Abstract: This paper presents energy potential of biomass in the region of Vojvodina. This part of Serbia is characterized by intensive crop farming and constant activities in fruit growing, viticulture and forestry. These are key regional resources for the creation of biomass.

Due to unsatisfactory level of utilizing this potential, barriers have been researched and presented relevant to the use of biomass. Activities are proposed for both the state and local level which will help that the use of biomass for energy purposes in Vojvodina gets the position it really deserves at the present time.

Key Words: Biomass in Vojvodina / potential / barriers

1. INTRODUCTION

With reference to its type, structure and quantities, biomass is almost as a rule a standard characteristic of some region. Its creation and growth are cyclic. These time cycles depend on the type of biomass and they are affected by numerous factors. The most important factor is the very type of biomass which is conditioned by geographic position, configuration and structure of soil, climatic conditions, existence of productive activities in the region, customs of local population, etc.

Generally speaking, biomass is combustible. As such and due to its energy values, it is considered to be the fuel. Therefore, it is usable for meeting final energy demand. The simplest use of biomass is directly by burning it in devices for transforming chemical energy of fuel into heat energy or indirectly as a raw material for the production of biogas. This depends on the composition of biomass and on moisture content.

2. PLACE AND ROLE OF BIOMASS IN ENERGY BALANCES

Because of all above stated, biomass has a real possibility for extensive application in the energy sector. This is the reason why this energy potential deserves proper attention in structuring regional energy balances. There is a general trend to maximize the share of renewable energy sources. This would also directly affect energy balance of a country. Unfortunately, the utilization of this potential varies greatly depending on the region. It varies even in regions with comparable types of biomass and other general similarities.

The progressive part of the mankind makes great efforts in order to put biomass as energy source at the deserved position because this will resolve two problems at the same time. Firstly, the exploitation lifetime of existing reserves of fossil fuels will be extended and secondly, the effects onto existing natural balance will be reduced. In this, equally important is the reduction of burnt fossil fuels for meeting final energy demand and the decrease of gas emissions. These gases create green house effects and lead to the degradation of existing climate equilibrium. Also, they affect every other equilibrium in the nature.

Before detail consideration of massive utilization of biomass in Vojvodina, it will be useful to analyze some energy indicators. Here is the comparison of some compound indicators for Serbia and Denmark. The Figures 1 and 2 show basic compound indicators for Serbia and Denmark in the period from 2001 to 2008. In order to provide as realistic comparison as possible, physical indicators are taken into account. There are no particular data for Vojvodina, and because of that data for Serbia are used. Denmark is a good example for comparison since it uses renewable energy sources, especially biomass, a lot. Elementary facts for the observed period in Serbia and Denmark are as follows:

<table>
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<tr>
<th>SERBIA</th>
<th>DENMARK</th>
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<td>• Mild fall of population</td>
<td>• Slowdown of economic growth</td>
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<td>• Slowdown of economic growth</td>
<td>- Significant growth of primary energy consumption per capita</td>
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<td>• Significant growth of electrical energy consumption per capita</td>
<td>• Significant growth of carbon dioxide emissions per capita</td>
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makes approximately 60% of overall potential of renewable energy sources (not counting solar energy) and therefore, its full deployment is very important for the Province of Vojvodina.

If we take into account the fact that this potential is fairly stable at the annual level, there are no doubts that it should have permanent position in the energy balance of Vojvodina. According to [2], the share of all renewable energy sources in the energy balance of Vojvodina is around 2.7% in meeting final energy demand in the region. Presently, such a low percentage of biomass utilization is unacceptable in particular with reference to trends of biomass utilization especially in the EU.

4. BARRIERS FOR UTILIZATION OF BIOMASS

Generally speaking, the use of biomass for energy purposes is faced with a series of principal barriers. Junginger [8] has classified them into the following categories: economic, technical, logistic, trade, ecological, social, competition with other possible uses, methodological, legal and information ones.

Barriers for applying biomass at the territory of Vojvodina have been investigated [3]. These barriers concern all typical organizational, strategic, political, regulatory, technical, financial, market, social and other dimensions. There is also a series of local conditions which have adverse effects onto higher application and presence of biomass in the energy balance of the region.

The barriers for biomass utilization in energy purposes of Vojvodina have been established in direct discussions conducted all over Vojvodina with 185 representatives, local stakeholders in businesses with and related to biomass including the following:

- Production of raw biomass,
- Processing of biomass into forms suitable for energy purposes,
- Production of equipment for biomass processing into forms suitable for energy purposes and
- Production of equipment for utilization of biomass for energy purposes
- Potential beneficiaries of biomass for energy purposes.

Tracing solutions for the removal of existing barriers can be expressed in the following groups of activities:

1. **Technical group** of barriers is reflected in the inaccessibility of technical solutions at the broad level of potential users for the simplest energy efficient uses in rural communities. At the same time, large users from industry, small and medium size enterprises, heating plants and others are faced with the impossibility to commonly use biomass and other fuels. Reasons for that are problems arising from corroded burners and aggravated conditions for heat exchange caused by ash deposits at exchange surfaces. This requires the change of existing boilers and current concept in energy plants.

   It will be especially useful to have a neutral, professional coordination body which will primarily provide technical support to potential users of biomass.

2. **Strategic group** of barriers is caused by unclear government’s strategy and vision for biomass utilization, unelaborated long term strategy and non-existence of action plans for that. Apart from the government’s one,
there are neither regional nor local strategies. Clearer regional strategy can also determine national objectives and priorities. Local authorities have different experiences which do not need to be generally acceptable.

The chain for removing waste biomass from agriculture, forestry, municipal activities and other sources of biomass wastes and their satisfactory manner of destruction should have systemic support, long term development infrastructure, planned and long term investments in the regional strategy.

3. Economic-financial group is reflected in the lack of incentives. This equally relates to investments and price of biofuels. Almost the whole territory of Vojvodina has been covered by gas network. The high price of biomass equipment in relation to natural gas equipment indicates that investment support is necessary. Financing new technologies is economically very difficult. Generally, the role of banks is not sufficiently stimulating. The market price of biofuels should be stimulating and competitive in relation to conventional fuels. These mechanisms have not been elaborated.

4. Political group of barriers is reflected the most in the conflict between declarative policy and practical activities in implementation. This brings in worries and frustration among parties interested for biomass utilization. In addition, the planning policy does not contain motivation instruments for opting towards biomass utilization.

5. Regulatory group consists of incomplete regulations which bring in unclearness and difficulties for implementation.

6. Insufficiently developed awareness about the importance of biomass utilization for energy purposes is recognized as a high risk for developers, architects and engineers of biomass utilization for energy purposes. The lack of experience in and skills for installation, exploitation and maintenance of biomass systems and equipment makes biomass utilization even more difficult.

5. SOCIAL BENEFITS FROM BIOMASS UTILIZATION FOR ENERGY PURPOSES AND THE ROLE OF THE STATE

The key reason for biomass utilization lays in the fossil fuel potential, growth of population number in the world and growth of standard of living. It is sure that biomass cannot be expected to resolve growing energy demand in the world but it is also certain that it is one of many possibilities for resolving these problems. In addition, locally and in the short run it can bring social benefits which are very important for every economy and thus for the economy of Vojvodina.

Social benefit arising from the utilization of biomass for energy purposes in Vojvodina has also been researched. This benefit is manifold and various. It has not only its energy, economic, ecological, development, and social dimension but also local, regional, national and global dimension.

In all of this, the state should play a key role. At the beginning of development and during intensified application, this leadership role is indispensable. This role will lose its importance with the development of the system since mechanisms established during time will further on set up conditions in which stakeholders will permanently achieve their interests. This will lead to further intensification of biomass utilization.

In the period 2006 – 2010, the Provincial government invested in the development of 6 groups of technologies (see Figure 3). Among them, the category of renewable energy sources also includes 9 plants for biomass utilization for energy purposes. Some € 7.7 million have been invested in these plants. The total number of directly employed in these activities is 193, and of indirectly employed ones on the basis of cooperation is 1310 workers.

![Fig. 3. Illustration of the Allocation per Municipalities and Number of Plants by Areas in AP Vojvodina [9]](image)

The important characteristic of investments in the biomass utilization for energy purposes is that in this group a job is the cheapest not only in relation to other 5 groups but also in relation to all other stimulated branches of economy in the Province of Vojvodina in the previous five year cycle. The average cost of a job in the area of biomass processing is around 30,000 €. At the same time, job demand is naturally created in rural communities and structures in line with locally available qualification and social structure of the population. Such projects reduce intensive outflow of population towards larger cities, support the development of small local communities and family business.

These are important facts for stimulation employment and therefore, the Government of the Province of Vojvodina pays full attention to the planned investment into this field.

The investment in energy equipment for utilization of biomass for heat purposes is (80 – 160) €/kW. At the same time, for biogas, it is around 2500 €/kW or for municipal wastes, around 1000 €/kW [10]. Projects for utilizing biomass for energy purposes by direct fulfillment of heat requirements are therefore, a realistic option with the highest chance for the existing potential to be deployed in full capacity as soon as possible.

Due to all above stated, activities aimed at biomass market development [3] have been intensified and accompanied by the full planned support of the Government of the Province of Vojvodina.

6. RECOMMENDATIONS AND CONCLUSIONS

More efficient implementation and intensification of biomass application for energy purposes requires
concrete and stimulating role of authorities at all levels. The development of biomass market is a necessary measure and basic precondition for investments in this area. The efficient development of biomass market is possible by means of employing the existing infrastructure of regional chambers of commerce and local self-governances with a comprehensive support provided from one centre in Vojvodina. In order to achieve that, it is necessary to prepare and Action Plan for the implementation of conditions and establishment of the biomass stock exchange. The Action Plan should list all future activities in particular: standardization of biomass quality for energy purposes, control and verification of products quality, role and conditions which should be fulfilled by all stakeholders, educational and promotional activities, etc.

7. ACKNOWLEDGEMENT

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8. REFERENCES