge. In this sense, the authorities should share more knowledge and should raise more awareness. It is important to minimize the fear about the costs and risks of biomass plants, by giving all the necessary knowledge to make the decision.

Also an important factor is social support/acceptance, it's important that in an early stage residents, people living in the neighbourhood, are informed and involved in the plans. Inconvenience for residents from biomass plants must be kept to a minimum, relevant issues are possible odour nuisance, transport movements etc.

Permit procedures have to be short in time and as easy as possible for project developers. Quite a lot of project are now under the Activities Decree, which simplifies and speeds up the

procedures for a permit/license. Some types of biomass are not under the Activities decree, like straw and grasses from roadsides. This hinders the grant for a permit.

Poland:

Policy level needs relate to secure the conditions favourable and stable for bioenergy. The role of policy makers is not decisive, usually market forces decide the (cost) optimal methods and energy sources.

Romania:

The actions that are needed are:

- coherent legislative framework dedicated to biomass, including secondary legislation, subvention schemes specific to the production of heat. This legislation will also create the necessary conditions for the banks to invest in biomass projects;
- identification of financing options for investments;
- activation of decision makers at local level;
- networking with the representatives of the governmental authorities;
- set up of simple steps and use of the best practice examples in the field of other Member States;
- stimulation of the private investors to make investments in the sector;
- conduction of information campaigns.

Slovakia:

Creation of policies is a hard long process, which need assistance of all market actors to meet the needs of all stakeholders. Assistance of all actors is necessary to help with identification of barriers, technical standards for fuel quality of biomass, technical issues and etc. Stability of market is defined by healthy investment and financial environment, regulation and subsidies. According to legislation we now prioritized the big sources (DHS) for production of heat and with this decision we limited creation of new small sources. Set of average price on defined territory created a question: gas or biomass. We need to limited building of new sources in industry on base of gas but make attractive consumption of heat from biomass. In this time the combustion of fossil fuel is limited and the future of biomass is not clear (according to emission of solid pollutants and very expensive technologies to flue cleaning).

Ukraine:

Means/actions needed for a successful introduction of solid biomass fuels:

- improvement of existing legislation in bioenergy area;
- transfer of know-how and knowledge from the more experienced countries, sharing best practices with the less experienced countries;

4. Conclusion and recommendations

The Partners were asked to give their suggestions and recommendations regarding overcoming barriers. The barriers concern every group of stakeholders (demand side, supply side and policy stakeholders), and despite different ways of perceiving biomass by them the barriers are in fact very similar if not common. While these are not all the barriers which hinder the growth of the biomass for energy purposes market, the ones identified are the most important and most frequently mentioned, with recommendations required:

- a coherent and clear legislative framework is needed, as well as subvention schemes focusing on the production of heat and not on both heat and electricity,
- financial incentives and support systems that favour using new technologies should be in place: this recommendation refers not only to governments and potential investors, but also to banks (so that they realize that biomass projects are not risky and can be profitable),
- it is essential to strengthen the cooperation and communication between all important actors in biomass sector; transformation of the heating sector requires both a further technology development through increased research and development efforts as well as market-integration aids,
- the most frequently mentioned suggestion was to increase the awareness of the authorities and potential stakeholders about biomass heating systems through information campaigns, training programs and workshops.

Possible role of B4B in development of biomass utilization

As a part of WP4 every partner had to organise a national stakeholder workshop. The objective of the workshops was a national level discussion on barriers, opportunities and needs of the biomass heating sector. In every country the achieved results were positive and the general perception of the B4B project by stakeholders was satisfactory. B4B can play a role in development of biomass utilisation by, for example:

- ♣ providing support through sharing information, wide information campaign, encouraging people to take part in training activities,
- ♣ providing training, information and guidance if needed,
- ♣ raising awareness of every kind of stakeholder,
- ♣ transfer of know-how from the more experienced countries, sharing best practices with less advanced countries.

→ **CROATIA** says...

Main role of b4b project could be sharing more information about biomass usage benefits and especially best practice examples from other countries with more relevant experience.

Every country has claimed that they should offer more workshops and seminars while trying to attract even more stakeholders from different groups.

