Organization for Protection of Environment"Gjethi" – OJQ OMMGJ
Address: Culture Center, 1st floor, Kaçanik, 71000, Kosova
FB: @ommghethi
E mail: ommgjethi@gmail.com
Tel: +377 44 756 390

Rationale behind the small hydropower plants in the Lepenci River Basin and the reasons why they shouldn't be built

A general analysis of the negative effects and benefits of these plants

Author: Sami Stagova, MA in Spatial Planning and GIS Application,
Head of Sector for Public Spaces and other Environmental Affairs
Organization for Protection of Environment "Gjethi"

The Author would like to thank the leading team of Gjethi for valuable discussions and analysis on the matters related to hydropower plants; Egzona Bela, eccologist, for going through the part of environmental effects, and all parties and individuals that have supported and are still supporting us in the process of opposing these hydropower plants.

Aprill 2017

Background

Kosovo has a total of 4 river basins: Drini i Bardhë, Ibri, Morava e Binçës and Lepenci. Drini i Bardhë River with the other rivers of that basin flow into the Adriatic Sea; Ibri River, Morava e Binçës River and other rivers of the respective basins flow into the Black Sea, whilst Lepenci River that together with one part of Nerodime form a special basin, flow into the Aegean Sea. Some parts of Kosovo's territory, which in this context are negligible, belong to the river basins of neighboring countries.

The amount of watercourses in Kosovo is as follows (MESP&AKMM 2010, pp. 31-33):

- Drini i Bardhë basin 61 m^3/sec 2200 milion m^3/year
- Ibrit and Morava e Binçës basins 38.7 m^3/sec 1100 milion m^3/year
- Lepenci basin 8.7 m^3/sec 307 milion m^3/year

From the data above, it is clear that Kosovo does not have sufficient water resources; a fact which can affect its sustainable development. Based on the total amount of water flow per year and according to the population estimation by the Kosovo Agency of Statistics for 2016, Kosovo has less than 2000 m3 water / year per capita. In this context, the situation appears much more favorable in most countries in Europe and the region (Croatia with over 26,000, Serbia with over 24,000, Slovenia with about 16,000, Albania with over 13,200, Macedonia with 3,136, etc.):

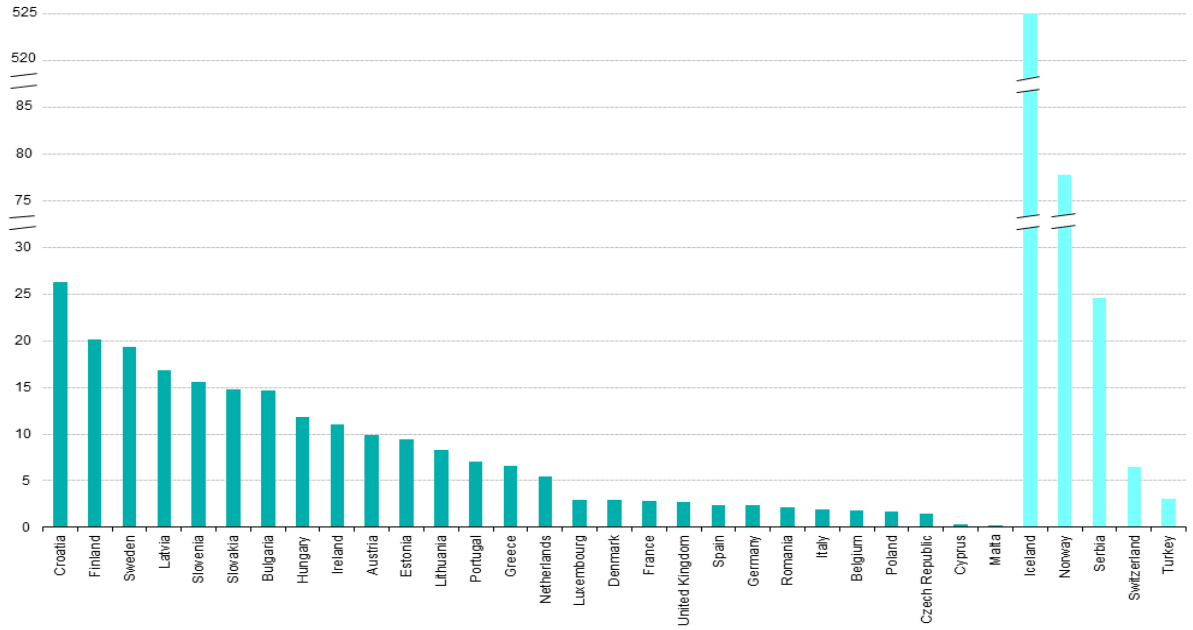

Fig. 1 – Water resources per capita (1000 m^3/per capita) – average of 20 year period[1]

Unequal spatial distribution of water flow within Kosovo is also evident, where the Dukagjini Plain has a more favorable situation than the Kosovo Plain and all this is disproportionate to the distribution of population.

[1] http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Freshwater_resources_per_inhabitant_%E2%80%94_long-term_average_(1_000_m%C2%B3_per_inhabitant)_V2.png

Context

Development of mankind, especially after industrial development, is characterized by the ever-increasing need for energy consumption. Knowing that the energy is extracted from the environmental resources and in parallel with the increase of the energy demands, the exploitation of the environment is also increased and the consumption of these resources in the medium term will result in shortages and irreversible environmental degradation, it was considered necessary and attractive to develop renewable energy sources where water power is more developed so far. For this purpose and consequently for achieving the Kyoto targets, large hydropower plants were built in USA, Brazil, Europe and later in China, India, and still continuing to be built in the shape of small hydropower plants in many other countries (Sperling 2012, pp. 110-118). Hydropower currently covers about 16% of global energy production[2].

Surface water reservoirs (artificial lakes), initially for irrigation purposes and later for drinking water supply and electricity generation, started to be built in Kosovo in the 1960s and ended in the mid-1980s. During this time were built (Hydroplan GmbH 2009, page 8):

- Batllava Lake (1960) capacity of 40 milion m^3
- Badovci Lake (1960) capacity of 27 milion m^3
- Radoniqi Lake (1984) capacity of 113 milion m^3
- Gazivoda Lake (1979) capacity of 370 milion m^3
- Përlepnica Lake (1983) capacity of 4,2 milion m^3

All of these lakes are located in the Kosovo Plain with the exception of Radoniqi Lake. Currently, all of them supply Kosovo cities with fresh water (mainly the ones located in Kosovo Plain). Among them, only Gazivoda Lake is used for electricity production, respectively it supplies water to the Ujmani Hydropower Plant and the cooling system at the Obiliq Thermo power Plants.

Starting from 1999, Kosovo has made a relatively good harmonization of its **environmental legislation** with the EU's (MESP & KEPA 2010). Indeed, it is the UN Declaration in Rio in 1992 and the UNECE Convention in Aarhus in 1998 that legislatively regulate the citizen participation in decision-making processes of environmental affairs. The first one states that the environmental affairs should be managed with the participation of all interested counterparts at the relevant level, whilst at the national level each counterpart should have proper access to the information that the competent bodies have about the environment, including the environmental activities in their communities as well as to have the opportunity to participate in decision-making activities which the government should facilitate, promote through raising awareness campaigns and make information widely available and accessible. The Second one, which through the "Environment for Europe" process makes the first one legally binding, and inter alia links environmental rights to human rights, states that a development can only be sustainable by including all interested counterparts and establishes links between government responsibility and environmental protection. The aforementioned statements have been more explicitly and legally specified by the following UNECE Ministerial Conferences. The Directive of EU Water Framework (WFD 2000/60 / EC) which requires that all water bodies should achieve a good ecological status is important for the context too. Although Kosovo is not a member of UN nor

[2] https://www.iea.org/topics/renewables/subtopics/hydropower/

EU, the SAA and potential co-operation with European states make the implementation of this environmental legal framework compulsory. On the other hand, by being a member of the Energy Community of SEE (ECSEE) and signing the Energy Community Treaty (ECT), Kosovo has taken over the implementation of EnC acquis in its territory (a set of EU Directives related to energy). This means that by 2020, 25% of the gross domestic consumption of energy in the country should be a contribution of renewable energy resources. Moreover, the Energy Regulatory Commission has also set "feed-in" tariffs[3] for hydropower, wind power and biomass, whilst it has not set for solar and geothermal energy (INDEP & KOSID 2014).

Since 2002 until now, more than 100 **small hydropower plants** have been constructed in Albania while more than 300 are yet to be constructed. Kosovo "started to catch hydropower plant fevers" in 2006 by planning and more recently by implementing these plans. It is estimated that the expertise and the experience of the neighboring country has played a key role in designing and making the first steps in this regard in Kosovo, despite the stagnation in the production of energy from lignite (thermo power plant Kosovo C's / Kosova e Re's dubious process) and renewable energy sources-RES (stagnations in constructing the Zhur hydropower plant, in utilizing wind power, sunlight, etc.). As a result of the aforementioned process, in 2013 Kosovo had already been using capacities of small hydropower plants of about 45 MW, while is planning to reach total capacities of about 286 MW in 2020. This, along with other production capacities from renewable energy sources, would account for about 25% of planned energy consumption in the same year (MED 2013).

The Ministry of Energy and Mining / Ministry of Economic Development through the pre-feasibility studies on identification of hydropower sources for small hydro plants conducted in 2006, 2009 and 2010, concluded that there were hydropower potentials in Kosovo for 79 plants (MED 2011). More specifically, at the Lepenci River Basin, studies had foreseen the construction of 23 hydropower plants with a total capacity of 34.4 MW, most of which were projected to be under 1MW.

A typical hydropower plant planned in the Lepenci River basin has the following characteristics. As a model was taken HEC Lepenci 8 (Viça Creek) (EESDC 2009):

- it's of the "run-off-river" type where the flow is diverted into the pipes;
- it has the water catchment facility, the pipes and the building where the energy is produced;
- it's about 3000 meters long;
- it consumes an average of 0.26 m3 / second of water;
- the ecological flow of 8.7 liters / second is planned to be left in the riverbed;
- 1.5 m' high concrete dam with a 2*1.2 m' lattice with 0.8 cm holes is planned to be constructed for water catchment purposes;
- the plant is planned to cost about € 829,774.00 (the amount of € 20,000.00 for environmental mitigation measures have been deducted from the total amount); and
- the plant is planned to produce 0.4 MW for its own needs and 0.6 MW for civil purposes.

[3] "Feed-in" tariff is a policy mechanism for stimulating the development of clean energy technology. It's a long-term contract based on the cost that would enable producers to have a guaranteed production, use and sale of the energy.

All this **planning process** of small hydropower plants and the first steps of **its implementation** were non-inclusive and lacked public participation. From the highest level of government to the lowest one, including the companies that had already received the green light from the central government to plan these projects, there was no serious approach in this regard. Moreover, their efforts to inform the citizens through the public announcements and meetings, due to the lack of seriousness in dealing with this important development, environmental issues as well as public involvement, failed completely. A negligible number of participants were present. Given that the simple information and consultation process with the stakeholders didn't work, one can imagine the scale of provision of environmental information for all, co-operation and joint decision-making, as well as government incentives for citizens to engage as much as possible in these processes. The low level of professionalism and lack of political will of the government has often resulted in flimsy and dubious agreements often made with a person acting "as a community representative" which later served as a justification for consulting with all stakeholders[4]. Consequently, in recent years, the Municipal Assembly of Kaçanik, without any serious discussion and public consultation, had issued consents for constructing the hydropower plants in the Lepenci River basin as follows: the Banovina Bridge hydropower plant (2012), the Soponica hydropower plant (2015), the Kriva Reka hydropower plant (2015) and the Reka e Kotlinës hydropower plant (MA Kaçanik 2015). In the south-east region of Kosovo, civil society and citizens, under the leadership of the Organization for Protection of Environment "Gjethi", objected to the last and the fifth (the future planned) hydropower plants by raising the issue in different ways and levels of government including the public protests[5]. Being under pressure of the aforementioned parties and the media, the Municipal Assembly of Kaçanik had rejected the fifth one and deferred the fourth one (MA of Kaçanik 2017), by finally issuing the consent for it on March 2017. The Municipalities of Shtrpce and Hani i Elezit[6] (MA of Hani i Elezit 2013), as neighboring municipalities of Kaçanik, have also issued consents to some hydropower plants.

Goal

This document aims to identify and analyze comprehensively all the negative effects and potential benefits of hydropower plants in the Lepenci River basin. A summary of the current hydropower activities is covered in the context. Conclusions and recommendations will be provided in the end on the basis of managing that process and the findings analyzed. Certainly, they can be used in other similar cases if considered relevant.

Within the logic of cost-benefit and taking into account the construction/ operation processes of these plants, the document will be structured in a way that will provide a range of positive and negative environmental, social and economic effects analyzed separately. The analysis will be both qualitative and quantitative. Finally, based on the results of the small hydropower plant planning-construction/ operation analysis, a summary of conclusions and recommendations will be provided.

---

[4] http://www.koha.net/arberi/9243/hec-et-qe-fusin-percarje-nder-fshatare-dhe-shkaterrojne-mjedisin/ http://www.insajderi.com/hulumtime/hidrocentrali-vellait-te-shaip-mujes-merr-mbeshtetjen-e-kacanikut-te- pdk-se/

[5] http://klankosova.tv/katemisionet/ora-e-fundit/?emision_id=495721, duke filluar nga minuta 18:06

[6] Other municipalities that their territory belongs to Lepenci River basin

Schematics used in the analysis

One of the best ways to find out whether a public has or would benefit on a project, which in this case is of public character, is to weight all the pros and cons against each other. In this regard, cost-benefit analysis is a technique widely used by economists to evaluate investment options based on the cost implications and benefits to be brought through realization of a project (Williams & Porter 2006). This document obviously does not claim to provide detailed data with accurate cost and benefit values, but there will be serious efforts to identify and analyze them in general so that the conclusion is as comprehensive and as realistic as possible.

Although in the case of hydropower schemes there might be challenges faced while using this technique because it is difficult to calculate environmental degradation to a wider ecosystem or loss of social potential in the area, it still provides a systematic and explicit approach to evaluation of project net benefits (World Commission on Dams 2000, p181). The problems and difficulties involved in using this scheme are related to:

- Limitations in economic assessment of externalities such as the environmental-social impacts that have not been calculated in the past;
- Assessment of long-term impacts and the way of approach (50+ years);
- Difficulties in assessing the risk and uncertainty (energy demand may vary and it's hard to be planned);
- Macroeconomic effects and shifts / impacts in a wider market; and
- Equity in the energy distribution (who is harmed and who benefits) (World Commission on Dams 1999).

In the following sections of the document will be provided separate analysis and assessment of losses / benefits for the process of construction and operation of these plants. Although the initial planning and final elimination process include the associated costs (any product of a project, including the hydropower plants, should be eliminated after being used for the planned time, including the environmental rehabilitation of the site), they are not included in the analysis due to the priorities given to the construction/operation of the plants as the most serious issues faced currently by Kosovo society.

In order to have a clear picture while describing the issues related to the hydropower plants, a classification by the European Union based on their generation capacities is provided below:

- Big more than 100 MW
- Medium 10 – 100 MW
- Small 1 – 10 MW
- Mini 100 kW – 1 MW
- Micro 5 – 100 kW
- Piko less than 5 kW

Given the classification above, the majority of hydropower plants in Lepenci basin are Mini size whilst a number of them are Small.

Negative effects and losses associated to hydropower plants

Nature and environment degradation

The unique nature of the Sharri Mountains and its inalienable values of natural heritage are of unique features that the region and all of Kosovo is identified by them. To protect, plan, develop and promote these values, a certain area is formally adopted as a National Park. A relatively large part of the Lepenc River valley, especially the northwestern part where natural values are high, is included in the Sharr Mountains. Moreover, The Lepenci water springs are within the National Park. Therefore, "*protection, conservation and development of water resources is also very important and one of the greatest environmental challenges*" (MESP & KEPA 2010, page 16).

Fig. 2 – Wonderful nature at the Lepenci valley

By constructing the hydropower plants, these special natural areas would be attacked and irretrievably degraded. The initial degradation, which has already begun, is related to uncontrolled deforestation, soil contamination and negative site shift by the heavy construction mechanisms and activities. For the project needs (constructing/operating the power plant), aside from the hydropower plant structure, at least one road along the pipeline would have to be built. In addition, most likely the connecting roads to the current road infrastructure and the transmission network to the national network would have to be built. As a result, flora and fauna loss, faster soil erosion after deforestation and more carbon emissions into the atmosphere from intense traffic (heavy construction mechanisms) would surely happen (Sharma & Rana 2014, pp.21-25). Emission of greenhouse gases would be evident from the burning of fossil fuels by building mechanisms (IEA 2002). Accidental oil spills are also not to be excluded.

These aforementioned areas associated with special natural beauty as well as the natural landscapes would also be lost due to the existence of plants (50+ years) that do not belongs there and the lack of water as an survival element for the entire zone. Large hydropower plants and their dams have become tourist attractions around the world, but a small hydropower plant has no such element that could provide an attraction that would have the opposite effect of site degradation.

With regard to the so-called "ecological flow" that will be left untouched during the operation of the power plant, its determination is still widely disputed at some parameters including the basic requirements for its definition. As a consequence, the inability of ecologists to provide quick and accurate opinions about the flow would usually result in tensions, prolongations and bad decision-making. Solving the issue in this case is harder than it seems. It is already mentioned above that for a model hydropower plant, the ecological flow is planned to be at 30% of average watercourse.

Firstly, it must be clear to everyone that the ecological flow will never have the effect of natural flow but in principle is a certain amount of water that is allowed to flow freely in order to maintain a balance and meet the needs of ecosystem and human community. This flow should be variable due to the seasonal river watercourse (Collier 2004). In this regard, assigning the rule to permanent ecological flow values at 30% or 50% would most likely cause ecological degradation at relatively large scale. This, in fact is in complete contradiction to the natural changes during different times of the year associated with the certain flow rates, especially in the diversified areas (including the bio diversified ones) which may have years of low flows that would result in drying of certain areas and imence ecological impact. Certainly, in case of approving such projects, the ecological flow should be based on the features of each river or river basin individually or by generalizing the records according to the similar features of the rivers that belong to an area (Arthington et al 2006, pp. 1311-1318). The case of the hydropower plants in Lepenci River where 70% of the watercourse is planned to be diverted, is in fact not well analyzed and out any applied standard.

Fig. 3 – Constructing the hydropower plants and environmental shift has already begon in Lepenci basin.

Actually, the aforementioned study on hydropower plants in Kosovo most likely never considered those mentioned in the paragraph above about the ecological flow. As a result, when 70% of the watercourse is diverted into the pipes, the water level fluctuation schedule would be altered by reducing the water level to a minimum. In most of the cases this kind of "flooding" is crucial because it provides nutrients for aquatic biota and creates protected habitats in the areas concerned. This biota in the rivers used for power generation is affected by the modification of those factors such as “riverbed droughts" (below the catchment facility), non-natural fluctuations of water level, changes in water quality, and changes in groundwater status. The species and their composition are directly affected by these conditions and if they are altered then this composition may also be affected. The lack of water and frequent changes in its level due to the hydropower plant's operation needs would most likely sterile the zone. Organisms living in the sandy areas are a source of nutrition for the river fish and also contribute to the animal feed. As a result of the river flow changes, this food source will be reduced (IEA 2002). Species that live on water all the time can be reduced, lost or replaced by the more resistant ones. This shift in the population and variety of species can affect the entire food chain in the affected zone. Lack of water can also minimize the productivity of the river valley.

It is already described above that the hydropower plants change the natural water flows (divert water into the pipes). This, together with the construction of small dams, hinder the normal water flow and block the sediment and nutrient movement in the riverbed, thus, causing direct impact on some species of fish (Anderson et al 2015 & HRC 2009), whose migrating trails are physically interrupted. The Mahseer fish of the Himalayas, as a result of the breeding sites alteration by building dams and diverting water into the channels, has not been seen in the upper parts of the Ganga River and its branches in India, although earlier this was evident. So-called “fish trails" have been tested but they failed. Even invertebrates (insects, snails, crabs) will be lost significantly. A study has shown that in similar cases where the water flow is diverted, this type of animal is reduced by 50-90% as a result of changes in substratum caused by water flow irregular fluctuations (Chopra et al. pp. 45-52), whilst these animals are prevented go through the pipes or eliminated by the turbine.

These natural and biodiversity features mentioned above are also associated to Lepenci River (eg. The Trout fish). Consequently, in case of building hydropower plants there, it is certain that there would also be changes in the water quality and in the structure of the river habitat resulting in the loss of the genetic heritage of flora and fauna. These negative effects are much greater when they are cumulative regarding the situation where all hydropower plants would operate in parallel.

Other externalities of the hydropower plants can be:

- Eutrophication in catchment facility dams (IEA 2002), although very low due to the low scale accumulation;
- Microclimate changes, reduction of rainfall, drying of water springs and wells; reduced soil moisture, etc.; as a result of diverting the most of water quantity (Sharma & Rana 2014);
- Potentially greater risk of flooding due to the aforementioned land instability and erosion, and the possibility of these floods being more dangerous in case of “taking” a structure part by the water (concrete structure, pipes, etc.).

Social effects

Potential effects and impacts in ecosystem by constructing hydropower plants (mentioned above) "*are often very closely linked to social impacts. Freshwater ecosystems provide humankind with essential services, including water supply and purification, fisheries, flood control and floodplain fertility. Although freshwater ecosystems occupy less than 1% of the earth's surface, they deliver goods and services of enormous global value, adding up to trillions of dollars annually*" (Collier 2004).

So, freshwater ecosystems, among others, are essential because they provide clean drinking water. In the Kosovo context, when by 2012 were 656 settlements lacking or with ineffective water system (SDC-K through CDI 2012, page 17), without any proper analysis of priorities of essential needs of the residents, the water resources are planned to be used for power generation. In addition, there are some small towns like Hani i Elezit where there are many issues regarding the water supply of citizens and the increase of water quantity is one of them (UN Habitat & MHiE 2013). Furthermore, many villages in Kaçanik and Strpce face similar problems. In the other side, based on similar cases already studied in other parts of the world, the settlements located within the Lepenci River basin (with or without water systems) may suffer from drying up of these water resources. Reduced natural regenerative power of the ecosystem for purification of potable water impacted by the hydropower plants is also another issue to be addressed.

Sanitation is a similar problem too. A reduced water flow influenced continually by urban developments may also cause secondary damages into the whole basin area. Different pollutants disposed into the river (sewage, industrial wastes) cannot be decomposed since the river flow in particular and all the absorbing power of the basin is general is smaller and powerless (IEA 2002). Currently, the Lepenci and Nerodime rivers "collect" all the untreated wastewater of the region (Municipalities of Ferizaj, Shtrpcë, Kaçanik and Hani i Elezit) and the industrial waters of Silcapor Factory and some other producers in south-east region of Kosovo. If the river flow is affected by hydropower production, its combination with the current pollution and the drinking water problems (described above above) could result in environmental and social disasters (various epidemics) with the ultimate impact on potential displacement of residents from there. To make the situation clearer, a comparative line may be withdrawn with Obiliç (thermo power plants are operative) where the environmental context is similar up to some extent and the present environmental catastrophe is evident there for years. The only difference is that the massive air pollution in Obiliç has negatively impacted water and soil, and in the case of the Lepenci River, the potential disaster is enabled by destroying water potential with consequences on land and air.

Socio-cultural potential in relation to the Lepenci Valley's identity, which is an element of particular importance in this area, will also be lost. Residents of the vicinity and the region would be removed of opportunity to spend leisure time, fish and hike in the river valley. In the contrary, this potential with genuine elements of a sustainable development should be further explored and developed. The ideal combination of fresh mountainous water flow with the surrounding nature and fresh climate during the summer, and the available road links to Sharri touristic areas (Prevalla, Prizren, Macedonia) is an opportunity for developing the zone so that Kosovars and others could spend a pleasant and healthy weekend in the social and sportive-recreational areas (regulated areas for picnic, sunbathing and tanning, water and other sports, bad and breakfast with traditional food, etc.).

Another cultural element in the area is the existence of traditional mills. Lack of water would greatly affect the loss of this cultural heritage that has started earlier and has never been properly addressed so far.

Economic effects

The greatest loss of economic potential is related to the agricultural land in the area. The upper part of the river is mountainous, but starting from the southern point of the Kosovo plain, there is a relatively large area of agricultural land, part of which located near the Lepenci (including the River Nerodime) is of the superior class (1). This land is traditionally used for growing crops that need irrigation which, as of recently, are also being cultivated in greenhouses funded by the Kosovo government and donors. But the main agricultural areas that have not been destroyed yet extend from the city of Ferizaj to Kaçanik. The following map shows that there are at least over 7,000 hectares of agricultural land along the rivers that can be developed into extensive farming with only a light irrigation arrangements and at least over 15,000 hectares of potential land in wider region for growing suitable crops.

Given the context, all this potential wouldn't be utilized as the water will be used for power generation resulting in continuation of the negative trend of agricultural land loss, thus, enabling developers and usurpers to use the land for other purposes.

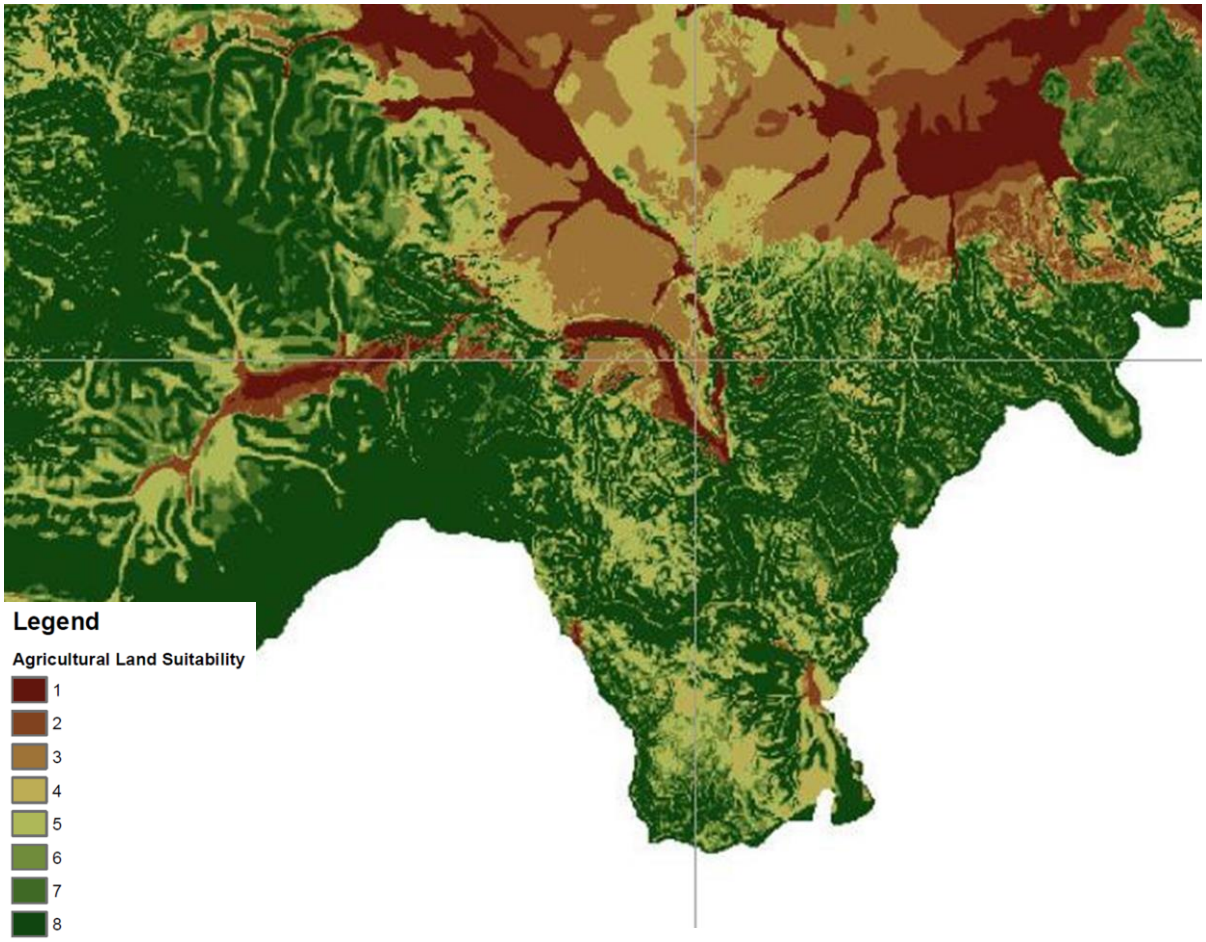

Fig. 4 – Agriculture land suitability for the Lepenci River basin (EULUP 2012)

The tourism development potential of the area enabled by the potential environmental, social and sportive developments mentioned above as well as the development of fisheries, given the same context, would also be lost.

In a situation where Kosovo has the lowest economic development in the region and Europe, decreasing the incomes from agriculture and other aforementioned service activities and depriving the residents from exploiting of these potentials is a step back in the development sense. Indeed, citizens need to enjoy a relaxed development atmosphere asociated with various facilitations and not limitations of this nature. Not doing so, can also contribute to the displacement of residents within and outside the country.

The document will also cover the planned cost of constructing the hydropower plants, including both direct construction cost and infrastructure cost (roads, energy transmission lines, etc.) The calculations will be generalized using the model hydropower plant described above and based on the planned total of production capacity also described above. A simple calculation results in over 47 million euro planned to be spent for constructing all the hydropower plants foreseen in the Lepenci River basin.

Benefits from the hydropower plants

There are no environmental benefits from the hydropower plants at all. The amount of about 1.1 million euros foreseen by the aforementioned study for mitigation measures is poorly studied and analyzed, negligible and can be considered ridiculous compared to the environmental destructions and losses that were identified above.

Social benefits are mostly related to a better possible transport of the residents by using the road infrastructure of hydropower plants. The power supply most likely wouldn't be improved, especially for the residents of the area, because the entire capacity of the Lepenci hydropower plants will account for only 2.2% of the country's gross energy consumption in 2020 (foreseen by the National Renewable Energy Action Plan (NREAP) 2011-2020). Moreover, since Kosovo has a joint energy network, residents will not be able to tell the improvements, while losses and destructions will be much evident and distressing.

Economic benefits are directly related to the energy produced and the employment. The construction cost of the model hydropower plant was mentioned above. In regard to the employment, the government study on hydropower plants does not provide thorough information on total number of individuals that are to be employed. Nevertheless, an estimate results in relatively high number of individuals and some local construction businesses that could be involved during the construction phase. The metal pipes are produced by a factory located in the region.

Public benefits from the energy production were mentioned to be very minimal. For the operation of a model hydropower plant, the government study envisages engaging of 6 employees (2 professionals and 4 operators/ maintainers). However, there is no information provided on efficient use of human resources given the multitude of hydropower plants. Finally,

a general estimation accounts for 30[7] employees required to operate the hydropower plants in Lepenci River basin.

Recommendations

Taking into account all the negative environmental effects caused by hydropower plants that are described in the previous parts of this document, it is clear that the opinion on small and mini hydropower plants having less environmental impacts does not stand. In the same time, they might not be cost effective because the cost of environmental mitigation and the cost of transmission systems cannot be covered by local population and industries of the developing countries (Williams & Porter 2006) such as Kosovo. Previous partial perception on small hydropower plants is a result of absence of the field research and studies, especially the ones that have undergone critics. All the information and knowledge related to the impacts of small hydropower plants (including the majority of the information analyzed in this document) are extracted in comparison to the studies on large hydropower schemes (hydropower plants with the dam and large artificial reservoirs) and the studies on water deviation. Hence, additional knowledge is more than necessary for this matter as well as the cumulative effects of many parallel schemes in a larger spatial scale (Anderson et al 2015).

Some of the aforementioned potential negative effects might occur or be larger as a result of not properly applying the legal framework or legally binding standards during constructing and operating the plants and not as their direct effect. In this context, it is recommended to identify the effects separately. At present, in Kosovo's reality, it is rather hard to separate a public project's impacts from a poor management or governance, but at least theoretically this should happen.

In conclusion, based on the analysis above, it is considered that the planning and constructing small hydropower plants in the Lepenci River Basin should be stopped for the following two reasons:

- Kosovo, with less than 2,000 m3 of water / year /capita, especially when this amount of water is much smaller and disproportionate to the number of inhabitants in the Kosovo Plain to which the Lepenci River basin belongs; should make preliminary analysis to prioritize needs and use of water. In a social reality where the fresh water supply system is not well managed and covers only a part of the population, priority of use of very limited water resources should be given to the basic water consumption needs of the households/businesses. Agricultural needs are also vital and using the Lepenci waters for irrigation of the land in the vicinity and dry land of Kosovo Plain would be a solution (even though costly) with the most immediate impact on the country's development. It is known that Lepenci River has been and still is an integral part of the planned Iber-Lepenc hydro-system, and as such, mega investments in the hydro-power schemes that utilize the same water source are beyond any logic.

[7] The estimated number of employees is approximate and based on discussions by the field professionals and the efficient use of human resources. Certainly, the operating companies maintain the rights to decide on the matter.

- It is mentioned earlier in this document that the designation of the ecological flow is more complex and should be done based on the local characteristics of the respective fresh water ecosystem. When these results would derive from serious studies and they would become legally binding standards that together with the legislation framework would be strictly applied, then the planned hydropower plants would not produce more than 40-50% of the planned energy, especially from the summer to the late fall. For this reason, some proposals for such plants in the USA have been rejected, whilst some existing ones are planned for removal because they were not proved to be cost effective (HRC 2009).

The entire process of planning and construction of hydropower plants in the Lepenci River basin is proposed to be at least frozen and prolonged until the following steps are taken:

- To conduct a serious feasibility study on how to meet the demands of power consumption in Kosovo. In the scenario where most likely the hydropower is to be considered, to conduct a feasibility study where not only hydric potentials would be assessed, but the socio-economic-environmental impacts of hydropower plants of different sizes as well (in particular micro and pico sizes), in order to be able to select the ones with less impact that in the same time would address the issues of power supplying the community in the area and be compatible with the country's energy system;

- To achieve a greater inclusiveness and transparency in the process. Based on the international and national legislation mentioned above, all the stakeholders and especially the community should have relevant information about what is happening and what is planned to happen in the area where they live. Ideally, the initiatives should derive from the community itself. However, all parties should be part of the whole process and ultimately there should be a joint decision-making whilst there shouldn't be any lack of information sharing and encouragement of parties for bringing different ideas on the table. The tendency to only inform and consult the parties is very limited in comparison to the degree of impact of these projects and does not work in this case. The possibility of changing opinions under certain circumstances by stakeholders is also possible and permitted by the aforementioned legislation;

- To check for the possibilities of reducing the impacts of hydropower plants in the area nearby and the community by applying socio-economic and environmental measures so that there wouldn't be any "Obiliç or Hade" where Kosovo society benefits economically whilst only the community of the area is negatively affected. Applying special energy distribution preferences for the community in the area may be one of the social steps in this context. It is important that all parties are informed for these non-direct steps for reducing the impacts and as such are implemented through seriously contracted modalities. Perhaps a good way that supply reaches the targeted part of the society would be the decentralization of the electric system.

- To meet the applicable Kosovo standards by reducing the Lepenci River pollution from untreated wastewater and industrial waters of the region. In addition to the enormous negative impacts on the environment, this fact makes every development project to be viewed with the utmost disbelief that the same will have a positive impact on society.

- In the course of development processes in Kosovo as a developing country, where demand and power supply production modalities are still being defined and where energy losses are enormous (technical and commercial losses of the energy system in Kosovo were 31.8% by 2015 (EC 2016, pp. 59-60)), the planning and implementation of policies and programs for the effective and efficient use of energy are more than necessary. The energy system cannot be effective given all these losses and its administrative non-extension to the north of Kosovo. Energy efficiency programs are also at embryonic stages and their implementation leaves much to be desired. In this situation, making hasty decisions in favor of allowing the hydropower plants to be built without consuming the abovementioned activities leads to a dead-end in the context of demand-supply analysis (Collier 2004). The effectiveness of the system and the implementation of the energy efficiency measures should be consolidated and only when the first substantive steps are taken in this direction, then the parallel planning and development of renewable energy schemes should be considered. It is nonsense to build a multitude of hydropower plants that carry tremendous negative impacts and cover only 2.2% of gross domestic consumption when more than 30% of energy is lost during transport, is not charged (stolen) or not paid.

- To conduct analysis and, consequently, to revise the Energy Strategy of Kosovo in order to include other alternative forms of energy such as wind, solar, biomass and thermal. During the process, feed-in tariffs should also be foreseen and applied for those alternative energy sources that currently are not foreseen by this plan (e.g. solar energy), and at the same time those tariffs should be long-term (INDEP & KOSID 2014). Facilitations and incentives from the Government to promote energy production and efficiency by the end-user (solar panels in private and public facilities, use of wind power, hydropower energy production for the needs of one or a small number of households, the application of thermal insulation in buildings, the use of low-energy consumption appliances and lighting, etc.), along with those mentioned above in this section, can substantially affect the achievement of the abovementioned capacity targets of renewable energy production in Kosovo.

References

Anderson et al "The impact of "run-of-river" hydropower on the physical and ecological condition of rivers", Water and Environment Journal, 2015.

Arthington et al "The challenge of Providing Environmental Flow Rules to Sustain River Ecosystems", Ecological Application, 16(4), 2006, pp. 1311-1318.

Chopra e al "Assessment of Environmental Degradation and Impact of Hydroelectric projects during the June 2013 Disaster in Uttarakhan", Part I – Main Report, 04 2014, pp. 45-52.

EESDC "Vlerësimi i mëtejmë i potencialeve për hidrocentrale të vogla në Kosovë – Raporti i plotë i Studimit", paraqitur në MEM, 2009

EC "Progress Report – Kosovo", 2016, pp. 59-60.

EULUP "Agricultural Land Suitability Map", 2012

Hydroplan GmbH "Feasibility Study on drinking Water Quality in Kosovo – Volume 1, Final Feasibility Report", The European Union's IPA Programme for Kosovo, 2009, p. 8.

Hydropower Reform Coalition "Low Power, Big Problems, How Low-Power Hydropower Dams Hurt Rivers", 02 2009

INDEP&KOSID "Tarifat nxitëse dhe rëndësia e tyre për investime në Kosovë", 2014.

KK Hani i Elezit Kosovë "Vendimi 01/Nr.1850/2013 për dhënien e pëlqimit në parim për kompaninë "Hidroenergji" sh.p.k. për realizimin e projektit të hidrocentralit Lepenci 1", 2013.

KK Kaçanik Kosovë"Vendimi 01Nr. 06-350-9420/15 për dhënien e pëlqimit kompanisë "2 korriku" nga Soponica për ndërtimin e hidrocentralit "Soponica" me kapacitet 1.3 MW në lumin Lepenc", 2015

KK Kaçanik Kosovë"Vendimi 01Nr. 06-350-22969/15 për dhënien e pëlqimit sh.a. "P&I" nga fshati Elezaj- kaçanik, për ndërtimin e Hidrocentralit me kapacitet afër 2.4 MW, në vendin e quajtur "Kriva Reka" në Zonën kadastrale Kaçanik",2015.

KK Kaçanik Kosovë "Vendimi 01Nr. 06-350-7971/15 për dhënien e pëlqimit kompanisë "Afa Energy" nga Prishtina, për ndërtimin e hidrocentralit me kapacitet 2.4 MW në vendin "Reka e Kotlinës", 2015.

KK Kaçanik Kosovë "Vendimi 01Nr. 06-350-3947/17 për prolongimin e propozim-vendimit të DUKMM 06Nr,350-3947/2017 për plotësimin e vendimit të Kuvendit të Komunës 01Nr. 06-350-7971/15 mbi dhënien e pëlqimit kompanisë "Afa Energy" sh.p.k. për ndërtimin e hidrocentralit", 2017.

KK Kaçanik Kosovë "Vendimi 01Nr 06-350-2158/17 për refuzimin e propozim-vendimit të DUKMM 06Nr.350- 2158/17 për dhënien e pëlqimit sh.p.k. "Hidroforca" për fillimin e procedurave për ndërtimin e hidrocentralit "Soponica 2"

MESP & AKMM Kosovë "Report – The State of Water in Kosovo", 2010

MZHE Kosovë "UA 01/2013 për Caqet e Burimeve të Ripërtëritshme të Energjisë", 2013

MED Kosova “National Renewable Energy Action Plan 2011-2020”, 2013).

MZHE Kosovë “Broshura – Burimet e Ripërtëritshme të Energjisë”.

SDC-K through CDI “Coverage Study and Assessment of Water Supply and Sanitation Systems in Kosovo – Volume 1”,2012, p. 17.

Sharma & Rana “Assessing the Impact of Hydroelectric Project Construction on the Rivers of District Chamba of Himachal Pradesh in the Northwest Himalaya, India”, International Research Journal of Social Sciences, Vol. 3(2), February 2014, pp.21-25.

Sperling, “Hydropower in Brazil: overview of positive and negative environmental aspects”, Energy Procedia 18, 2012, pp. 110-118.

The International Energy Agency (IEA) – Implementing Agreement for Hydropower Technologies and Programmes, “Environmental and Health Impacts of Electricity Generation”, 06 2002

UN Habitat&MHiE “Feasibility Study for Improvement and Management of Hani i Elezit Water Supply – Final Report”, 2013.

Ute Collier “Hydropower and the Environment – Towards beter decision-making”, WWF International, 2004.

Williams & Porter “Comparison of Hydropower Options for Developing Countries with Regard to the Environmental, Social and Economic Aspects”, Proceedings of the International Conference on Renewable Energy for Developing Countries, 2006.

World Commission on Dams, *Dams and Development*, Earthscan, 2000, p181.

World Commission on Dams, Thematic III.1 Financial, Economic and Distributional Analysis – Version 1, July 1999