



# **E**nvironmental Technologies & Renewable Energies in the Balkan Area

Analysis of the  
Environmental Technologies and Renewable Energy Sector  
in the Balkan area



*Ministero dello Sviluppo Economico*





**REPORT ON THE ANALYSIS OF ENVIRONMENTAL  
TECHNOLOGIES AND RENEWABLE ENERGY SOURCES IN  
BOSNIA AND HERZEGOVINA**

Bosnia and Herzegovina, June 2012

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## SUMMARY

Report on the Analysis of Environmental Technologies and Renewable Energy Sources in Bosnia and Herzegovina was produced as part of the project "Environmental Technologies and Renewable Energy Sources in the Balkans." The Project was funded by the Italian Ministry of Economic Development under the Italian Law no. 84/2001 - Funds, and its implementation commenced in January 2012, with the planned duration of 24 months.

The Report lays out quantitative and qualitative data in the area of environment protection and renewable energy sources, current trends, regulations and legislation, key issues and problems, current and potential applications, statistical and macro-economic data, potential impact at referenced markets (EU primarily), policies of local governments and institutions, as well as contact details of relevant actors in Bosnia and Herzegovina with the focus on the territory of central and North-East BiH.

**Key words:** Environmental Technologies, Renewable Energy Sources, Central BiH, North-East BiH, NERDA, REZ

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## LIST OF ABBREVIATIONS

<b>BAM</b>	Bosnian currency Convertible Mark. 1 BAM = 0,51 EUR
<b>GDP</b>	Gross Domestic Product (macroeconomic indicator that shows the value of final goods and services produced in the country during a given year, expressed in monetary units)
<b>BiH</b>	Bosnia and Herzegovina
<b>EP BiH</b>	Public Enterprise “Elektroprivreda Bosne i Hercegovine”
<b>EP HZHB</b>	Public Enterprise “Elektroprivreda Hrvatske Zajednice Herceg Bosna”
<b>EUR</b>	Euro – official EU currency. 1 EUR = 1,96 BAM
<b>FBiH</b>	Federation of Bosnia and Herzegovina
<b>FWMP</b>	Federal Waste Management Plan
<b>SME</b>	Small and medium enterprises
<b>MtOE</b>	Million Tonnes of Oil Equivalent: 1 tOE: unit of energy and represents the amount of energy that is released by burning one tonne of crude oil, approximately 42 GJ
<b>MW<sub>th</sub></b>	MW of thermal energy
<b>NEAP</b>	National Environmental Action Plan
<b>Nm<sup>3</sup></b>	Normal cubic meter
<b>RS</b>	Republika Srpska
<b>USAID</b>	United States Agency for International Development



## **1. INTRODUCTION**

Report on the Analysis of Environmental Technologies and Renewable Energy Sources in Bosnia and Herzegovina was produced as part of the project "Environmental Technologies and Renewable Energy Sources in the Balkans." The Project was funded by the Italian Ministry of Economic Development under the Italian Law no. 84/2001 - Funds, and its implementation commenced in January 2012, with the planned duration of 24 months.

The Project is realized by the member of Enterprise Europe Network - Metropoli (Special Agency of the Florence Chamber of Commerce, Italy) in partnership with agencies: Aries (Special Agency of the Trieste Chamber of Commerce, Italy), Promos (Special Agency of the Milan Chamber of Commerce, Italy), Regional Development Agency for Central BiH Region - REZ Agency, Regional Development Agency for North-East BiH - NERDA Agency, Serbia Chamber of Commerce, Montenegro Chamber of Commerce, and Macedonia Chamber of Commerce.

The main objective of the project is to contribute to the process of economic development in Bosnia and Herzegovina, Serbia, Montenegro and Macedonia through a set of targeted actions in the area of environment protection, promotion of European standards and legislation related to environment, promotion of advanced technologies in this area, as well as improvement of economic cooperation between Italy and the Balkan countries.

The Project design included the activity of situational analysis in the area of environment protection and renewable energy sources for each of the countries participating in the project. It is also planned to organize bilateral meetings of Italian and Balkan countries' companies with the purpose of business cooperation, as well as info days and seminars dedicated to EU Legislation related to environment and renewable energy sources.

The subject of this Report's analysis was Bosnia and Herzegovina, with the focus on territories of North-East and Central Bosnia and Herzegovina in which NERDA and REZ agencies operate.

### **1.1. Bosnia and Herzegovina**

Bosnia and Herzegovina is located in South-East of Europe and central part of the Balkan Peninsula. Its total size is 51.129 km<sup>2</sup>. Bosnia and Herzegovina borders Croatia, Serbia, and Montenegro. According to the UNHCR estimates for 1999, the total number of population in Bosnia and Herzegovina was around 3.894.000. Out of this 2.381.496 (61%) inhabitants live in the Federation of BiH, 1.432.020 (37%) in Republika Srpska, and 80.324 (2%) live in Brčko District. According to the 1991 Census, density of population in

Bosnia and Herzegovina is uneven and ranges from 40 to 200 inhabitants per km<sup>2</sup> in some parts of the country.

## **1.2. Macro-Economic Indicators**

In 1990 GDP in Bosnia and Herzegovina was estimated to US\$ 10,6 billion or US\$ 2.400 per capita. Income were generated from various industries, while basic industry was among the most developed in the region, with highly educated workforce and high share of export to western markets. (Environmental Performance Reviews, UNECE, 2004). The 1992-1995 War devastated the country and held back the economy. With the signing of the Dayton Peace Accords the recovery started and in the period 1996-2001 the country registered a 25% annual economic growth. Post-war recovery in this period was supported by numerous donor programmes. The structure of economy was largely changed from predominantly industrial to service-oriented economy.

In 2002 GDP reached almost a half of the pre-war level. The transition process, which is in the middle of privatization of public enterprises, has the key influence on the change of structure of economy.

## **1.3. Strategic Documents**

Indicator of new social trends, which include simultaneous dealing with both social care issues and care for the environment, is the development of strategic documents. The leading document adopted by both entities and Brčko District is the BiH National Environment Action Plan (NEAP, 2003, National Environmental Action Plan). NEAP identifies problems, pressures and the need to harmonize the care for environment and economic development. According to NEAP, economic development with environment friendly strategy is the priority. NEAP BiH identified short-term and long-term priority activities as well as creation of foundation for development of long-term environment protection strategy in line with industrial and economic development of Bosnia and Herzegovina and in harmony with its social-political structure. The intention of NEAP is to define joint environment protection policies in the context of macro-economic reforms, struggle against poverty and transition process.

## 2. THE ROLE AND IMPORTANCE OF ENVIRONMENT PROTECTION SECTOR AND RENEWABLE ENERGY SOURCES SECTOR IN BIH

In this moment it is hard to discuss environment protection sector and renewable energy sources sector in BiH as separate sectors, however, their nature in itself is cross-sectoral and their role is to enhance and precisely direct the actions of other well-developed sectors. Apart from the sector of energy, is naturally interwoven with the need to actively protect the environment and the need to increase the share of energy from renewable sources. These sectors include the sectors, that based on the Draft BiH Export Strategy 2012-2015<sup>1</sup> developed by BiH Export Council in November 2011, were selected for detailed analysis on the basis of potential growth and their importance for the BiH economy and future export growth:

1. Wood Sector
2. Agriculture and Food Sector
3. Metal Sector
4. Civil Works/Construction Sector
5. Tourism

### 2.1. Wood Sector

Wood Sector is one of the three sectors that have positive balance of trade. Its share in the total export is 11,16%, or in absolute terms the wood sector export in 2010 was 813.946,335 BAM, out of 7,3 billion BAM of total export.

The Sector is comprised of several sub-sectors: wood and wood-products (lumber, veneer, boards, joinery, floors and parquets, wooden packaging), furniture, and prefabricated wooden construction. The highest share in export is registered in export of seats (6,20%), while lumber and furniture make for the remaining 5% in approximately same percentage. The following table shows the main indicators of size and relevance of the sector in reference to the export scope.

Table 1. *Overview of Wood Sector Indicators*

Share in GDP	3,08%
Share in Export	11,16%
No. of active companies	1.642
No. of employees	35.975

Despite a satisfying level of export, this sector is faced with many challenges but also with many opportunities to become more profitable and transform into highly competitive regional industry.

## 2.2. Agriculture and Food Sector

Although it does not represent a traditionally important driving force of BiH, this sector had a high share in GDP, solid share in BiH export, but also a high trade deficit. Coverage of export by import is only 22,86%. Absolute value of export in this sector amounted to 564 mil. BAM, while import was 2,46 billion BAM. Still, this industry has potential for export of specialized products for market niches. It is possible to form several clusters in this sector which is characterized by large number of sub-sectors, to include fruits and vegetables, meat and meat products, milk and milk products, fish, honey and herbs, alcohol and non-alcohol beverages.

Subsectors of milk and milk products and meat and meat products are currently not ready to fully comply with the EU market standards related to product safety. These products are mainly exported to the CEFTA countries and to some specialized market segments in countries with large number of BiH immigrants. However, many products, to include fish, fruits, vegetables, herbs (and honey – depending on the FVO Mission) can be exported to EU and other markets. During the consultations process, few potential opportunities for creation of clusters have been identified, including fruits and vegetables processed fruits and vegetables for end-users, honey and herbs, alcohol and non-alcohol beverages, fish and industrial plants. All of them have export potential but require development assistance in all aspects (management, cooperation, quality infrastructure, increase of production effectiveness, zoning, etc.).

Table 2. *Overview of Agriculture and Food Sector Indicators*

Share in GDP	11,10%
Share in Export	7,36%
No. of companies	1.793
No. of employees	27.952

## 2.3. Metal Sector

Metal Sector includes metals and minerals, metal products (pipes, profiles and other products), equipment and machinery, and automotive industry. Besides the wood sector, this sector is the only production-based sector that has positive balance of trade. At present this sector is the biggest exporting sector in BiH. Basic metals, such as aluminium and steel are leaders in export, along with automotive industry that has continuous growth trend, while metal products have large potential but require support in activities related to innovation and promotion. The sub-sector of machinery production

lags behind the previous three and requires development assistance in restructuring of its business operations as well as substantial investment in modern technologies and licenses. The overall export of this sector in 2010 was 3,2 billion BAM (1.6 billion EUR) which makes for the 43% of total BiH export.

However, small share in GDP clearly shows that the level of added value in this sector is low which indicates the need for innovations and integration of value chain. In order to reach the growth of value it requires investment through either loans or direct investment (both foreign and domestic).

Table 3. *Overview of Metal Sector Indicators*

Share in GDP	4,24%
Share in Export of Goods	43,47%
No. of companies	1.138
No. of employees	33.926

## 2.4. Civil Works/Construction Sector

Civil Works/Construction sector is comprised of a unique combination of products and services. It can be observed through several sets of products: construction products and elements, preparation of construction sites, construction of buildings, plants, and professional services such as project design and consulting. This classification is based on NACE 1,1 Classification.

However, specifically important for BiH are construction materials, construction works and professional services for construction of buildings and civil engineering. Over the course of few past years the civil works sector as a whole suffered great turmoil due to global economic and financial crisis. There are insufficient official data to support the export of construction operations or professional services. The following table shows value of this sector's products, including plastic masses used as construction material.

Table 4. *Overview of Construction Sector Indicators, including plastic materials*

Share in GDP	10,19%
Share in Export of Goods	6,07%
No. of companies	3.975
No. of employees	46.235

## 2.5. Tourism Sector

Tourism sector interferes with many other service providing sectors and production-based industries, such as food industry, construction and financial services. The success of this sector is closely linked to the image of the country, its political and economic stability, as well as the quality of its transport infrastructure (airports, roads, railroads) and ICT-based services (booking, hosting, payment, information). Tourism sector depends on people from any county but it also affects them, too. However, it is not questionable that BiH has

significant natural heritage as well as cultural, historic and religious destinations that foreign tourists find attractive. Most guests still come from the neighbouring countries, that is, from the first ring of countries that understand Bosnia and Herzegovina and have more information than tourists from other parts of the world.

This in itself indicates that promotion is one of the downsides of the tourism sectors and that information are not reaching the audience. Also the audience is not targeted while the budget for promotion is unknown. Verbal recommendations and Diaspora together with occasional groups of tourists in quest for adventure are still reaching BiH. Many come to one- or two-day visits that are organized as parts of overall travel offers in the neighbourhood (for instance from the Croatian Coast to Mostar, Sarajevo, Međugorje).

This sector requires a lot, but on the long run it can also contribute to job creation and promotion of BiH product. Main indicators for this sector are laid out in the following table, but the reliability of the data is not certain due to the fact that the current statistical system does not offer comprehensive and accurate data for this rather complex sector. Therefore it is possible that the real income generated in this sector is larger.

Table 5. *Overview of Tourism Sector Indicators*

Share in GDP	2,47%
Share in Export of Services	1 billion BAM in 2009
No. of companies	1.078
No. of employees	32.458



### 3. ECONOMIC/STATISTICAL DATA

In BiH structure of overall consumption of energy, coal is the most used with 45,3%, then liquid fuels with 21,0% and wood mass with 20,5%. Other forms of energy (hydro power, natural gas, and imported electrical power) take 13,1% of the overall consumption.

Coal represents the foundation for the future development of energy sector, and its exploitation reserves are estimated to 2,8 billion tons, balance reserve to 3,8 billion tons and geological reserves to 8,5 billion tons.

Estimated reserves of oil fields, mainly in NE BiH, are around 50 million tons, while in reference to the use of wind power (estimate of up to 1.000 MW) and biomass (up to 0,79 MtOE) only the preliminary analyses of limited reach have been elaborated.

Bosnia and Herzegovina does not have significant production of power from renewable sources, apart from small hydro power plants of the total installed power of 37,7 MW, out of which 23,7 MW in the Federation of BiH and 14 MW in Republika Srpska, and more isolated installations of local importance and small capacity. In addition to that, in March 2012 the first solar power plant in BiH was opened in Kalesija with the power of 130 kWh. At present there is one photo-voltaic system of 3,9 kW installed at the roof of Centre for Children with Special Needs „Los Rosales“ in Mostar, while many similar projects are in the phase of obtaining necessary permits and concluding concession contracts.

BiH has valuable bio-mass potential given the fact that around 50% of the BiH territory is covered in woods, but the biomass generated from agriculture production should also be noted as its potential and availability are still to be identified and defined. Some analyses (for instance<sup>2</sup> and<sup>3</sup>) have been done several years ago. It is worth noting here that consumption of bio-mass though exploitation of forests cannot be *a priori* referred to as renewable energy source unless it is consistent with the sustainable forests management system, given the fact that inadequate system of adequate and efficient forest planning and management can lead to deforestation.

Potentials of residual wood and wood waste are unused and are estimated to 1 mil. m<sup>3</sup>, which could ensure thermal energy for 130.000 households or 300.00 inhabitants. Waste from wood industry is less than 50% used and so far we only have one furniture producer who built a power plant so as to use the wood waste<sup>4</sup>.

Annual consumption of firewood in BiH is estimated to 1,5 million tons and having in mind previous observations it cannot be referred to as a renewable source in itself because there are no data on control of this source's sustainability.

With 1.240 kWh/m<sup>2</sup>/of solar radiation per year in North and 1.600 kWh/m<sup>2</sup>/per year in South, conditions for consumption of solar power in BiH are rather favourable. Annual average of daily solar radiation ranges between 3,4–4,4 kWh/m<sup>2</sup>.

According to survey (EVD, 2009), solar power potentials in BiH are 70,5 mil. GWh per year. It is interesting to note that according to the estimates of ITM Controls which installed one 3,9 kW photo-voltaic system in Mostar, by installing photo-voltaic systems on top of roofs of Sarajevo buildings 26 MWh of electrical power could be produced.

Total possible installed capacity of geo-thermal sources from 28 sites at which, according to the set criteria, thermal power exploitation is possible in federation of BiH, amounts to 7,15 MW<sub>th</sub>, if observed only for the purpose of space heating (lowering the temperature up to 50°C), that is, 57,08 MW<sub>th</sub>, if geo-thermal power is observed for heating and recreation and balneological needs (bath) (lowering the temperature up to 20°C). With the use of all of the mentioned sources and with the usage factor of 0,5 it is possible to produce 112,77 TJ of energy in one year only for space heating, that is, 899,75 TJ of energy for both space heating and bath.

Research and consumption of geo-thermal water is somewhat more intense in the Balkans, while in our country only recently people started paying more attention to it, although some areas have traditionally been using geo-thermal water for healing purposes. Average temperature gradients of certain areas are as follows: Pannonian area 50 K/km, Adriatic area 25 K/km, the Dinarids 15 K/km.

According to surveys conducted so far, it has been determined that around 25% of BiH territory can be referred to as potential geo-thermal resource of three-fold type: hydro-thermal systems, geo-pressed zones, and warm dry rocks. These areas are for the most part in Central and North BiH, namely tectonic lines Zvomik – Doboj -Bosanski Novi -Ilidža - Kiseljak- Busovača. Out of the three types of resources, hydro-thermal systems draw the most attention as their exploitation is most developed and the cheapest in comparison to other two types.

When speaking about wind power usage, one thinks of generating electrical power from the power of wind by the use of wind-mills (wind generation) which will operate in electrical-voltage system of electric power companies. Preliminary studies produced by GTZ indicated that clear economic potential for development of approximately 600 MW electrical power on the basis of wind generation exists in BiH.

According to measurements from pre-war period, at the region from Trebinje over Mostar to Bugojno some promising values have been registered. Same measuring results have been confirmed in the more recent research according to which there is a large region with wind speed above that 10 m/s at the height of 10 meters for over 150 days per year. Measuring for the Podveležje region started as early as 2002 and has been performed at heights above 40 meters and have been performed at micro locations. So far these are the best locations in BiH and according to the research over 1000 MW of economically

payable wind generation units could be installed. Wind generation units (windmills) can be installed at various sites at the continent and at coastal areas. However, there is no wind atlas at the national level and research efforts in this area are sporadic.

Solid waste can also be observed as alternative energy source. The practice so far has only confirmed incineration as thermal treatment of waste, because other methods are being developed so the most probable solution is facility for classic incineration.

Looking at the composition of the waste and possible direction of development of its collection and transportation, the plant without prior selection of waste is imposed as the solution. This does not exclude selection of waste at source for recycling purposes, which has to be considered, but this is a phase in waste management that will surely develop more slowly due to the need to develop associated recycling facilities and due to the need to raise environmental awareness of population.

In addition to that, it has been proven in practice that full separation of calorific portion of waste, rubber, plastic, carbon from bulky waste evidently leads to insufficient calorific potential of waste for the operations of such a facility. The solution in such a case is co-combustion of waste in power plants with fossil fuels.

Degree of economic development has the biggest impact on composition of waste. Typical seasonal variation in quantity of waste is laid out in the Table. As is well known that the variation occurs, if the distribution of components is a critical factor in determining the management process, it is necessary to determine the current distribution by applying a special study. Even then it is often impossible to get an accurate view unless a large number of samples are analyzed. In general, the coefficient of variation for individual components of waste is very large. A typical coefficient of variation for paper is 20-40%, while in other components it can be 40-100%.

Table 6. *Typical seasonal variation for collected communal waste from households*

Waste	Mass share [%]		Percentage of variation (%)	
	Winter Period	Summer Period	Decrease	Increase
From food	11,1	13,5		21,6
Paper	45,2	40,0	11,5	
Plastic	9,1	8,2	9,9	
Other organic matters	4,0	4,6		15,0
Yard waste	18,7	24		28,3
Glass and metals	3,5	2,5	28,6	
Inert and other types of waste	4,1	3,1	24,4	
Total	4,3	4,1	4,7	
	100	100		

Omissions were made in many studies because of the large number of collected data that have little use or will never be used. This happens when

determining statistical distribution of waste components for the sampling period of time. For instance, it is much more important to have the data showing seasonal variation in the speed of waste generation rather than knowing whether some components share in percentage is 8,10 or 8,12 % for the sampling period.

#### **4. PROMOTION OF ENVIRONMENTAL TECHNOLOGIES AND RENEWABLE ENERGY SOURCES IN BIH**

Promotional activities related to the use of environmentally friendly technologies, renewable energy sources and waste management significantly affect the long-term sustainability of the results that are achieved by using clean technologies and renewable energy sources.

Promotion of environmental technology and renewable energy sources can be done in various ways, such as: pointing out their importance in strategic plans, through planning activities (leaders/actors and funds) to achieve goals related to new and cleaner technology, environmental protection, activities related to reducing pollution, by using renewable energy sources, creating appropriate legislation, promotional events, educating the public, by organizing specialized conferences and professional meetings, establishing funds and incentives for the introduction of environmental technologies and renewable energy. A very significant method of promotion is raising the awareness and knowledge in this field through education at all levels.

The essence of environmental technologies is based on bio-ethics and raising modern society's awareness of importance of leaving the nature and environment in a better shape than the one we inherited. Sustainable technologies are linked with or include renewable energy sources, sustainable life style, environment economics, and environment-friendly technologies. Since recently, in Bosnia and Herzegovina attention has been paid to environment-friendly technologies, green technologies or clean technologies that include application of ecological sciences, green chemistry, environment monitoring and models of protection of natural heritage and natural resources, with the aim to reduce negative impact of human activities. Sustainable development is the key or the main objective of environment protection technology.

- FWMP (Federal Waste Management Plan) envisages activities on the prevention of waste, which include: regulatory actions on business subjects with the aim to implement measures to reduce waste, conducting a systematic education of society as well as promotional activities to educate and influence to change in consumer behavior. Federal waste management plan has defined operational objectives, which will influence the reduction of the amount of waste for final disposal.

- Cleaner production is, undoubtedly, a global initiative. In this sense, the Centre for Earth Resources Research & Management (CERRM), University of Pahang, Malaysia (UMP), University of Tuzla (Technology Faculty) and the Embassy of Malaysia to BiH organized an international conference on green technology and eco system for global sustainable development ((InCGTGSD 2012) which took place at Technology Faculty of Tuzla University in Tuzla from 28 to 30 Ma 2012. The main objectives of the conference were exchange of information and ideas among professionals from Malaysia, BiH and international guests related to the latest research and innovations in environment-friendly (green) technologies. Also, one of the objectives was to enhance continuous cooperation in an efficient and effective way for promotion of the latest research and innovations among researchers in and outside the country, and especially introduction of technologies and ideas that are related to green technologies and eco systems in BiH.
- Government of Tuzla Canton has provided support in relation to organization of conferences on energy and environmental protection, one of which is support to the organization of the International Conference ENERGA in 2011 and 2012. ENERGA 2012 International Conference is organized as a expert conference with topics related to the challenges and experiences in the transformation of the energy sector to an environmentally sustainable economic activity. This expert conference was organized by NERDA and Tuzlanski sajam Ltd. with the aim of strengthening local capacity, to exchange experiences, to promote best practices in energy efficiency and renewable energy sources.
- Guidelines for development and implementation of energy policy in Tuzla Canton is a document that was created as a result of the initiative of the Government of Tuzla Canton and Development Association NERDA. This document shows that the Cantonal Government intends to become more actively engaged in the issues of energy efficiency, and through the creation and implementation of energy efficiency policy intends to implement actions that lead to reduction in energy consumption, reduction in CO2 emissions, as well as finding ways to implement the project for renewable energy.
- CETEOR (Center for Economic Technological and Environment Development - CETEOR Ltd.) is an organization that is active in the field of promotion, education, audit and advice on issues of environmental

protection, energy efficiency, waste management. Centre deals with the organization of seminars on hazardous waste management in order to protect the environment. CETEOR has organized a conference on energy efficiency and renewable energy, "Energy Efficiency and Renewable Energy - From Theory to Practice." The conference was organized by the Center for economic, technological and environmental development - CETEOR Ltd. And Business Systems RMK Zenica, under the patronage of the Federal Ministry of Environment and Tourism and the Federal Ministry of Energy, Mining and Industry. Business Partner of the conference was the Environmental Protection fund of BiH Federation. The conference was held duringr the 19th General BG ZEPS Fair 2012.

- "Association of Biomass in Bosnia and Herzegovina", based in Sarajevo was formed in mid-2012 in Bosnia and Herzegovina. The The association aims to bring together all the stakeholders from the biomass sector in BiH in order to improve the representation of interests of the sector, improve the position of domestic producers and users, and to track global trends in legislation, technology and marketing related to biomass. The goal of Association of Biomass BiH, is to bring Bosnia and Herzegovina closer to global trends in the use of renewable energy sources and by joining, domestic manufacturers and representatives of the sector will acquire a better position for representation of their own interests.

**Chapter No. 5 of this document contains an overview of current projects in BiH, which are the focused of environmental technology. The projects that are listed and are being implemented give important contribution to the promotion of environmental technologies.**

**Chapter 6 of this document includes a detailed description of the activities and projects in BiH dealing with renewable energy.**

**Standards, legislation and funding** for projects related to environmental technology and renewable energy as well as promotional activities in that field are given in detail **in Chapter 7 of this document.**

## 5. FOCUS ON ENVIRONMENT-FRIENDLY TECHNOLOGIES IN BIH

Due to significant reductions in national budgets and insufficient funds, municipalities will need to enhance their fundraising and activities on seeking other ways of support. Municipalities around world are struggling to get sufficient funding. Economic crisis affects all, while smaller communities suffer the most. This has a special negative effect on countries in transition. The European Union, both the Member States and other states, provide opportunities for funding the networks in energy sector, energy efficiency, and renewable energy sources, which seem to be top priorities worldwide.

In 2008 the European Commission started a very interesting and appealing initiative under the title Covenant of Mayors. The main task of the Covenant is to support local authorities in implementing sustainable energy policies. Local authorities play a crucial role in reduction of CO<sub>2</sub> emission. By their commitment, Covenant signatories aim to meet and exceed the European Union 20% CO<sub>2</sub> reduction objective by 2020 and to increase energy efficiency with the aim to save 20 % of energy consumption by 2020, and to ensure the renewable energy sources share in gross energy consumption in EU reaches 20% by 2020. These goals are known as the 20-20-20 Agenda<sup>5</sup>.

Covenant of Mayors<sup>6</sup> is a remarkable example of successful self-governance. Signatories of the Covenant are serious in embracing their accountability for their citizens and strive to improve their living conditions. An important part of everyone's life today is the rising cost of utilities. We are all responsible for our lives and we create conditions in which we live. It is always good to have on-site experts to help in meeting the requirements related to energy efficiency. Still, that is not necessary, because the Covenant of Mayors offers assistance and support to those who do not have sufficient funds of expertise.

The following BiH cities have signed the Covenant of Mayors: Banja Luka, Bihać, Bijeljina, Gradiška, Kakanj, Laktaši, Livno, Prijedor, Sarajevo, Travnik, Trebinje, Tuzla and Zvornik, while four of them have already submitted their Sustainable Energy Action Plans. All of these municipalities have realized that they will be stronger if they become part of this network.

Another advantage of signatories of the Covenant is that they have better chances to access funds from various organizations or to benefit from various EU assistance programmes.

Through various best practice examples, EU regulations, and the will of authorities and citizens a good concept of energy efficiency one can make a good energy efficiency concept that will be based on scientific grounds. An example of such approach is DELTER Project<sup>7</sup> "Energy Efficiency – a chance for better tomorrow" for mayors.

Energy efficiency is a measure of the quality of energy use or in other words lower energy consumption for obtaining the same services. Through planning and good governance a local community can significantly impact the



reduction in energy consumption. There are municipalities in BiH that have initiated energy efficiency projects, for instance inefficient boilers in Sarajevo were replaced by new ones for district heating. Also, around 400.000 EUR of grants have already been allocated for municipal energy projects.

The Project has four components with the first one being improvement of isolation so as to improve energy efficiency in public buildings, the second one is education and it involves 21 municipalities; the third one is education of public; and the fourth one is a legal component which include a public survey that led to the conclusion that energy efficiency is a neutral field that brings people together. For instance, DELTER activities in Brčko include isolation of a school and replacement of boiler. It is expected that this intervention will lead to 30-50% savings in energy consumption.

There are many best practice examples, and the city of Banja Luka stands out as a pioneer in energy efficiency. They signed the Covenant back in 2009 followed by development of the Sustainable Energy Action Plan that is now in the second year of implementation.

All this speaks for the fact that DELTER is one of the most significant projects in BiH in the field of energy efficiency. This Project is supporting BiH in their efforts to achieve all goals by 2020. It also provides support in capacity building of institutions, while it constantly works on promoting energy efficiency and making the relevant information available to the public. This EU-funded project is dedicated to support Bosnia and Herzegovina to meet the requirements of the EU Energy Community Treaty for SEE focusing on Energy Efficiency and Renewable Energy.

Primary energy consumption in BiH Federation is 1,37 billion, while in Republika Srpska it is 0,73 billion EUR. Based on these data, and having in mind EU goal to increase energy efficiency by 20%, potential annual energy savings in BiH would be 420 mil EUR, or 274 mil for FBiH and 146 mil EUR for RS.

USAID is funding a 4,26 mil project "Enterprise Energy Efficiency (3E)" will last until September 2013 and is implemented by *Advanced Engineering Associates International (AEAI)*. The idea to start this Project lies in the fact that almost 20% of Bosnia and Herzegovina's (BiH) gross domestic product (GDP) in 2008 was spent on energy, compared to about 6.1% of GDP in the USA and about 4.75% of GDP in EU countries. In BiH, tariffs in both the electricity and gas sectors are increasing, raising the energy costs to consumers. One way that citizens and government can offset rising energy costs is by reducing their use of energy, for example, taking energy efficiency measures in buildings.

USAID's project Enterprise Energy Efficiency (3E) assists BiH to promote energy efficiency technologies by developing demonstration projects in buildings that are co-funded by public and private counterparts. This increases the capacities of municipal public sector counterparts and small- and medium-sized enterprises (SMEs), and increases public awareness about the benefits of energy efficiency. The 3E project focuses on public-private partnerships and private sector participation to increase public awareness and demand for energy efficient technologies and practices. One component of the 3E project is

to implement 10 pilot projects throughout BiH to support private and public sector collaborations for energy efficiency initiatives and technologies. Selection of the projects was done on a competitive basis after three workshops held in three BiH locations in Fall 2010. The 3E project will also help potential energy efficiency projects to seek financing under the USAID Energy Efficiency development Credit Authority (DCA).

Another goal of the 3E project is to increase public and private sector capacity to understand and implement energy efficiency programs by providing

(1) commercial bank training in loan appraisal and financial product development in support of the energy efficiency sector;

(2) identification and training of at least 50 SMEs to meet financing requirements for energy efficiency projects;

(3) ME training to perform energy audits, implement viable energy efficiency improvements, and monitor energy consumption before and after implementation to ensure financial returns and justifiable payback periods;

and

(4) training for staff or representatives of public sector counterparts on developing energy efficiency plans, and integrating them into long-term development plans.

Finally, the whole 3E technical effort will be closely followed by a public outreach and awareness program, targeting all the key energy sector stakeholders on the benefits of using energy efficient technologies and methodologies<sup>8</sup>.

Based on the Public Call for grant scheme, the Environment Protection Fund of Federation of BiH in early 2012 allocated funds for realization of programs, projects and activities in the area of environment protection for 2011. Contracts were signed with representatives of local authorities, public utilities companies, public institutions and enterprises:

1. Orašje Municipality for the project *“Developing project design and documentation for waste water treatment plant”* (contract value 50.000,00 BAM),
2. Tuzla Municipality for the project *“Construction of a sewage system in settlement Mandići, Local Community Tušanj – Tuzla Municipality”* (contract value 200.000,00 BAM),
3. Novi Travnik Municipality for the project *“Sewage System for settlements Pećine and Ruda, Novi Travnik Municipality”* (contract value 100.000,00 BAM),
4. Busovača Municipality for the project *“Protection of potable water source from water intake Topalovići and Duboki Potok of the public water supply company of the Municipality of Busovača through construction of sewage network in Pridolci settlement”* (contract value 200.000,00 BAM),

5. Travnik Municipality for the project *“Developing project design and documentation for protection of water resources at the water source Bašbunar, Travnik”* (contract value 25.000,00 BAM),
6. Trnovo Municipality for the project *“Construction of the waste water treatment plant”*(contract value 200.000,00 BAM),
7. Stari Grad Municipality for the project *“Completion of the sewage network part in Local Community Mošćanica-protection of the Mošćanica river”* (contract value 100.000,00 BAM) and
8. *“Solving the water supply problem at the Borija Area in Stari rad Municipality”* (contract value 28.000,00 BAM),
9. Hadžići Municipality for the project *“Construction of Sewage System for settlements: Kučice, Griđići, Vrančići, Drozgometa, Selimovići and Koščan”* (contract value 200.000,00 BAM),
10. Visoko Municipality, Local Community Gračanica for the project *“Sewage system in Local Community Gračanica – Veliko čajno”* (contract value 50.000,00 BAM),
11. Visoko Municipality for the project *“Waste water treatment at the city cemetery in Visoko”* (contract value 100.000,00 BAM),
12. Lukavac Municipality for the project *“Drainage of surface water in the area Doležal, Lukavac”* (contract value 200.000,00 BAM),
13. Banovići Municipality for the project *“Construction of sewage system in Zone B”* (contract value 100.000,00 BAM),
14. Ilidža Municipality for the project: *“Elaborating project and technical documentation for horticultural arrangement of water protection zone and rehabilitation of existing walkways and the project of new tree lined walkway Ilidža-Vrelo Bosne”* (contract value 60.000,00 BAM) and *“Solving the issue of water supply in Rakovica area”* (contract value 300.000,00 BAM),
15. Dobretići Municipality for the project *“Water Supply Suhi Vrh-Brnjići-Pavlovići-Dobretići”* (contract value 100.000,00 BAM),
16. Ključ Municipality for the project *“Water supply for the high zone of Rejzović: Construction of the Increase Water Pressure System”* (contract value 30.000,00 BAM),
17. Novi Grad Municipality for the project *“Executing works on regulating the Buća Potok stream – Phase III”* (contract value 300.000,00 BAM) and *“Executing works on II Phase of Separate Sewage Network in the ALeja Bosne Srebrene Street (Dobrinja A settlement) and Esada Miđića Street”* (contract value 150.000,00 BAM),

18. Natron Hayat d.o.o. Maglaj for the project *“Removal and final disposal of sludge tah tis generated in the facility for preparation of technological water, Natron Hayat d.o.o.”* (contract value 100.000,00 BAM),
19. McCann Ericson Sarajevo for the project *“Raising public awareness on water protection importance”* (contract value 50.000.00 BAM),
20. JKP Komunalac d.o.o. Busovača for the project *“Arranging and protecting the Crni Potok water source”* (contract value 50.000,00 BAM),
21. Zemaljski muzej BiH for the project *“Enhancing research capacity and protection of collections in the Department for Natural Sciences”*(contract value 50.000,00 BAM),
22. JP Vodovod i kanalizacija d.o.o Zenica for the project *“Construction of Sewage network in the Josipovića put Street and 9. Maj Street in Zenica (according to the project: Major Project for sewage network in the Josipovića put Street and 9. Maj Street in Zenica, project design by JP “Vodovod i kanalizacija” d.o.o. Zenica; Project No. 712/295)”* (contract value 100.000,00 BAM),
23. Pobjeda Rudet d.d. Goražde for the project *“Reconstruction and modernization of the facility for processing of waste technological water – facility 121”* (contract value 200.000,00 BAM),
24. KJKP “Vodovod i kanalizacija” d.o.o. Sarajevo for the project *“Reconstruction of the part of sewage collector Bjelašnica-Hadžići at the route Mrazište-Radova Voda and Hotel Igman-Grkarica”* (contract value 1.500.000,00 BAM),
25. Institute for Genetic Engineering and Bio-technology for the project *“Assessment of the initial state of genetic diversity of salmonids with the aim to protect indigenous fish population in the Neretva river and its tributaries”* (contract value 20.000,00 BAM), and
26. Ministry of Spatial Planning, Transport, Communication and Environment Protection of ZDK, for the project *“Taking care of infectious waste generated from health care sector in ZDK area”* (contract value 1.100.000,00 BAM).

The total of 12.441.847,55 BAM has been made available through this Public Call for the support to 87 projects in the areas of waste water management, the use of waters, protection of waters, and the area of public awareness on the importance of water protection. So far the total of 56 beneficiaries signed contracts with the Fund. Since 2010 the Fund participated in implementation of 134 projects in FBiH through Public Calls and provided financial support in the areas of: waste water treatment (sewage systems with purifiers for communal and technological waters), protection of surface and underground waters (protection of flora and fauna), enhancing public

awareness of the importance of water protection and especially protection and preservation of intensively exploited potable water sources – water protection zones, which were allocated with more than 17 mil BAM.

Also, somewhat earlier contracts in the total value of 1.530.000,00 BAM were signed for co-funding of programmes, projects and activities in the area of environment protection. There were 19 new contracts, out of the total of 87, that were granted funds for projects' realization. In line with the inflow of funds collected through water fees and the structure of their purposes, the projects that were co-funded were related to water protection issues in FBiH. Given the fact that the water protection sector tops the list of sectors burdened with problems in all segments, this sector is also included in all programming tasks of the Fund, especially in terms of financial support. The projects that were supported were in the areas of: waste water treatment (sewage systems with purifiers for communal and technological waters), protection of surface and underground waters (protection of flora and fauna), enhancing public awareness of the importance of water protection and especially protection and preservation of intensively exploited potable water sources – water protection zones. The projects are as follows: "Construction of pumping station facility at the lagoon No. 2 – filtering pumping water from lagoons at the landfill", Regional landfill Moščanica"; "Construction of three wells with irrigation system in line with ISO 14001 standard, Sokolović kolonija Nursery", KJKP PARK d.o.o. Sarajevo; "Construction and audit of the main project design for the waste water purification facility in Doboj Jug Municipality", Doboj Jug Municipality; "Žabljak Sewage System, Usora Municipality" Usora Municipality; "Elaboration and audit of the main project design for the continuation of construction of sewage collector in the city of Kakanj", JP Vodokom d.o.o. Kakanj; "Reconstruction of the waste water treatment plant" Energoinvest TDS Sarajevo; "Facility with purifying filter HM Tenax d.o.o. Sarajevo and usage of of technical water"; "Reconstruction of existing pipeline Lepenica-Kiseljak at the route Draževići-Paleška čuprija, of the water supply system of the city of Kiseljak", JP Vodovod i kanalizacija d.o.o. Kiseljak; "Project on protection zones and protection measures for water source "Okanovići" – Ledenice for Gradačac water supply", JP Komunalac d.d. Gradačac; "Final works on the construction and rehabilitation of waste water collection networks in town and in suburbia local communities of Srebrenik Municipality towards the constructed purification facility" and Kiseljak Municipality's project "Inter-municipal water supply system Fojnica-Kiseljak-Visoko/pipeline r. Dubrava-r.Bilalovac-r.Dubrava-r.Palež".

The Fund is also providing co-financing<sup>9</sup> for the part of a large project of collection and purification of waste waters and storm waters in the Bihać Municipality territory whose implementation starts this year: "Drainage and purification of waste waters in Bihać, drainage of storm waters – Phase I" with the Bihać Municipality as the investor, and JP National Park Una project "Wilderness and the life of wild animals in the Una National Park". This project is aimed at advancing the importance of wilderness within the Park, and the Fund provided financial support for elaboration of Environment Impact Study.

Improvement of environment cannot be done without active involvement of the entire society. With the aim to underline the importance of education on environment protection so as to increase the public understanding and interest in environment, the Fund has also provide financial support for the following projects: "Water for Life" 3M Music Company d.o.o.-Radio M , "TV series Eco Minute" Tim System Sarajevo , "Magazine ZE-DO eko" "Naša riječ " d.o.o. Zenica , "Raising public awareness on water protection and its sustainable use through promotional campaign" MITA GROUP d.o.o. Sarajevo and the project "Everything you throw into river today, you will drink tomorrow" by the Association for improvement of environment, nature and health EKO TIM.

Swedish Development Agency Sida has donated equipment for 8 municipalities (Zenica, Visoko, Žepče, Zavidovići, Travnik, Novi Travnik, Busovača, Vitez) in the Zenica region as support to solid waste management. The value of donation is around 1.383.000,00 EUR. The use of the donated equipment in each of the municipalities should result in expansion of the area from which waste is collected and thus increase amounts of waste that will be collected in an organized manner.<sup>10</sup>

Over the course of last year the Public Enterprise "Elektroprivreda BiH" allocated the total of 145.851.768 BAM for projects related to environment protection and natural resources. In their 2011 Report on Environment Protection, Public Enterprise "Elektroprivreda BiH" it is stated that the total of 116,7 mil BAM were invested in reduction of pollutants emission from thermal power plants Kakanj and Tuzla, modernization and reconstruction of existing facilities and air pollution fees.

Public Enterprise "Elektroprivreda BiH" has invested over 29 mil BAM in environment and natural resources protection in the area of Hydro Power Plants at the Neretva river and electrical power distribution, water protection fees, projects of capital investments and realization of Power IV programme.<sup>11</sup> Given the fact that environment protection is one of the key components in the Public Enterprise "Elektroprivreda BiH" business policy, investments in this area are related to continuous improvement of impact on environment, monitoring and reduction of pollutants' emission in air, water, and soil, re-cultivation of thermal power plants' combustion products landfills, as well as abandoned surface and underground mines, adequate management of harmful, dangerous and waste material through its final disposal done in an acceptable way, and assessment of risk and safety for environment.

Representatives of "Marano Solar" Company from Rimini, Italy are supposed to present the BiH local communities with methods for rehabilitation of asbestos waste and collectors for renewable energy sources. During the visit to "Marano Solar" Company, a special attention was paid to asbestos material whose lifetime is around 20 years, so most of the roofs in BiH that were constructed with the use if this material have already become a danger for the health of population. The Italians presented methods according to which this waste could be disposed of so as to avoid soil pollution and at the same time place collectors for renewable energy sources.<sup>12</sup>

Gradačac Municipality has established good cooperation with Centre for Development and Support (*Centar za razvoj i podršku* CRP) in order to improve energy efficiency and protect the environment. Prior to establishing this cooperation, Gradačac Municipality already took measures that led to significant savings of electrical power in street lightning. Strategic objective of Gradačac Municipality is to achieve high efficiency in electrical power consumption and environment protection. In effort to achieve this objective the Mayor and Speaker of the Municipal Council have signed the Statement on Energy Efficiency and Environment Protection Policy. This strategic objective will lead to decrease in costs for energy consumption by 5% each year over the course of next five years. For the same period, the Municipality intends to decrease greenhouse gas emission by 2000 tons per year. Through management of energy costs the Municipality aims to improve energy efficiency and continuously work on environment protection and preservation. Cooperation with experts for energy efficiency monitoring will be established by regular monitoring of realization and achievement of objectives and through public announcements. Also, a system for measuring of energy consumption and its impact on the environment will be put in place. Realization of energy efficiency and environment protection policy will last over the next five years.<sup>13</sup>

Municipal Councils in Municipalities of Bugojno, Jajce, Donji Vakuf and Gornji Vakuf-Uskoplje have given their consent for establishment of Regional Waste Management Centre d.o.o. Gornji Vakuf-Uskoplje. The Centre would be at the location of former coal seam of the Coal Mine "Gračanica", Municipality of Gornji Vakuf-Uskoplje, and it would operate as an economic enterprise, while waste would be collected from territories of all four municipalities in the Upper Vrbas region. Elaboration of project design and documentation as well as identification of funding opportunities for this significant project is to take place in the upcoming period<sup>14</sup>.

## **6. FOCUS ON RENEWABLE ENERGY SOURCES IN BIH**

According to Bloomberg's research, the year of 2011 marked the record investment in renewable energy sources. The investments exceeded 260 billion \$ which is a 5% increase in comparison to the year of 2010, and almost five times more than 2004. Investments in solar energy have exceeded wind power, and surprisingly large investment has been made in renewable energy sources in the USA who for the first time since 2008 replaced China at the position of the world leader in these investments, thanks to various national incentives programmes. The total investment in solar energy in 2011 amounted to 136,6 billion \$ which makes for the growth of 36% in comparison to the previous year. This is almost double the amount of 74,9 billion that were invested in wind power and it makes for the decline of 17% in comparison to the previous year. Europe, as a whole, had a 3% increase in investment in renewable energy sources leading to 100,2 billion \$, with the biggest percentage of investment in solar energy technologies.

Pursuant to the EU Legislation, by 2020 all EU Member States should have realized their strategic plans to save 20% energy, increase energy efficiency by 20% and use 20% of energy from renewable energy sources (EC, 2004). For BiH such plans are not realistic, but they need to serve as encouragement for more serious actions in this regard. By signing the Energy Community Treaty in 2005 BiH took the obligation to become part of the EU internal energy market. The Treaty calls for improvement of situation related to functioning of large electrical power systems, losses in transport of energy and distribution. The Treaty advocates for adoption of development measures in the area of renewable energy sources and energy efficiency, environment protection, social cohesion and regional development. The Energy Community Treaty is the basis for the Stabilization and Accession Agreement in energy sector signed by BiH in 2008, pursuant to Article 107. Through ratification of the Energy Charter on Energy Efficiency and environment related issues, BiH took the obligation to work on promotion of energy efficiency in line with sustainable development through creation of conditions that will encourage producers and consumers to use energy in a rational, efficient and environment-friendly way. BiH still has no national-level energy strategy that should include implementation of energy efficiency and renewable energy sources.

As the basis for development of energy strategy at the BiH level, an Energy Sector Study for BiH was developed by a consulting consortium that included: Energy Institute "Hrvoje Požar", Croatia, Soluziona, Spain, Economy Institute Banja Luka and Mining Institute Tuzla, in March 2008.



The study presents valid indicators suggesting that determined efforts and consistency in the implementation of efficient energy use and savings could be one of the promising paths that lead to a stable economy for a longer period, which could have an impact on reducing energy costs and increasing employment. This could be an important factor in creating economic prosperity.

Measures to be taken to reduce energy consumption are:

- Improved energy management, which includes analysis of existing regulations for production, operation and maintenance of equipment and devices and if necessary update the regulations and apply those that proved valid and successful in other countries. That would mean efficient operation of equipment and facilities and good management of processes to maximize energy efficiency.
- The introduction of equipment for efficient energy use. This equipment includes the use of waste heat through heat exchangers, incorporating automatic control and monitoring of combustion in boilers, the use of high energy performance lamps, etc.
- Installation of modern equipment, a high degree of energy efficiency in the construction of new facilities or complete reconstruction of existing production facilities.

Applying these and other measures proposed in the Strategy will not exhaust all opportunities to reduce energy consumption. Additional energy savings can be achieved by transition to production of less energy-intense industrial products and covering for the energy deficit by the use of renewable energy sources.

Most of the energy in BiH is produced from non-renewable energy sources. These are mainly domestic coal, and oil and natural gas that are imported into BiH. All these fuels are a significant source of pollution and emission of greenhouse gases.

When it comes to renewable energy sources, some of which are worthy of consideration in BiH mainly small hydro, wind power and biomass, it is important to note that these activities are only starting in BiH, but it is important to begin with establishing policies for the development of technologies for exploitation of renewable energy sources and their categories and capacities.

The situation in the field of energy efficiency is rather similar. Companies spend significantly more energy per unit of production than similar companies in other countries, which makes them less competitive. In the field of building construction much more energy is spent per building size unit than in the EU, with less comfort. According to available data, individual buildings and residential buildings consume the same amount of energy as objects with similar characteristics in the EU during the 90's of the last century. The legal framework for improving energy efficiency and introduction / construction of

systems using renewable energy sources is unclear, without defined strategic priorities and objectives. Republika Srpska (RS) has prepared a strategy for energy sector by 2030, which includes changes to parts of the legislation, raising awareness, renewable energy sources, energy efficiency in buildings, certification, etc.

Because of the specificity of renewable energy and cogeneration in BiH, this will require political will of entity governments for the support of these technologies in terms of regulation of prices, the purchase of energy, elimination of administrative barriers, etc.

BiH Federation Decree on the use of renewable energy sources and cogeneration (FBiH Official Gazette, No. 36/10) from 16 June 2010 supplemented by Decrees on its amendments and annexes, quantifies the goals that indicate the percentage of the share of the total energy need can be covered by renewable energy sources. However, so far there is no Action Plan for promotion of RES nor is there a legal framework at the state level.

The purpose of this Decree is to encourage bigger production and consumption of electrical power from renewable energy sources and cogeneration (RESandC) in the internal energy market and development of regulatory and technical infrastructure for RESandC, particularly in terms of:

- Removal of barriers for increased use of RES, including administrative barriers,
- Decreased impact of the use of fossil fuels on environment,
- Getting closer to the Kyoto objectives,
- Encouraging, introducing, applying and developing new equipment and technologies as well as domestic economy in general,
- Job creation and development of entrepreneurship in energy sector,
- Long-term energy security,
- Efficient use of energy, including energy efficiency and savings,
- Quality waste management.

In line with the Decree, the RESandC facilities can be categorized on the basis of their installed power:

- micro facilities: up to and including 150 kW,
- mini facilities: from 150 kW to and including 1 MW,
- small facilities: from 1 MW to and including 10 MW,
- large facilities: over 10 MW.

It is important to note that the Decree also foresees incentives for electrical power production from RES and efficient cogeneration and the funds for the incentives are paid by consumers of electrical power on a monthly basis. In Federation of BiH consumers allocate 0,001 BAM plus VAT per kWh for the RES Fee, while in Republika Srpska consumers pay 0,018 BAM on a monthly basis for each spent kWh of electrical power.

Centre for Education and Awareness Raising on the need to increase energy efficiency “Energis” reported that the FBiH Government’s intention to legally regulate this area is a positive step in 2012.<sup>15</sup>

## 6.1. Solar Energy

Around 40 million households in the world get hot water through solar collectors. Also, many street lightening systems use the power of Sun. German production of electrical power from solar sources in 2010 grew to almost 18 billion kWh, which is more than 3% of the gross national production of electrical power.

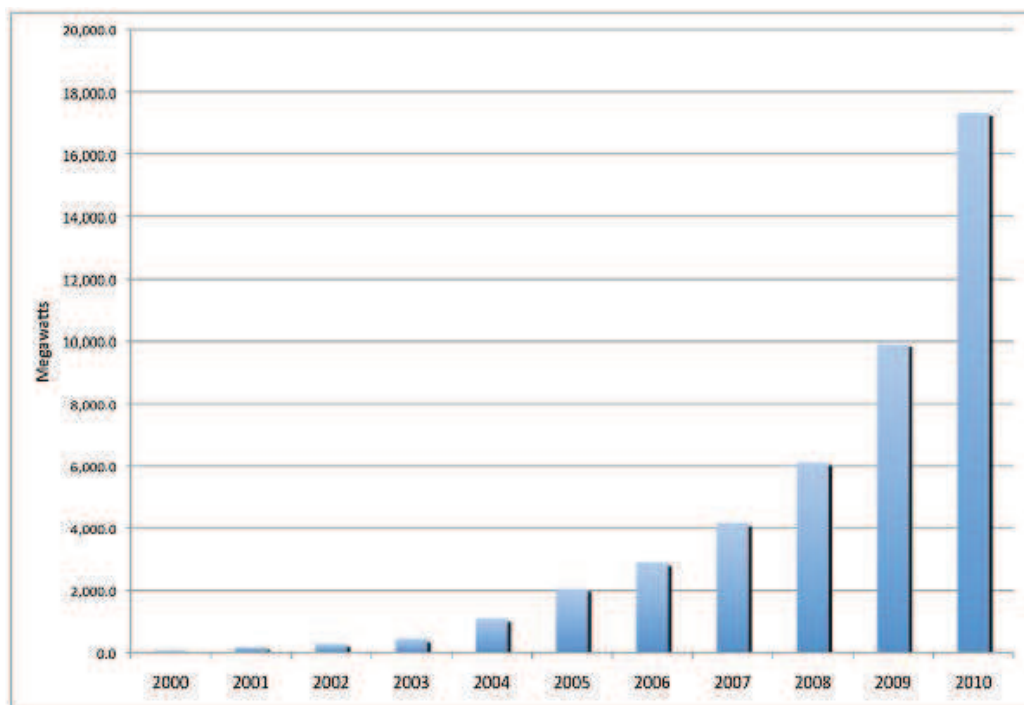


Image 1. *Growth in the use of solar energy in Germany 2000-2010*<sup>16</sup>

BiH does not have Action Plan for promotion of RES, nor legal framework or incentives. Despite that, the first solar power plant in BiH produces 30% more than planned in its first month of operation.

As stated earlier, solar power potentials in BiH are 70,5 million GWh per year, and with solar radiation of 1.240 kWh/m<sup>2</sup>/annually in northern part of the country and 1.600 kWh/m<sup>2</sup>/annually in southern part, conditions for the use of solar power are rather favourable. Annual average of daily solar radiation varies between 3,4-4,4 kWh/m<sup>2</sup>. Research project: Feasibility study for the use and promotion of development of solar energy sources in BiH, funded by Spanish Government, will identify areas in BiH in which it is possible to use solar energy. The Project includes analysis of the existing offer of solar thermal and photo-voltaic technologies in BiH, analysis of institutional,

regulatory and legal framework and possible instruments of financial support. It also involves a proposal of strategic guidelines for solar energy development, installing pilot projects of solar thermal and photo-voltaic energy and development of educational programme on solar energy.

Although BiH has excellent conditions for utilization of solar energy, the state does not stimulate the usage of RES as is the case in Europe and the rest of the world. Should only a part of the BiH potential be used, solar systems could produce enough electricity to replace a significant portion of existing systems that produce electricity.

The first photovoltaic power system of 3.9 kilowatts, as stated before, is set in the Centre for Children with Special Needs "Los Rosales" in Mostar. In March 2012 BiH got its first solar power plant<sup>17</sup> with capacity sufficient for inclusion in the distribution system, and it was installed on top of the City Sports Centre in Kalesija. The investor was the "Eko energija" Company from Kalesija, owned by Selmir and Sadik Fatić, and they invested 800.000 BAM in the project. Solar energy will be collected and by means of solar modules it will be transferred into electrical power and then distributed to the system of Public Enterprise "Elektroprivreda BiH". The installed capacity of the plant is 120 kW, while the planned annual production is 130 MWh. Electrical power in the value of 100.000 BAM will be produced over a course of one year. Estimates show that the investment should pay off after 10 years. After opening of this first solar power plant, the company "Eko energija" will continue renting free spaces on top of roofs of public and residential buildings in Kalesija so as to collect as much solar energy as possible and transfer it into electrical power<sup>18</sup>.

## 6.2. Wind Turbines

Although it is generally known that the Balkans is an area suitable for the installation of wind turbines, none of the six states emerged after the breakup of Yugoslavia, with exception of Croatia, has a single megawatt wind turbines installed at this time. Back in 2010 BiH announced the adoption of the Law on RES and C, but even today the Federation of BiH only has a Decree with the same title that is in force presently. However, public debates are being held nowadays to discuss draft law on the use of RES and efficient cogeneration in line with the announcement of the Federation Parliament's House of Peoples from 20 December 2011. In comparison with the Decree, the Law is more comprehensive and it treats the issues of RES not only from the aspect of electrical power production, but also from the aspect of thermal power production and cogeneration. It is also prescribed to develop an Action Plan for Renewable Energy in the Federation, which will set out binding targets by 2020, and the obligation to comply with the objectives of the Electrical Power Strategy of the Federation. On the other hand, Republika Srpska has a Manual on Incentives and Support for Electrical Power Production from RES and Efficient Cogeneration that is in force. All of the mentioned documents, as well as their

current status, indicate that there is a serious intention to intensively develop RES, even a wind turbine included, as early as this year.

As far as the wind and its potential for electrical power production are concerned, southern part of BiH is identified as the most interesting area. Wind turbines that are at higher levels of development are very scarce in BiH. Most of these projects are located in the area of Livno, Kupres, Tomislavgrad and Mostar. This area showed excellent wind potential and it is to be expected that first projects will take place in of these locations.

Apart from a few private investors and developers, of whom some are already very close to obtaining the building permit, wind turbines are also being developed by Puhlci Enterprises "Elektroprivreda BiH" and "Elektroprivreda Hrvatske Zajednice Herceg Bosna". "Elektroprivreda BiH" Project is located at the Podveležje plato near Mostar, and Mesihovina project by "Elektroprivreda Hrvatske Zajednice Herceg Bosna" is also close by.

Before the summer of last year, the tender for wind farm Podveležje was supposed to be launched, however it was cancelled at the last moment. Had the tender duly passed, it would probably be the first wind farm built in BiH. Currently, the new tender launch is awaiting, and at this moment nobody knows when the wind farm could be built, while it is quite certain that it will not be possible before 2013.

As for the Mesihovina wind farm, the agreement signed by the FBiH Government, German investors<sup>19</sup>, and KfW President for East Europe, guarantees that KfW will insure 71 million EUR of loan and 1 mil EUR grant for the Project of Mesihovina Wind Farm near Tomislavgrad. It is planned to construct 22 wind turbines with individual production capacity of 2 MW. With average wind speed of over 6 m/second the expected annual production would be 115 GWh.

The Pakline-Ljubuša-Kupres wind turbine owned by private investors Kamen-Dent is currently in the phase of obtaining the location permit, and there have been texts in media announcing construction of wind farms in Republika Srpska, although there has been no progress in that regard so far. Vran-Dukić and Koncig Companies are also in final phases of developing wind farms.

Public Enterprise "Elektroprivreda BiH" is planning the realization of wind farm at the Podveležje-Mostar site in the centre of Herzegovina-Neretva Canton. A wind turbine of minimum power of 32MW contains 16 wind generators with minimum installed power of 2MW per each generator. Construction will be split in two phases where two generators will be constructed and put in function in the first phase, while the second phase (construction and putting in function of the remaining 14 wind generators) will be finalized afterwards. Total annual production of electrical power in this wind farm will be around 70 GWh<sup>20</sup>. The estimates show that the potential of energy that can be produced in this way in BiH ranges between 900 and 2000 MW (EVD, 2009).

An application for environmental permit to build Škadimovac wind farm in Glamoč which was submitted by the investor "WBL City Project Banja Luka"

is on the public release of the Federal Ministry of Environment and Tourism. The planned wind turbine will have the power of 110 MW. The project is currently in the phase of installation of testing poles to measure the wind speed, and the deadline for completion of testing and project design for wind farm is October 2012. Construction and the start of power production is expected in 2013. The future wind farm will be spread over the area of 17 km in length and 8 km in width, and the total of 55 wind turbines will be placed each with the 2MW power. The value of investment is around 270 mil BAM<sup>21</sup>.

In the Federation of FBiH Decree, the goals by the end of 2012 are targeted at 5% of total electrical power consumption, and it is already certain that these objectives cannot be achieved. It still remains unclear what are the RES goals for 2020, but they will most certainly rely on the EU best practice. Finally, it will be interesting to see which wind farm will be built first in BiH, and according to their current statuses the two public enterprises "Elektroprivreda BiH" and "Elektroprivreda Hrvatske Zajednice Herceg Bosna" are in the best positions and their wind farms should be built in 2013. That way the situation with wind farms in BiH would become completely opposite to that in Croatia, in other words, instead of private investors the wind farms projects will be initiated by public enterprises<sup>22</sup>.

### **6.3. Biomass**

Observing the current status of wood biomass sector in BiH, market conditions, and the need to raise awareness of the advantages of the use of biomass as domestic, environment-friendly fuel with competitive price, within the GEF Project "Biomass energy for employment and energy security", the UNDP in BiH identified a clear need to increase self-sustainability of biomass market. Global Environment Fund (GEF) donated funds for realization of this project whose main objective is to decrease equivalent emission of CO<sub>2</sub>, by retrofitting or installing biomass-fired boilers in BiH. With consulting, administrative and technical assistance provided by consortium CETEOR d.o.o. Sarajevo, Enova d.o.o. Sarajevo and Regional Education and Information Centre (REIC), UNDP GEF Project Biomass initiated activities leading to establishing and developing Biomass Energy Association in BiH. The objective of the Association is to bring together biomass sector stakeholders in BiH so as to enhance advocacy for the sector, improve the position of domestic producers and consumers, and monitor world trends in legislations, technology and marketing of biomass.

These activities are aimed at creating sustainable market for biomass energy. Benefits at the local level are new jobs, reduced emissions of pollutants into the atmosphere, and better thermal comfort provided. Workshop participants will engage in solving the obstacles that hinder the growth of the use of modern biomass energy. The realization of the project will contribute to the acquisition of local experience and awareness in terms of biomass and will

lay a solid foundation to put these issues in the context of broader initiatives related to energy, forestry, business policy and legislation.

By establishing the Biomass Energy Association, Bosnia and Herzegovina will be closer to world trends in the use of renewable energy sources, and local producers and sector representatives will be joining to gain a better position to represent their own interests. Ultimately, this will remove market barriers to the establishment of sustainable services of biomass energy in rural areas of Bosnia and Herzegovina through market transformation, job creation, reducing poverty in the community and secure energy supply at the local level<sup>23</sup>.

Forests cover 50% of Bosnia and Herzegovina<sup>24</sup>, so the biomass potential is more than evident. In 2003, 1.464.400 tons of biomass (firewood) were spent in BiH<sup>25</sup>. Such use of biomass, through exploitation and utilization of forests, cannot be considered as the use of renewable energy due to the non-sustainability of this situation. Lack of adequate and effective planning and management of forestry, together with inefficient use of firewood, lead to deforestation, pollution, and health problems among population. The natural potential of wood waste in BiH is estimated at 1.785 million m<sup>3</sup>. Waste from the wood sector is used less than 50% and to date we have only one furniture manufacturer who built a power plant to take advantage of wood residues<sup>26</sup>. When it comes to waste biomass from agriculture, its estimated amount varies, but one can count on about 211.000 tons of branches of fruit trees and vineyards pruning, and more than 630.000 tons of waste from agriculture.<sup>27</sup>

Products based on the use of biomass such as briquettes and pellets, are not only environment-friendly fuel of the future, but in many countries of the present too. The fact that there were about 670 plants for the production of pellets with a total capacity of 10.1 million tonnes in Europe in 2009, which is about 1.8 million more than in 2008, speaks for itself.<sup>28</sup>

Western European countries have the legislation that defines this area by creating legal preconditions for realization of projects. In addition, attention is paid to models and measures for incentives, both for natural and legal persons. They imply financial support for those who opt for the realization of projects in the field of biomass, ranging from manufacturers of equipment and fuel to end users. The assumption for these incentives is that one achieves the planned emission of dust and carbon monoxide in order to achieve the environmental effects in addition to already indisputable economic ones. Bosnia and Herzegovina has great potential in terms of use of biomass for production of heat primarily, but also for production of electrical power.<sup>29</sup>

In 2008 a plant "Sistem ekologika" was opened in Sitneši near Srbac with the investment of 30 mil \$ made by the US Company "Best inc." This plant, which is the biggest of such kind in the Balkans, can produce 180 tonnes of biodiesel per day, but in the first stage of production it was limited to 100 tonnes. The potential for biodiesel and other bio fuels in our country are very important because currently half of arable land in BiH is abandoned. Around 360-400.000 hectares of arable land is uncultivated, and if only one part is used for cultivation of the necessary raw materials for biodiesel production, it would

create job opportunities not only for the US "best inc" but for all other investors who have already showed interest in bio fuel production in BiH.

When it comes to the production of biodiesel, the plant "Voćar" from Gornji Rahić began with the construction of a biodiesel plant, which will use the used oil remaining from the production of food in their factory (chips, peanut frying, etc.), and the imported palm oil.

As for the biogas, calculations based on the number of cattle indicate that the potential of biogas production in BiH is about 44 million Nm<sup>3</sup> per year.<sup>30</sup> The first progress in this area was registered in Agriculture Cooperative "Livač" in Aleksandrovac, Laktaši Municipality, where a biogas production plant was opened in late 2011, and it will be used to produce electricity and thermal energy; construction of the plant cost € 250,000. The installed electric power of the plant is 35 kW, and heat power of 70 kW, while the expected annual level production is 290.000 kW of electricity and 560.000 kW of thermal energy. Biogas plant project was implemented by Caritas in cooperation with Federal Foundation for Environment, Germany, the Banja Luka Diocese and Agriculture Cooperative "Livač"<sup>31</sup>.

#### 6.4. Geothermal Energy

As far as geothermal energy is concerned, its use is currently quite limited. Geothermal energy is used in agriculture, residential heating, tourism and mineral water treatment, but could certainly be used in power generation too. As mentioned above, with the use of all sources registered in BiH, and with a utilization factor of 0.5 it is possible to annually produce 112.77 TJ of energy only for space heating, or a total of 899.75 TJ of energy, if we observe both space heating and bathing.

These geothermal sources are used to a lesser extent for bathing, and even less for space heating. Recreational or balneological (spa) capacities are present at many geothermal sources (Fojnica, Olovo, Višegradska banja, Ilidža, Sočkovac, Tuzla, Ilidža). Geothermal water is used in these facilities throughout the year. At few sites (Gata, Sanska Ilidža, Kreševo, Breza) geothermal water is used seasonally. The degree of utilization of geothermal capacity in these facilities is extremely low and amounts to only 5%. Geothermal energy is used in most cases only for bathing.

Geothermal sources of Bosnia and Herzegovina for space heating are estimated at about 33 MW<sub>th</sub>. The temperature at sites in Bosanski Šamac (85° C), Kakanj (54° C) and Sarajevo (58° C) is too low to start electrical power production, which is the main reason why these reserves are taken into consideration only when it comes to the exploitation of thermal energy. The northern part of Republika Srpska is very promising in terms of presence of geothermal energy and geothermal waters. The areas of Posavina, Semberija and Lijevče Polje are particularly interesting. The main geothermal sites are located in the Triassic and Cretaceous limestone and consist of reservoirs of geothermal water with temperature from 35 to 150° C.



The City of Bijeljina ordered development of the Study entitled "Hydro geological and hydrothermal resources of the Municipality Bijeljina: Potentials and usability." The study provided for the supply of water for the town of Bijeljina from five extraction wells.

According to the Study, the complete heat system of Bijeljina will require 850 l/sec of thermal water with temperature of 80° C. For the implementation of the project it is necessary to make a more exact analysis that includes the development of exploration wells.<sup>32</sup>

Geothermal energy in Bosnia is still not used to produce electricity. There are plans to build a geothermal power plant in Ilidža (Sarajevo), where it is expected to have production of electricity from three new wells, which should produce 100 kg/s of geothermal water with temperature of 120° C. It is possible to develop district heating for several buildings in Ilidža, with the use of the same source. However, funds for research drilling are missing. The deepest well in the area of Ilidža IB-10 with the depth of 1100 meters, which was created in 2004, drilled through the aquifer of about 30 l/s yield of spillway and water temperature of 20° C.

## **7. NORMS, LEGAL REGULATIONS AND FUNDING**

The specificity of environmental legislation in Bosnia and Herzegovina is that the highest level of environmental legislation is generally lowered to the level of entity legislation. However, we should emphasize the fact that the legislation of the Federation of BiH and that of Republika Srpska largely agree with the relevant legislation of the European Union, and the fact that both entities' legislation are identical in terms of fundamental solutions, with some differences in terms of by-laws and implementation documents.

### **7.1. National Environment Action Plans (NEAP)**

Regarding the legislation on the state level, it is crucial to mention this very important document.

In July 2000, the Governments of the Federation of Bosnia and Herzegovina and Republika Srpska received an International Development Fund (IDF) grant from the World Bank for environmental capacity building. With the assistance of this grant, the National Environmental Action Plan (NEAP) for Bosnia and Herzegovina was completed in early 2003. The goal of the NEAP is identification of short and long-term, priority actions and measures providing the basis for preparation of a long-term environmental protection strategy in accordance with the economic, social and political situation in Bosnia and Herzegovina.

NEAP BiH was officially adopted by both entities (FBiH and RS) Governments and Assemblies in 2003. It was then concluded that it is necessary to establish supervision and ensure efficient implementation and updating. In line with this approach, during implementation of NEAP, it is necessary to prepare a National environmental protection programme and appropriate cantonal and local programmes for realisation of projects included in the NEAP.

A key element of NEAP is the comprehensive analysis of the state of the environment. Ten thematic areas were identified covering key environmental issues (air, water, land, forests, waste, space, economy, biodiversity, health and demography, legal and institutional framework). NEAP preparation was based on principles of sustainable development and defines criteria and priorities for the thematic documents with the aim of resolving environmental protection issues.

When setting up the priorities for environmental protection the following criteria were used:

- Impact of environmental pollution and human health,
- Impact of environmental pollution on ecosystems,

- Socio-economic and economic significance,
- Commitments and obligations from accepted international agreements.

With the use of joint multidisciplinary approach, the top eight environmental issues agreed upon are:

- Water resources/waste water,
- Sustainable development of rural areas,
- Environmental management,
- Protection of biodiversity and landscape diversity,
- Waste/waste management,
- Economy,
- Public health,
- Demining.

The Plan also includes the status of environment in eight key sectors and suggests measures that will be aimed at the key environmental issues and defines institutional and technical needs, updating and monitoring of NEAP.

Federation of Bosnia and Herzegovina adopted a set of environmental laws in 2003:

- Law on environmental protection, including the provisions of the integrated framework for issuance of environmental permits as well as procedure, such as environment impact assessment, based on the concept of integrated control and prevention of pollution (IPPC),
- Law on nature protection,
- Law on air protection,
- Law on waste management,
- Law on Water protection (the law was abrogated with the adoption of the new Law on Waters in 2006),
- Law on the Environment Protection Fund.

By adopting the set of environmental laws, the legal aspect of environment protection in FBiH has been compiled. In the earlier period environment-related legislation was spread through various acts, regulations, decrees and decision. The laws have prescribed the obligation to adopt various by-laws and have defined responsibility of various bodies/institutions.

Law on environmental protection (FBiH Official Gazette No. 33/03 and 38/09) states that the right to a healthy environment is recognized as the basic constitutional right.

A by-law of the Law on environmental protection, Rulebook on plants and machinery which require environment impact assessment and units that can be built and operated only if they have an environmental permit, (FBiH Official Gazette No. 19/04) defines the procedure for Rulebook on plants and machinery which require environment impact assessment and units that can be built and operated only if they have an environmental permit obtaining and the content of environment impact assessment study.

Protection of nature is regulated through the Law on Nature Protection (FBiH Official Gazette No. 33/03). This Law regulates the conditions and methods of restoration, protection, conservation and sustainable development of landscapes, natural areas, plants, animals and their habitats, minerals and fossils and other natural components of the Federation of Bosnia and Herzegovina, the authority to carry out nature protection, planning protection of nature, general and specific measures for nature protection, information systems, supervision, financing of nature protection and penalties for violations of legal and natural persons.

The Law on Air Protection (FBiH Official Gazette No. 33/03 and 4/10) regulates the conditions and technical measures to prevent or reduce air emissions caused by human activities that must be followed in the production process all over the Federation of Bosnia and Herzegovina, planning of protection of air quality, specific sources of emissions, emission inventory, air quality, monitoring and penalties for violations by legal and natural persons.

It is important to note that under the Law on Air Protection, a Rulebook on conditions for incineration of waste was also developed (FBiH Official Gazette, No. 12/05).

The Law on Waste Management (FBiH Official Gazette No. 33/03 and 72/09) regulates:

- all categories of waste, except radioactive waste gases emitted into the atmosphere and wastewater,
- all types of waste management activities, operations and facilities.

The provisions of this Law apply to:

- waste generated from resources exploitation, extraction, treatment and exploitation of minerals and quarry operations,
- liquid waste,
- animal waste and other non-hazardous materials of natural origin that can be used for agricultural purposes,
- disposed explosives, unless covered by special regulations.

Under this Law the waste management activities that under the jurisdiction of the Federation are exercised by the Federal Ministry in cooperation with the Federal Ministry of Health and other relevant ministries. All actions related to management of all waste types, and determining the location and land use issues in waste management and facilities are performed by the Cantonal Ministry of Environment, except for the cross-border waste transport or waste management among the cantons.

Law on Environmental Protection (Official Gazette of FBiH No. 33/03) prescribed the formation of Environmental Protection Fund (FBiH) and determined its formal structure, organization, management and governance, property and operations of the Fund, sources, purpose and ways for funds disbursement, and it also defined other issues related to fundraising and fund management.

Activities of the Environmental Protection Fund FBiH consist of the collection and distribution of financial resources for environmental protection in the territory of the Federation of Bosnia and Herzegovina, and will be used in particular for the following purposes:

- to support the implementation of tasks arising from the obligations and responsibilities towards the international community on environmental protection;
- to minimise damage to the environment when you cannot apply the principle of responsibility for damaging a certain corporation (“polluter is responsible for paying”);
- costs of preventing or eliminating the damage to the environment which requires immediate intervention;
- support for different measures to protect the environment, particularly in the field of development and funding of information systems, education and information dissemination;
- improving the economic structure that is favourable to the environment,
- preservation of protected natural areas,
- promoting environmental awareness and environmental research,
- funding, instigating and funding the preparation, implementation and development programs, projects and similar activities in the field of conservation, sustainable use, protection and improvement of the environment and renewable energy sources.

In carrying out its activities the Fund is promoting the objectives and principles of environmental protection in order to achieve a systematic and integrated conservation of the quality of all components of the environment, conserving natural communities and the rational use of natural resources and energy, as well as basic conditions for sustainable development, in order to achieve the basic rights of citizens to a healthy environment (Unfortunately, it still does not work in its full capacity at the federal level and in some cantons).

## **7.2. Federal Environment Protection Strategy (2008-2018)**

Development of the Federal Environment Protection Strategy was prescribed by the Law on Environment, while the Federal Ministry of Environment and Tourism was responsible for this task. The Strategy covers a ten-year-period (2008-2018).

The Federal Environment Protection Strategy includes the following documents:

- Federal Nature Protection Strategy;
- Federal Air Protection Strategy;
- Federal Waste Management Strategy;

- Federal Water Protection Strategy, that is, water management, which is being developed separately.

Principles and guidelines that the Strategy is based upon are as follows:

### **7.2.1. PRINCIPLES**

- Sustainable development principle,
- The principle of precaution and prevention - carefully manage and economically use components of the environment,
- The principle of substitution - any activity that could have harmful effects on the environment should be substituted with another activity that bears significantly less risk,
- The principle of an integrated approach - environmental protection and improvement of environment quality should be an integral part of policies aimed at the development environment
- The principle of shared responsibility and cooperation - cooperation and joint action of all subjects in order to protect the environment,
- Public participation and access to information - the participation of all interested citizens, every individual and organization must have appropriate access to information,
- The polluter-pays-principle - the polluter pays the costs of pollution control and prevention.

### **7.2.2. GUIDELINES**

- how to reduce usage, prevent loading, pollution, and disruption of environment, as well as improve and restore damaged environment,
- how to protect human health and improve environmental conditions for quality of life,
- how to preserve and protect natural resources, rationally use resources and apply industry models that ensure renewal of resources,
- how to align other entities' interests with the requirements of Environmental Protection,
- how to participate in international cooperation in the field of Environmental Protection,
- how to receive initiatives from the public and start up public participation in activities aimed at Environmental Protection,
- how to coordinate economy and integrate social and economic development with the Environmental Protection requirements,
- how to set up and develop institutions for protection and preservation of environment.

### **7.3. Draft Law on Nature Protection**

This Law, which entered the legislative procedure, shall regulate the competence of bodies carrying out nature protection, general measures for conservation of nature, the assessment of acceptability of actions in nature, types of habitats and ecologically significant areas, species and subspecies, protection of wild birds, protection and conservation of biodiversity, forest ecosystems, karst eco-system, water and wetlands, protection of marine and coastal natural resources, the establishment of the European Ecological Network of Protected Areas - Natura 2000, measures to protect species and subspecies, cross-border traffic of protected wild species and subspecies, protection measures for minerals and fossils, protected natural assets, compensation, incentives, proposals for concessions in protected natural values and natural protected facilities, planning and organization, inventorying and monitoring, access to information and public participation, a sign of nature protection, promotion of education in protection of nature, recognition and awards for achievements in nature conservation, nature conservation funding, inspection, penal provisions, transitional and final provisions.

Under this Law, the budget of the Federation and the Environmental Protection Fund are to ensure funds to protect the natural values, and to allocate funds for financial and other incentives provided by this Law, for compensation of damage inflicted by the protected animals, for realization of pre-emption right of the Government of the Federation, and for compensations to owners and users of real property rights in protected natural values that are of international, state and federal importance.

Cantonal budgets allocate funds for protection of natural values that are recognized by the Canton, for financial and other incentives provided by this Law, and for the realization of the pre-emption right and compensation to owners and users of real property for the restrictions imposed on them in these protected natural values.

Funds for financing of nature protection shall be provided by using natural resources and protected natural resources, unless this or other special law prescribes otherwise, as well as from concession fees and other sources identified by Law or regulations adopted pursuant to the Law.

### **7.4. Decree on the Usage of Renewable Energy Sources and Cogeneration (RESandC)**

The Government of the BiH Federation brought the Decree on the usage of RESandC (FBiH Official Gazette No. 36/10 from 16 June 2010). This was followed by: Decree on Amendments of the Decree on the usage of RESandC (FBiH Official Gazette No. 11/11 from 16 March 2011) and Decree on Amendments of the Decree on the usage of RESandC FBiH Official Gazette No. 88/11 from 28 November 2011). This Decree and its Amendments regulate: way of using renewable energy and cogeneration plants (hereinafter: RESandC), a

group of plants, the minimum share of electricity produced in plants using RESandC in total energy consumption, encouraging the production of electricity from RESandC, RESandC potential testing, the register of projects and facilities for usage of RESandC, RESandC plants construction, purchase and fees, connecting the RESandC facilities to the grid, certification of origin for electricity produced from RESandC, the establishment of institutional structures for operationalization of the system of incentives for production from RESandC, as well as other issues of importance for the usage of RESandC.

## **7.5. Draft Energy Efficiency Law**

Draft FBiH Energy Efficiency Law regulates energy efficiency as the activity of general interest in the final consumption, making and implementing plans for improvement of EE and measures for EE improvement, including energy services, energy audits, duties of public sector and large consumers, consumer rights in terms of implementation of energy efficiency measures, the method of financing energy efficiency improvements and other issues.

## **7.6. Republika Srpska Energy Law**

National Assembly of Republika Srpska (RS) adopted the Law on Energy (RS Official Gazette No. 57/2011), which, in a unique way, regulates the energy market based on the principles of de-monopolization, competitiveness, equality and protection of the rights of all parties and the security of energy supply. By adoption of this law, common definition of energy as a commercial commodity, like electricity, thermal energy, natural gas, petroleum, petroleum products and bio fuels, was first introduced in RS.

This Law, as stated in its first Article, "... regulates the energy policy objectives and the manner of its exercise, the conditions for a reliable, secure and reliable energy supply, and conditions for safe supply of customers, the conditions for construction of new energy facilities, conditions and manner of carrying out energy activities, a way of organizing and functioning of the market of electricity and natural gas, rights and obligations of market participants, protection of energy consumers, method, conditions and incentives for energy production from renewable sources and combined production of electricity and thermal energy, rights and duties of state bodies, position, method of financing, operations and other issues of importance for the work of the Energy Agency of the Republic of Serbia, as well as supervision over the implementation of this law."



## **8. KEY STAKEHOLDERS IN THE SECTOR OF ENVIRONMENTAL TECHNOLOGIES AND RENEWABLE ENERGY SOURCES IN BIH**

Permanent and effective communication, cooperation and coherence between different stakeholders, segments and processes of environmental protection fall in the category of fundamental and necessary actions to establish a quality environment protection system.

In addition to stakeholders who are key in the sector of environmental technologies and renewable sources, such as Ministries at all levels of government (state, entities, cantons), municipalities, universities, research centres, business associations, international organizations, certification bodies specializing in environmental and energy sectors, nongovernmental organizations, they must be joined by all reference institution for specific components of environment (Federal Hydro-meteorological Institute, Federal Agropedology Bureau; Agency for the Sava Water Basin, Agency for Water Area of Adriatic Sea, the Federal Geological Bureau, Federal Bureau of Statistics and the Federal Administration for Geodetic, Property and Legal Affairs).

The responsibility for waste management, landfill sites and determination and development of operational plans is at the municipal level. The concept of waste management system is determined at the cantonal level through cantonal waste management plans. These plans should define the concept and requirements for waste management at the municipal level, and propose solutions for the disposal of certain waste streams at the cantonal level. At the federal level, in addition to the FBiH Ministry of Environment and Tourism, other ministries are responsible for the field of management of some waste streams. Ministry of Health is responsible for establishing systems to manage waste from medical institutions, especially medical waste (as defined and regulated by the Regulations on the management of medical waste). The issue of management of biodegradable agricultural waste, animal waste, waste from veterinary facilities and waste resulting from production and use of chemicals in agriculture and the use of sewage sludge in agriculture are regulated by the Ministry of Agriculture, Water and Forestry in collaboration with the Ministry of Environment and Tourism of the BiH Federation.

### **8.1. Local institutional structure**

At the level of FBiH municipalities, environment is the responsibility of:

- Department for communal services,

- Communal utilities enterprises.

The Law on the Basics of Local Self-Government ("Official Gazette of Federation BiH", No: 6/95), which was adopted on the basis of the Decree on Ratification of the European Charter of Local Self-Government adopted by Republic of BiH ("Official Gazette of BiH", No: 31/94), in Article 8.5 provides that, self-governance activities will primarily include "conduct of utilities-related and other services and local infrastructure in the municipality." Articles 18 and 19 of the above-mentioned Law lay down that cantonal assemblies are authorized to bring laws on local self-government for their territory/region. All ten cantons adopted the laws on local self-government which determined the competences and responsible bodies in municipalities. The legislative bodies of municipalities passed the Statute of the municipality and on the basis of the Statute adopted a Decision on the organization of administrative bodies in its territory. This decision defined the relevant municipal services and the scope of their work.

Communal utilities enterprises were established in line with the Law on communal services and with municipal decisions.

The 1990 Law on Communal Services (SR BH Official Gazette No. 20/90) defined that communal services have special interest for the society. The Law on Communal Services identified communal operations of special social interest, the way to ensure special social interest, organization of conduct of communal operations, the way of their financing and other issues important for communal operations.

Waste management is one of the communal operations like water supply, gas supply, transportation, funeral activities, etc. governed by this Law. Collection and disposal of municipal waste includes municipal solid waste collection from residential and commercial buildings and its removal to designated sites. Disposal of municipal waste includes final disposal of municipal waste to landfill and rehabilitation and closure of the landfill in accordance with special regulations.

The Law requires that providers of communal services must be registered to conduct certain activities, that they have the equipment and resources to work, appropriate professional staff, then to ensure the performance of communal services and to continuously work to raise the quality of communal services and improve municipal services in general.

This Law also stipulates that the municipalities will provide organized communal activities, either through a company founded by the municipality for this purpose, or entrusting other utilities companies, which are also engaged in other economic activities. Municipalities can delegate the task to perform municipal services under certain conditions. The matters of public companies in Municipalities are regulated by the Decision on Communal Activities. The Decision precisely defines the way of organizing communal activities by identifying companies that will perform certain communal services.

## **9. CLUSTERS, BUSINESS ZONES, TECHNOLOGY PARKS IN BIH**

Industrial/business zones should be seen as one of the instruments in the implementation of new industrial policies that promote important economic goals. Industrial / business zone in their regional characteristics raise their efficiency by including the regional network of industrial / business zones, which may represent a good basis for formation of regional clusters. The need for industrial / commercial zone to become more specialized and thus achieve maximum competitiveness and attractiveness to investors has been recognized in BiH. In this sense, industrial / business zones should enjoy adequate support. This support should be considered in the context of support for cluster development, because the industrial / business zones can be considered as small clusters, especially in cases of specialized industrial / business zones. *There is no cluster in Bosnia and Herzegovina whose focus is environmental technology and use renewable energy sources.*

## **10. FINAL CONCLUSIONS**

BiH lacks strategic documents for the development of the energy sector, and has no energy efficiency strategy at the state level. The institutional framework for improvement in the field of environmental technologies and clean production is set by the Law on Environment Protection, primarily by introduction of environmental permits and by-laws which prescribe the procedure of environmental impact assessment. The logical path for BiH is the one on which BiH follows the European objectives in this area and focus on the implementation of the Energy Community Treaty and the directives of the European Commission related to energy, as well as the IPPC Directive, and documents associated with it. Energy efficiency was mentioned through the National Environmental Action Plan (NEAP) and the Medium Term Development Strategy (PRSP), which note that the environmental protection and rational use of energy are important in the fight against poverty. NEAP proposes to develop a program of stabilization and reduction of harmful gas emissions by improving energy efficiency, technological reconstruction, more efficient use of energy sources and increased use of renewable energy sources.

Bearing in mind the current state and progress of BiH on its path of

European integration, civil society organizations made the following recommendations<sup>33</sup> for decision makers:

- Ministry of Foreign Trade and Economic Relations of BiH, Federal Ministry of Environment and Tourism, the Ministry of Physical Planning, Civil Engineering and Ecology of Republika Srpska should urgently pass a Law on Environment Protection at the state level.
- Ministry of Foreign Trade and Economic Relations of BiH and the Ministry of Civil Affairs of BiH should develop guidelines for the implementation of the Social Action Plan for Bosnia and Herzegovina from 2010.
- Ministry of Foreign Trade and Economic Relations of BiH should further support the work of the newly formed DNA agencies, to provide training for faster implementation of CDM projects.
- Federal Ministry of Physical Planning needs to implement the EU Directive 2010/31/EC on the energy characteristics of buildings which are defined by the Law on Spatial Planning and Land Use in the FBiH and the Rulebook on technical requirements for thermal protection of buildings and the rational use of energy, and the Rulebook on energy certification of facilities, while the Ministry of Physical planning, Civil Engineering and Ecology of RS should urgently pass the Law on the implementation of this EU Directive.
- The BiH Ministry of Foreign Trade and Economic Relations, Federal Ministry of Energy, Mining and Industry and RS Ministry of Economy, Energy and Development should urgently start the establishment of the Agency for Energy Efficiency at state, entity and local levels.
- Federal Ministry of Energy, Mining and Industry and RS Ministry of Economy, Energy and Development should ensure a strong and transparent financial and administrative support to investors for the projects of energy efficiency and renewable energy sources.
- The Agency for Statistics is required to collect and appropriately present all the information about the projects implemented in the energy sector at the state level.
- Environment Protection Fund of FBiH and Environment Protection Fund of RS should encourage and co-finance projects in energy efficiency and renewable energy sources.
- The strategies of Cantonal Assemblies, Governments, and municipalities should give priority to sustainable development projects that encourage energy efficiency and renewable energy sources.
- Cantonal Assemblies, Governments, and municipalities should ensure access to funds for co-financing of projects in energy efficiency and renewable energy sources for citizens.
- Local governments should set an example for citizens by implementing energy efficiency projects and projects of renewable energy sources.

- Universities and other scientific research institutions should be more active in development and realization of research projects in energy efficiency and renewable energy sources.
- Local governments should set up an office for Energy Efficiency Advisors in local communities.
- The work of Energy Efficiency Advisors should increase the level of education and create new programs of civic education on efficient energy use.
- Cantonal Assemblies, Governments, and municipalities need to harmonize laws on communal activities with the Consumer Protection Act, and other laws relevant to this area.
- The BiH Ministry of Foreign Trade and Economic Relations, or the future competent institution for aggregation of data, should nominate at least one person as a contact point for civil society at the state level to allow easier access to information in energy and environment sectors.

## 11. LIST OF ENTERPRISES

### 11.1. Public Communal Utilities Enterprises

Below is an overview of public utilities enterprises in areas of interest to NERDA and REZ Agencies. (a detailed review is also published by the Association of Employers in Utilities Industry in the BiH Federation<sup>34</sup>, as well as of businesses whose activities include environmental technologies and/or production of renewable energy.

Table 7. *Public Utilities Enterprises in NE BiH*

COMPANY NAME	ADDRESS/CONTACT
JKP "KOMUNALAC" Tuzla	Tuzla, Husinskih rudara bb <a href="http://www.komunalactz.com.ba">http://www.komunalactz.com.ba</a> Tel/fax: +387 35 302 552
JKP "RAD" Lukavac	Lukavac, Partizanski put bb
JKP "KOMUNALAC" Kladanj	Kladanj, Ulica 10 Tel/fax: +387 35 621 310
JP "KOMUNALNO" Živinice	Živinice, 2 Krajiške bb <a href="http://www.komunalno-zivinice.com">http://www.komunalno-zivinice.com</a> Tel/fax: +387 35 774 473
JKP "KOMUNALAC" Kalesija	Kalesija, Kalesijskih brigada bb Tel/fax: +387 35 631 214
JKP "ČISTO" Dobož Istok	Dobož Istok Brijesnica mala 105-a Tel/fax: +387 35 722 697
JP "KOMUNALAC" d.o.o. Banovići	Banovići, Školska 2 Tel/fax: +387 35 875 355
JKP "KOMUS" d.o.o. Gračanica	Gračanica, M.Ahmetbegovića 9 Tel/fax: +387 35 706 680
JKP "KOMUNALAC" Gradačac	Gradačac, H.K.Gradašćevića 114 Tel/fax: +387 35 817 219
JP „9 SEPTEMBAR“ Srebrenik	Srebrenik, Kiseljaci b.b. Tel/fax: +387 35 645 759
JKP „ČISTOČA“ Čelić	Čelić, Zlatnih ljiljana 3 Tel/fax: +387 35 668 002

Table 8. *Public Utilities Enterprises in Central BiH*

COMPANY NAME	ADDRESS/CONTACT
JP VIK Zenica	Zenica, Bistua Nuova 17
JKP KOMUNALAC Busovača	Busovača, S.S.Kranjčevića bb
JKP VIS Doboj Jug	Doboj Jug - Matuzići, Matuzići bb
JP VIK Bugojno	Bugojno, Ulica Slobode bb
KJP Maglaj	Maglaj, Osmo Ulica 4
JKP RADNIK Zavidovići	Zavidovići, Podubravlje 3
JKP KOMUNALAC Žepče	Žepče
JKP USORA	Usora
JKP RADOVINA Gornji Vakuf	Gornji Vakuf
KP GRADINA Donji Vakuf	D. Vakuf, 770 Slavne brigade 15
JKP VILENICA-ČISTOĆA Novi Travnik	N. Travnik, Stjepana Tomaševića bb
JKP BAŠBUNAR Travnik	Travnik, Kalibunar 3-a
JKP VITKOM Vitez	Vitez, Kralja Tvrtka bb
JP VODOKOM Kakanj	Kakanj, Zgoščanska 51
KP RAD Tešanj	Tešanj, Patriotske lige
ALBA-ZENICA d.o.o. Zenica	Zenica, Sarajevska bb <a href="http://www.alba.ba">http://www.alba.ba</a>

## 11.2. Businesses

Table 9. *Businesses*

COMPANY NAME	ADDRESS/CONTACT	PRIMARY FIELD OF ACTIVITIES
„C&G“ d.o.o. Sarajevo	Sarajevo, Sime Milutinovića Sarajlije 15/I Tel/Fax: tel: +387 33 212 352 <a href="http://www.c-g.si/ba/podaci/">http://www.c-g.si/ba/podaci/</a>	More details at website <sup>35</sup>
„Grioss“ d.o.o. Grude	Grude, Republike Hrvatske 71 Tel: +387 39 661 612 Fax:+387 39 661 609 <a href="http://www.grioss.com">http://www.grioss.com</a>	More details at website <sup>36</sup>
"Süd-Müll", d.o.o. Tuzla	Tuzla - Bukinje, Vjekoslava Tunjića 1 Tel: +387 35 31 09 50 Fax:+387 35 31 09 51 <a href="http://sud-mull.jimdo.com/">http://sud-mull.jimdo.com/</a>	More details at website <sup>37</sup>

COMPANY NAME	ADDRESS/CONTACT	PRIMARY FIELD OF ACTIVITIES
"Kemis", d.o.o. Lukavac	Lukavac, Kulina bana bb Tel/Fax: +387 35 556 988 <a href="http://www.kemis.ba/">http://www.kemis.ba/</a>	More details at website <sup>38</sup>
'Kemokop'', d.o.o. Tuzla	Tuzla, Mehmedalije Maka Dizdara, PZC Stupine do B-11 Tel./Fax.: +387 35 251 118	Waste oils with polychlorinated biphenyls, pyralen oil transformers with PCBs, waste pharmaceuticals, etc.
"Tuzlamet'', d.o.o. Tuzla	Lukavac, Termoelektrana b.b. Tel./Fax: +387 35 553 441 <a href="http://tuzlamet.com/">http://tuzlamet.com/</a>	More details at website <sup>39</sup>
"Delta Petrol", d.o.o. Kakanj	Kakanj, Alije Izetbegovića bb Lamela P+4+M Tel./Fax.: +387 32 552 211 <a href="http://www.delta-petrol.com/">http://www.delta-petrol.com/</a>	More details at website <sup>40</sup>
„Reciklon“ d.o.o. Tuzla	Sarajevo, Brčanska 5 Tel: +387 (0) 33 716 755 Fax: +387 (0) 33 716 756 GSM: +387 61 103 534; +387 62 585 560 <a href="http://reciklon.ba/">http://reciklon.ba/</a>	More details at website <sup>41</sup>
C.I.B.O.S. Sarajevo	Ilijaš, Bosanski put 215 Tel.: +387 33 580 270; +387 33 580 280; +387 33 580 281 <a href="http://www.cibos-scholz.ba/bosanski/unternehmen/bosna.htm">http://www.cibos-scholz.ba/bosanski/unternehmen/bosna.htm</a>	More details at website <sup>42</sup>
SIROVINA-EKO d.o.o. Maglaj	Maglaj, Tešanjaska 1 Tel.: +387 32 603 572; +387 61 758 293	Purchase and processing of secondary raw materials
"SIROVINE PEZIĆ" d.o.o. Kalesija	Kalesija, Miljanovci b.b. Tel/ Fax : +387 35 617 491 Mob.: +387 61 195 050 <a href="http://sirovinepezic.blogspot.ba/">http://sirovinepezic.blogspot.ba/</a>	More details at website <sup>43</sup>
ALBA d.o.o. Zenica	Zenica, Sarajevska bb Tel.: + 387 032 442 851 Fax: + 387 032 440 611 <a href="http://www.alba.ba">http://www.alba.ba</a>	More details at website <sup>44</sup>



COMPANY NAME	ADDRESS/CONTACT	PRIMARY FIELD OF ACTIVITIES
BINELA KOMERC doo Zenica	Zenica, Sarajevska 294 Mob.: +387 61 166 261	The collection, purchase and sale of secondary raw materials - waste materials
VUL-EX Busovača	Busovača, Kaćuni (Bukovci) 45 Tel: +387 63 567 538 Fax: +387 30 876 516 <a href="http://www.vul-ex.com/">http://www.vul-ex.com/</a>	More details at website <sup>45</sup>
DILAVER Company doo Zenica	Zenica, Tetovska 497/A tel./fax: +387 32 431 435 <a href="http://dilaver-company.com.ba/">http://dilaver-company.com.ba/</a>	More details at website <sup>46</sup>
FAJEM doo Zenica	Zenica, Bulevar Kralja Tvrtka I br.17 Tel./Fax.: +387 32 403 708 Mob.: +387 61 448 526 <a href="http://www.fajem.com/">http://www.fajem.com/</a>	More details at website <sup>47</sup>
"TOLA COMPANY" doo Zenica	Zenica, Lukovo polje 75 Tel./Fax: +387 32 203 220; +387 32 403 433 <a href="http://www.tolacompany.ba/">http://www.tolacompany.ba/</a>	More details at website <sup>48</sup>

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