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AN EXAMPLE OF IMPAIRED BIODIVERSITY– HPP DIKANCA

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Abstract – The project related to the repairing phase on the HPP Dikanca has caused a significant disturbance of biodiversity in one part on the riverbed of the river of Brod and nearby, i.e. along the entire constructed flume with a dam, also including its two dams. This paper's purpose is to serve the engineers and other experts as a good example how not to behave towards healthy living environment, i.e. biodiversity.

Energy balance of available primary energy, in the aspect of hydroenergy as energy source, is almost equal to zero or 0,36 % in relation to all energies from primary sources. Taking into account that this part of the territory is rather poor (deficient) with water, the water will be a limiting factor in planning the future economic development of the society. We reach the conclusion that it is required to change the manner of dealing with water capacities for the purpose of sustainable development of society and environmental protection.

In the territory of Gora, it is planned to build six mini power plants on the rivers of Brod and Rastelica and it is very important to comply with all legal and sublegal terms, as well as to satisfy the criteria for environmental protection. Perhaps it would be the best to reconsider the allowing of the implementation of the mentioned projects, since the behaviour of participants in HPP Dikanca project is irresponsible.

Keywords **-** biodiversity, living environment, energy, hydropower plant.

I. INTRODUCTION

IN MOST countries there is a special body competent for living environment, and national policy of environmental protection. In most countries, by analyzing international documents, those competences are transferred onto the competences of local bodies with the obligation to implement the policy and apply the regulations adopted at national level. If the situation requires and the country is not able to adopt regulations, local government bodies can adopt particular regulations that would ensure the sustainability of the specificity of biodiversity both in those regions or areas.

European Union strives for the equalization of criteria with the requirements in the aspect of preservation and improvement of living environment quality. It is very important to emphasize the fact that both economic and environmental goals are integrated in Europe, as well as the measures for consensus in terms of developmental goals in Europe are also emphasized.

Most European countries, in the process of joining the EU, had the equalization of national legislation with EU laws in all sectors as a crucial activity.

When it comes to harmonization of our legislation with international conventions and declarations from this field, the most significant certainly are:

1) *„Declaration on the Human Environment" adopted at the first Conference of the United Nations on human environment in Stocholm in 1972. It stresses out the necessity of preserving the water, air, soil, flora and fauna and representative ecosystems for the welfare of present and future generations.*
2) *„Convention on Biological Diversity" adopted in Rio de Janeiro in 1992. stresses out the significance of preserving biological diversity in planetary proportions.*
3) *„Declaration on Conservation of Flora, Fauna and their Habitats" adopted by Economic Commission for Europe UN (ECE) in 1988. regulates rules of behaviour towards jeopardized species of flora and fauna of international significance, for the purpose of their conservation.*
4) *„Convention on International Trade in Endangered Species of Wild Flora and Fauna", abbr. CITES or so-called Washington Convention (Washington, 12 February- 2. March 1973.), is the international agreement that provides international cooperation in protection of particular species of wild flora and fauna from excessive exploitation through international traffic.*
5) *„Convention on Wetlands of International Importance especially as Waterfowl Habitat" (Ramsar, Iran, 1971).*
6) *„Convention on Conservation of European Wildlife and Natural Habitats", or so-called Bern Convention (Bern, 1979.), international agreement on conservation of the species of flora and fauna in nature and their natural habitats, particularly those whose protection requires international cooperation.*

Partial solving of biodiversity issues cannot be successful, because practical experiences have shown that it is impossible outside the system of living environment. Each biodiversity issue must be institutionally regulated and the unity of relations in this

field must be provided, as well as constant and continuous cooperation, coordination of all the subjects and their interests, at all organization levels in entire territory.

Harmonized relations between living beings are a guarantee for stability of biosphere. Biodiversity is characterized by millions of organic species and their combinations that are partially explored (5-10 % of organic species), and for human welfare only 0,2 % of the total species on the Planet is used. According to the latest data, from the total of 270.000 species of global vascular flora, about 60.000 herbal tascons are dramatically jeopardized, while about 380 species have vanished. In the last 200 years, 600 animal species vanished (86 mammals, 104 bird species, 20 lizards, 5 amphibians, 80 teleost fishes, 72 insects, 206 gastropods and other groups) [1-3, 11,12, 15, 16, 20, 28-32].

Reasons for the vanishing of plant and animal species on Earth are [15]:

1) *Destruction of natural habitats,*
2) *Introduction of allochthonous species,*
3) *Excessive exploitation of species,*
4) *Direct or indirect pollution of water, air and soil.*

II. PRESENTATION OF ENERGY BALANCE

Energy balance on Kosovo during 2011 relies on the structure of primary consumed energy, which is not significantly changed in relation to 2010. The review of the amount of available energy from primary sources is presented in TABLE I [33].

TABLE I: THE REVIEW OF THE AMOUNT OF AVAILABLE ENERGY FROM PRIMARY SOURCES [33]

Energy sources	ktoe	%
Coal	1.623,49	64,81
Oil derivatives	591,56	23,61
Biomass	241,93	9,66
Electrical energy	38,27	1,53
Hydroenergy	9,00	0,36
Solar energy	0,63	0,03
Wind energy	0,02	0,00
Biofuels	0,13	0,00
Total	**2.505,03**	**100,00**

According to EUROSTAT methodology, electricity is based on imported and exported energy that amounted to 38,27 ktoe or 1,53 % in 2011. While the consumption of electric power in the same year amounted to 396,80 ktoe. Supply of electricity was mostly based on production of thermal power plants of Kosovo A and B, with the amount of produced electricity of 489,89 ktoe, i.e. supply of electricity achieved in the amount of 5.234,6 GWh [33].

Data on hydroenergy obtained by KEK j.s.c. *(Kosovo Energy Corporation)* and KOSTT j.s.c. *(Kosovo Electricity transmission, System and Market Operator)* are based on the amount of the production of electricity in hydropower plants: HPP Gazivoda (74.387 MWh), HPP Bistrica (22.304 MWh), HPP Radavac (2.985 MWh), HPP Dikanca (4.352 MWh) and HPP Istok (597 MWh). In 2011., the amount of hydroenergy was 9,00 ktoe or 0,36 %. The amount of supplied electricity was 104,63 GWh. Energies obtained from the sun, wind and biofuels are negligible and amount to 0,00 % [33].

The amount of energy obtained from import is 816,20 GWh.

Data that are presented clearly indicate that energy potential is in almost 65 % based on coal.

Consumption of energy per capita is 0,73 toe, while energy intensity is 0,54 toe/1.000 €.

If we overview the data presented in numerous studies over the previous years, we'll be sure that they refer to the amount of water, and, we will achieve a conclusion that region of Kosovo is poor in this resource that is the most significant for survival on Earth.

HPP Dikanca was commissioned in 1957. Production capacities were relied on two generators of equal apparent powers of 0,55 MVA (G_1+G_2=1,1 MVA), active power of 0,5 MW (G_1+G_2=1,0 MW), speed 1.000 r/min and maximum amount of water $\cos_\varphi$= 0.8 (Fig. 1).

Then, on the basis of the decision of Electrokosovo, no. 283 since 11. March 1975, the capacities were improved up to 0,95 MW (G_1+G_2=1,9 MW).

And finally, the repairing phase on the HPP Dikanca was carried out in 2010., i.e. through privatization process following a reached agreement regarding the purchase of produced electricity, between KEK j.s.c. (Kosovo Energy Corporation) and *Frigo Food Energy Invest* from Albania with the purpose of improving techical capacities, i.e. rehabilitation on 2,66 MWh [33].

Hydroenergy as a primary source is present with 0,36 %, i.e. HPP Dikanca with its capacity is nearly zero, almost without any impact on energy balance of available energy from primary sources.

Having in mind the above mentioned, we can see that capacity of HPP Dikanca is not significant for economy and it brings more harm than benefit to the society. It is required to seriously take into account to stop investing in such or similar undertakings that will impair biodiversity and jeopardize living environment and provide advantage to other energy sources (sun, wind and biomass), and society does not have any benefit that is more significant.

The Energy strategy of Kosovo (ESK) predicts the construction of thermal power plant "New Kosovo", with new excavations, obtaining electricity from water, sun and wind. Techical study was done on feasibility and possible hydropotential capacities, where 18 locations were identified for the production of electricity from hydropower plants of small capacities (less than 10 MW). The study warns about the effects and impacts that these small hydropower plants that can have on healthy living environment with a special insight into biodiversity [33].

This area of Balkans is rather deficient in water and it is among the areas with the lowest water capacity in

Europe. We should mention that water resources are insufficient in comparison with the needs for water, i.e. unequal existence in time and space, which is a limiting factor for future economic development of Kosovo. The capacity of topographic surface of accumulation is 10.908 km^2. It takes place on four accumulating basins with discharge of water in three seas: Adriatic (Beli Drim), Black (Ibar and Binačka Morava with 43,5 %) and Aegean sea (Lepenac with 5,8 %). In lowlands, the average of annual precipitations is about 600 mm and in mountain areas it is 1.400 mm. East region is much more poor in relation to the West part of the territory [33].

Numerous studies show that the following issues were identified:

1) *Loss of biodiversity of water flora and fauna,*
2) *Insufficient amount of water,*
3) *Dam's safety,*
4) *Objects for the needs of hydroenergy are the threat for water biodiversity.*

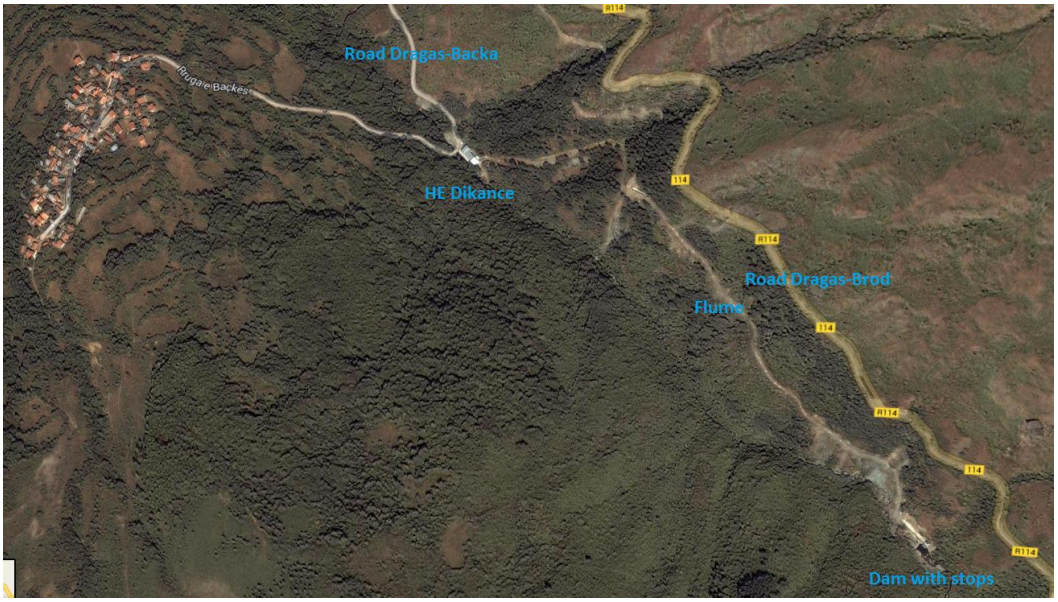

Fig. 1: Position of HPP Dikance with flume and dam

III. ANALYSIS OF IMPAIRED BIODIVERSITY POSITION

Biodiversity is the base of life on Earth, under man's pressure it is alarmingly destroyed, by using natural resources and it represents a serious threat for humanity. Uncontrolled economic activities are main reasons for jeopardizing biodiversity and many business activities depend on biodiversity, i.e. all business activities have direct or indirect impact on biodiversity.

Good management of waters can have a significant impact on biodiversity. Demand for water is being increased every day and it is predicted that it will be both the most required and important resource for survival of human kind in next-coming period of time.

Strategy and Action plan of biodiversity during 2011-2020, being derived from Article 140 of the Law on Nature Protection, no. 03/L-233, approved by Decision no. DL-054-2010., since 18.10.2010., and publishing in Official Gazette of Kosovo, no. 85, since 09.11.2010., it's considered as the basic document related to nature protection determining the long-term goals of biodiversity conservation and diversity of landscapes, protected values of nature, as well as manner of implementation in accordance with overall economic and social development. Main goal of the Strategy is not only to demonstrate open issues that refer to biodiversity, but also to create the framework of tendencies and activities with better coordination, giving the priority to programmes with strategic approach for development of future initiatives [20]. There are four basic principles of this Strategy [20]:

1) *Conservation of biodiversity,*
2) *Sustainable development based on sustainable use of natural resources,*
3) *Creation of income,*
4) *Division of benefits from using biodiversity in equal manner.*

Strategy tends to fulfill the tasks according to Convention on Biological Diversity, Convention on International Trade in Endangered Species of Wild Flora and Fauna, then Convention for the Protection of the World Natural and Cultural Heritage, Conventions on Wetlands, Convention for the Protection of Migratory Species of Wild Animals, as well as compliance with teh Law on teh Protection of Nature, Directive on Natural Habitats, Directive on Wild Birds, Framework Directive on Waters, Convention CITES etc. [20].

Šar mountains represent a rather small surface, but extremely rich in plant and animal species. Therefore, 18 types of local endemic plants are identified and they grow on this territory or nearby (nowhere else on the Planet) and more than 300 endemic types that grow only

in Balkans. Šar mountains represent one of the most significant centers of endemism in Balkans and Europe. Total number of species is larger than in some European countries.

Diversity is a result of complex interactions of physical factors (soil and climate) that create diversity of habitats and conditions for the growth of plants. As a result of human activity, about 24 types of plants are in danger.

Favourable conditions for diversity of plants enable high degree of diversity of animals in such a small territory. There are about 46 types of mammals, most of them is of regional and global significance. Some types of water birds have disappeared as a consequence of the destruction of wetlands, pollution and degradation of rivers. Biodiversity of river ecosystem is seriously reduced. Birds, within fauna, take significant place with about 180 types, more than half of these can be found in Balkans only. Predators are present with 22 species, most of them are endangered species [1-3, 11,12, 15, 16, 20, 28-32].

Previous studies have shown the diversity of about 1.800 species of vascular flora, however particular sources say that it reaches about 2.500 species. There is no complete study on flora and fauna. Vegetation is rich with 139 plant associations grouped in 63 genders, 35 orders and 20 classes.

Status of endangered species in Region is presented in TABLE 2.

TABLE 2: STATUS OF ENDANGERED SPECIES [1-3, 11,12, 15, 16, 20, 29-33]

Species	Number of species	IUCN 1994	Preliminary Red list of vertebrates
Mammals	100	11	72
Birds	360	11	353
Lizards	25	3	22
Amphibians	23	0	22
Fishes	110	12	30

On Šar mountain, there are about 2.000 plant species, where the group consists of numerous tertiary and glacial relicts, 332 endemites and about 20 local endemites, which is classifying it into one of the most significant centers of European high-mountain endemism. Like flora, vegetation is also extremely diverse with about 112 plant communities. Grandeur of the richest region in Europe is completed with 147 types of daily butterflies, 120 types of running insects (15 types of endemies), short-winged 88 types (10 types of endemities), presence of 9 types of amphibians and 14 types of lizards [1-3, 11,12, 15, 16, 20, 28-32].

When we take the presented situation into account, then the following question is asked: who should participate and be responsible for conservation and sustainability of living environment?

All relevant bodies, starting from local government to government, are responsible for the existence of human kind. It can be achieved if we pay attention to survival, conservation and sustainability of biodiversity. If we show boldness and seriousness, then we will justify the role of main creator of healthy living environment.

IV. PRESENTATION OF CURRENT SITUATION - HPP DIKANCA

The concept of spatial development of the National Park of "Šar" represents the basic framework of possible spatial developments in park and provides simpler decision-making in relation to its future developments. This concept tends to realize the vision determined for national park, through adequate implementation of future development, through the accomplishment of previously set purpose and goals. This concept deals with the following issues:

1) *living environment and use of land,*
2) *socio-economic development and*
3) *infrastructure.*

Concept deals with the issue of conservation of particular values of biodiversities, endemic and steno endemic types of flora and fauna, and to somewhat less extent, the concept deals with development that will provide the sustainability of the Park. These values and wealth exist on entire territory of the park and are divided into zones according to the content and significance, as it is presented in Fig. 2.

We also need to mention that biodiversity is both food and medicine, fuel and construction material, paper and fabric, natural wealth of each country, it is a precondition for easy life of population. Biodiversity is beauty, inspiration and real natural wealth.

Unfortunately, behaviour of a man towards the nature is not in compliance with its basic laws. The increase of human population, spreading of urban environments, excessive and uncontrolled use of natural resources are main factors that jeopardize living environment. In the previous 150 years, the mankind has jeopardized its environment much more than any other factor in entire geological history of the Earth. Climate changes are primary problem, as well as number of extinct and endangered plant and animal species.

HPP Dikanca is located in Dragaš municipality, in the area of Gora, in the vicinity of the villages of Dikanca and Baćka (Latitude: 42° 02' 32" **N** and Longitude**:** 20° 40' 57" E).

During 2011., new water channel is constructed, its length is about 2,5 km (Fig. 3a,b). Along entire construction, land road is open and biodiversity system is entirely changed by land works, reinforced concrete and other construction works (Fig. 4a,b). The allowed minimum of water draining into riverbed was not considered. Unfortunately, the water is 100 % aimed into the channel.

Behind the dam and along newly-built channel, biodiversity is entirely destroyed and riverbed remained entirely empty. It is obvious that legal minimum of 25 % of water in riverbed and 75 % that can be exploited is not respected.

Any other word would only disturb the credibility of photos that confirm everything that is done with this part of the nature, i.e. how HPP Dikanca and their owners treat environment and biodiversity (Fig. 3-6).

It is left to be seen whether some of the authorities will respond to such projects and to those that are planned for the future. I believe that reason and care for our land will prevail and that citizens of Gora will respond and prevent such a crime over nature.

It is left for us to hope and pray for reason, when adequate scientific knowledge was not applied.

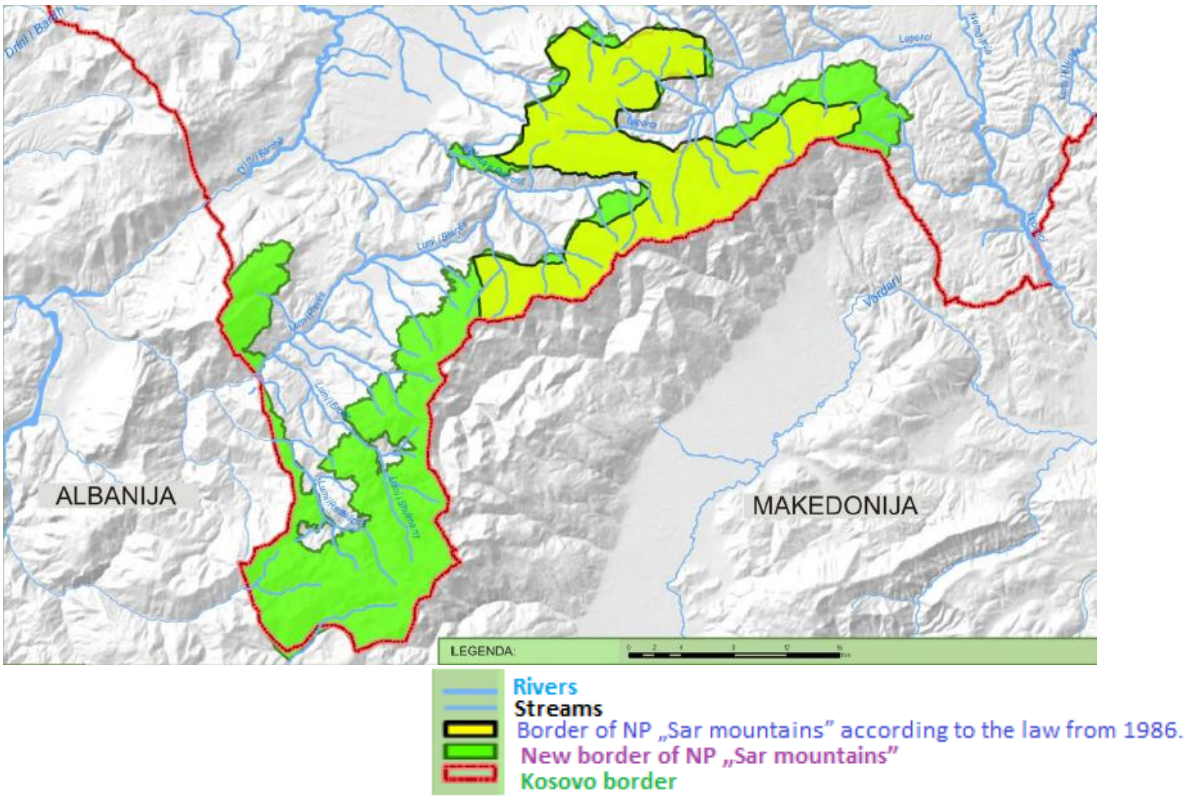

Fig. 2: Borders before and after expansion of National Park „Šar"

Fig. 3a,b: HPP Dikanca (object and construction of a new channel, 2011)

Fig. 4a,b: HPP Dikanca (development of a new channel and „empty“ riverbed, 2011.)

Fig. 5a,b: HPP Dikanca (development of a new dam with two stops and „empty“ riverbed, 2011.)

Fig. 6a,b: HPP Dikanca („empty“ riverbed and constructed new channel with „empty“ riverbed, 2011.)

Perhaps some other solution is better that would be much more useful for entire region, and particularly Prizren area. Studies that have shown what amount of energy potential is only in solid waste of organic origin, can draw the strategy on other sources of energy and other solutions [21-27].

We present one of the possible solutions. For obtaining 1 kWh of electricity and 1,24 kWh of heat, the required amount of renewable energy sources, i.e. solid waste is from 5 to 15 kg. If for the calculation of energy potential we adopt medium amount of 10 kg, then on the basis of total mass annually for 2012. is 46.889 tons, and average amount per months is 3.907,4 tons. While the average daily amount is about 130, 25 tons. If we perform the evaluation per volume t in m^3, based on current studies, the relation would be the following 46.889 t x 1,5 = 70.333,5 m^3. and it corresponds to density of compact material from 50 to 60 % and it is required to add about

15 % of inert material for covering of disposed waste and amounts 64.706,82 t.

If we would consider the collected solid waste in the period from 2007 to 2012., then it is about the amount of 266.091 tons or 319.309,2 m^3. And if we include the following period of 20 years, then the amount of collected communal waste would be (medium value from 2007 to 2012 of 44.348,5 tons) 886.970 tons or 1.330.455 m^3. Probability of increasing generated communal waste per citizen is real, as well as increase of population number, which additionally guarantees that it is about significant amounts of communal waste as potential resource (Fig. 7) [4-10, 13,14, 17-19, 21-27, 29-32].

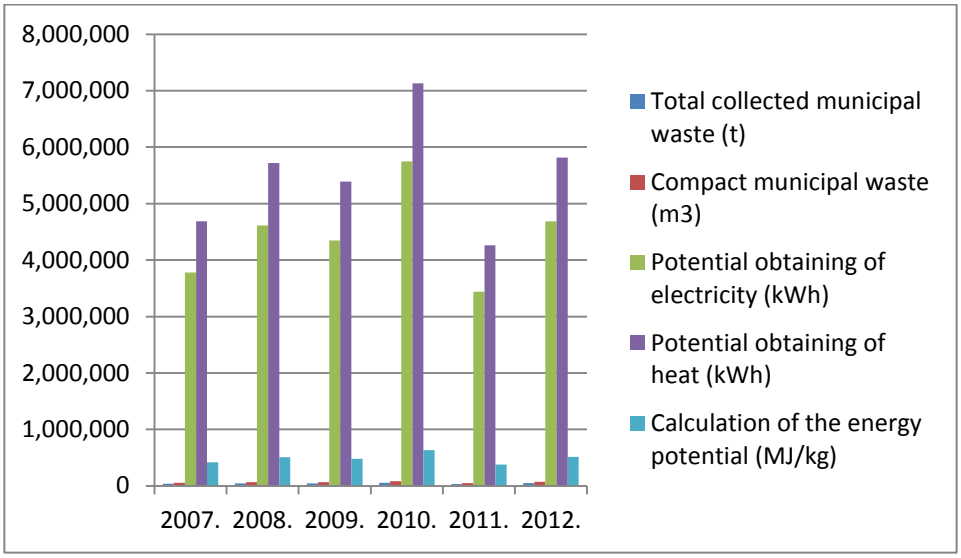

Fig. 7: Graphical overview of the energy potential calculation of the Prizren region (2007-2012) [4-10, 13,14, 17-19, 21-27, 29-32]

Calculation of energy potential is related to heating power of one kg of solid communal waste (Bar - Montenegro), the average is taken 11.235 kJ/kg, for the paper it is 13.490 kJ/kg, biootop 9.300 kJ/kg, food waste 7.560 kJ/kg, plastics 26.960 kJ/kg, wood 16.050 kJ/kg, fiber 15.350 k/kg and rubber/leather 19.538 kJ/kg. For each communal waste, it is required to determine in laboratory its bottom heating power, and thus for Prizren region we took medium values or approximate values from experiences of Belgrade, Zagreb and Bar. We will assume that heating power of solid communal waste is about 11 MJ/kg [4-10, 13,14, 17-19, 21-27, 29-32].

Communal solid waste can be of different composotion and size. It consists of organic matters (flammable) and inorganic (inflammable) matters. Size of particles can be different, from dust to bulky materials, such as furniture and different house devices. Average bottom heating power of typical communal soild waste is about 11 MJ/kg. Determination of heating power and other characteristics of communal solid waste was defined in standard CEN/TS 15359 – Solid recovered fuels – Specification and classes.

For the operation of plants for incineration of rated electrical power of 1 MW it takes within 24h about 45t of communal solid waste. According to the analysis carried out in USA, cities could provide for about 10 % of needs in electrical energy from communal solid waste. By application of incineration, the surface required for disposal of solid communal waste is reduced and price of those surfaces are constantly increasing.

And finally, resource and environmental protection, why not? We should always seek for different solutions, offer more options and decide afterwards.

V. CONCLUSION

Each project that endangers living environment must meet the criteria and law in order to avoid the conflict of interests with citizens, i.e. human kind.

Unfortunately, this example of HPP Dikanca shows the relationship of a man towards nature that is not in accordance with its basic laws. Not to mention legal regulations, conventions and other legal and sublegal acts in region, Europe and at global level.

In 21st century, ignorance cannot be an excuse for destruction of healthy living environment, when there is enormous ecological and biological knolwedge that can enable the raise of awareness to adequate level, as well as to understand the possible consequences for humanity, biosphere and Planet.

Survival of humanity is related and conditioned with biodiversity of teh Earth, human hand is crucial factor and everything is mentioned here.

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