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Gigantic Hydroelectric Plants Distroy Ecosystems, Cultural Haritage and Displace Local Population

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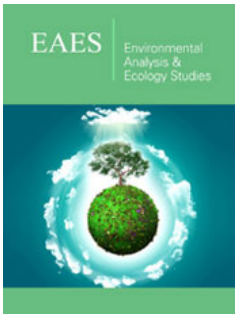

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Abstract

The first years after breakup of the Soviet system reminded us those of the early stages of wild capitalism when everything was possible without punishment. When all plants and factories have been broken down and sold as scrap iron in abroad our governments began to look on country's natural resources as the easiest source to get money. The first target was our valuable beech forests that have been overharvested and sold as round wood abroad. Then, in 2006-2010 about 70 licenses have been given to foreign businessmen. It was neither profitable, nor admissible by sustainable point of view for development of mountain forests. Moreover, it degraded our forests further and had detrimental consequences for local ecosystems. Along with destroying forests governments of these periods tried to develop on high mountain rivers gigantic hydroelectric plants that will have catastrophic adverse effects on local ecosystems, cultural heritage and displacement of local population who constantly protesting against development of these projects because they don't have ecologically based strong arguments of safe development and possible consequences of this project. This protesting movement is being supported by ecologists, NGOs and local population.

Keywords: Hydropower; Plant; Detrimental; Ecosystem; Heritage; River; Reservoir; Dam; Earthquake

Introduction

After breakup of the Soviet system that was based on the principles of planned economy all former Soviet republics occurred in a confused position without any knowledge and finances for development of market economy. For last 30 years after breakup of the Soviet System Georgia is experiences the transmitting period from command to market economy. Georgia is a comparatively small country with limited natural resources that are scattered in the country with small amounts having limited economic potential to develop the country's economy. Unlike some neighboring countries it have not big potential energy-carriers like natural gas or oil to sell and fill country's budget for developing other different branches of economy. The only natural resource we can use successfully is climatic resource and fertile land for developing husbandry and cattle breading. Another branch of economy that can be developed based on our favorable climate and nature resources is tourism and development of summer and winter resorts and we did it successfully for last fifteen years if not Covid-19 pandemic that destroyed everything. All governments from 1991 cannot develop other branches of economy as they need much more investments, knowledge and know-how technologies.

Another great obstacle for developing national economy is the loss of 20% of the country's territory after 2008 Russo-Georgia war. Especially painful was the loss of Abkhazia that is a golden place for developing sea resorts and tourism industry all the year round.

After the end of the Soviet System all factories and plants have been destroyed and sold as scrap iron. Presently all technical and household machinery and goods are imported from neighboring countries even agricultural products due to the fact that harvested agricultural

products are not enough for the whole year. Besides, we don't have enough refrigerating equipment for keeping the agricultural products in winter and early spring periods and have to import them from abroad.

Result and Analysis

In this hard economic conditions projects of hydro power construction is booming in the country in last periods. Over 100 HPP projects are on different stages of development. The contracts with investors on their construction as a rule are signed before having reliable, independent and comprehensive adverse environmental impact assessments that leads to disregard of ecological issues. More than half of the 30 HPS planned in Mestia region are intended on the territory of the already planned Svaneti National Park. Among them was the Nenskra HPS, the most harmful to Svaneti's biodiversity. The roject which is being planned to be built within the planned strict protection zone of Svaneti National Park. The planned HPPs prevent setting up of "Emerald Sites" in Svaneti. The memorandum has been signed on construction of another 2 HPPs in the potential "Emerald Sites" of Machakhela. For the same reason it will be problematic to set up national parks and "Emerald Sites" in Racha region known for its outstanding biodiversity.

The attempts of HPPs construction have already been taken in last period in Svaneti and Pankisi Gorge, where the local population protested against construction of gigantic hydropower plants causing detrimental ecological consequences in form of water floods, landslides, sedimentation, etc. The protests resulted in physical collision and the government had to step back it isn't known for how long.

Lately the government initiated a renewed project of gigantic hydroelectric plant that is intended to build in the west Georgia on the second biggest river of Georgia Rioni. The construction site is located in Tskaltubo and Tsageri municipalities. The cascade type hydroelectric plant consists of Namakhvani, Tvishi and Dariali plants [1]. The installed capacity of the cascade is 433 MW, with annual energy generation of 1496GW/h. In case on construction of the project 19 objects of cultural heritage, 14 oldest churches among them will be destroyed. According to some sauces these churches are of 5-4 millennium and belong to Eneolithic era. 14 archaeological objects and grave yards of several villages will be covered with water [2]. Tvishi plant construction is planned in Tsageri municipality between villages Tvishi and Alpana. 57m high gravitation dam is planned to build and under water will occur 100 hectares of agricultural lands, vineyards of unique Tvishi wine and Kutaisi-Mamisoni road. Namakhvani-Zhoneti plant is planned to develop in Tskaltubo municipality near the village Namakhvani. According to the project 111.5 meter high concrete gravitation dam and the reservoir on 5000 hectare territory must be built. Water will cover 48 hectare of agricultural lands, 157 hectare of forest lands and 3 villages.

In 2009 construction of Namakhvani hydropower plant, that was several times rejected by the Soviet high qualified hydroelectric specialists was renewed again. The political party "Georgian Dream" before coming to the leadership in 2012 declared that they won't agree on construction of gigantic hydropower plants. But in 2019 signed the agreement with Turkish developing company "Enka renewables" on 99 years for symbolic price-only 16 Lari (about $7) [3,4]. Local society, scientists, students and common citizens protest against development of this project. They pitched up tents on the project developing place and stay there day and night. According to the emulation model in case of catastrophic development of events for example earthquake or dam damage, the 30 meter high water wave in 19 minutes strike and smash away the second biggest and oldest cultural center of west Georgia-Kutaisi.

It is well known that this place of Georgia is included in the high seismic zone. Racha is especially affected by earthquakes and landslide hazards. In 1991 earthquake of Mw=7.0 struck Racha region [5-7]. It exceeded Spitak (Armenia) earthquake in 1988 (Mw=6.8). Another strong earthquake happened in 2009 Mw=6.0 [8-10]. NGOs "Green Alternative" and Young Lawyers Association addressed to the City Court in April 2020 with suite against developing company that no scientific ecological research have been made to reveal possible ecological threats. In spite of this fact the Ministry of environment protection and agriculture of Georgia approved the project for construction [11]. According to the suitors in the trial process local and international legislation procedure and their rights have been violated and limited [12]. Namakhvani cascade project is calculated on 170 times less earthquake capacity than Racha earthquake in 1991.

According to the ombudsman of Georgia the process of project development arouse great anxiety and constant protests of specialists and society in connection of threats from geological and seismic risks and ecological and socio-economical deterioration of the situation. Besides, the validity of all adverse ecological aspects of the project and its economical and energetic benefits are rather questionable. The ombudsman underlines that many years supervision on such projects shows that governmental decisions don't answer legitimate questions of society and arouse distrust of their quality, transparency and economical value [13]. Nobody ever evaluated the damage threatening to the development of international tourism, vine-growing and wine-making, ecological damage due to destroyed ecosystems including "EMERALD" belt forests, archeological, cultural and socio-humanitarian damage.

Generally hydroelectric dams are a good way of producing a huge amount of power, but they do not last forever. There are some dams in the world that will fail unless they are urgently repaired otherwise catastrophic consequences of suffering and loss of life would be the result. For example we'll bring some most dangerous dams in the world to show the HPPs and dam-supporters what kind of calamities can face people and environment any time in future [14,15]. These dams are:

A. The Mosul Dam on Tigris River in the valley north of Mosul, Iraq. In case of damage Mosul would be wiped out by waves of waters that could reach more than 15 meters in height. These waves would extend to Bagdad. Life losses could reach 500,000;

B. The Kariba 55-year-old dam in South Africa on the Zambezi River. The dam that was considered the masterpiece of the civil engineering now is predicted to fail within several years unless it undergoes massive repairing. Otherwise, surging water would rip a vast trench down the length of the Zambezi River to the Indian Ocean. The loss of life could reach 3.5 million with massive damage to wildlife.

C. Bhakra Nangal Dam of 1300 mw capacity built on the borders of Punjab and Haryana. It is estimated that if Bhakra Dam breaks more than half of Punjab and Haryana will flow into Pakistan, with the greatest destruction coming to Pakistan where the lives of millions of people be greatly affected.

D. Tehri Dam in India that is projected on 9 mm earthquake of intensity. In 1991 there was 8.5 magnitude earthquake in that region. So the danger is obvious in future. The scientists predict that if this dam be destructed by earthquake, it is difficult to imagine the catastrophic consequences it will cause. The water wave of 8.5 to 10 meters height will have widespread side effects as far as West Bengal.

E. The Three Gorges Dam is located in China. Ever since the dam was built the problems of the Chinese government increased. With its creation 13 million people have been displaced from their homes, cities, and villages. The problem of continuous flooding in the surrounding areas has increased. Land ejaculation also emerged as a major problem.

F. The Enguri or "Angry Dam" is the largest hydroelectric plant in the Caucasus until now. It is situated in Georgia. The dam has been constructing in 1961-1978, temporarily operated in 1978 and was completed in 1987. It is an arch, cascade type, HES with a dam of 271.5m. height. It's installed capacity of 1,300MW. The annual generation of the HES is 4.3TW/h [16,17]. The total capacity of the dam is 2404ml.m^3. Since its construction the Enguri HES is considered dangerous until today for the reason of its location. This dam is built on a narrow stretch of a mountain range. In 1994 the dam was inspected by the engineers of HYDRO-QUEBEC who found that the dam is in a rare state of dilapidation. In 1999 the European Commission granted €9.4 million to Georgia for urgent repairs of the HES, replacement of the grappling hook at the arch dam on the Georgian side and refurbishing one of the five generators of the power station at the Abkhaz side. Later there were found 26 splits on the dam that have great potential threats.

It must be underlined again that Georgia is situated in the Caucasus which is one of the most seismically active regions in the Alpine-Himalayan Collision Belt. Historical analysis shows that it is a region of moderate seismicity and that strong earthquakes have occurred in the past too including a 7.0Mw earthquake in Racha in 1991 killing 270 people. Presently due to the flow of water the mountain is being sunk 5-10cm. every year. This part of Caucasus is considered as seismically dangerous. In case of an strong earthquake it is very questionable how the dam save itself on such weak grounds [18].

Scientists advise that when a large dam reach the age of 50 years it is getting especially alert to the upkeep challenges and dangers. In late 1950s as well as in 1970s upwards of 1,100 dams were constructed every year. Since 1990 that number has dropped below 500 and below 300 since 2000. The United Nation's experts expect that the number of new dam projects will remain low in future. Public safety and environmental concerns weighed against the cost and benefit of keeping a dam will decide their fate around the world. Dam failures (of all sizes of dams) have already risen since 2005 and keep rising having reached 175 incidents in 2015-2019 [19].

Table 1: U.S. Renewable Electricity Generation as a Percentage of Total Generation.

	Hydropower	Solar	Wind	Geothermal	Biomass	Total Renewables
2005	6.70%	0.00%	0.40%	0.40%	1.30%	8.80%
2006	7,1 %	0.00%	0.70%	0-4 %	1.30%	9.50%
2007	5.90%	0.00%	0.80%	0.40%	1.30%	8.50%
2008	6.20%	0.10%	1.30%	0.40%	1.30%	9.30%
2009	6.90%	0.10%	1.90%	0.40%	1.40%	10.60%
2010	6.30%	0.10%	2.30%	0.40%	1.40%	10-4 %
2011	7.80%	0.20%	2.90%	0.40%	1.40%	12.60%
2012	6.80%	0.30%	3.50%	0.40%	1.40%	12.40%
2013	6.60%	0.50%	4.10%	0.40%	1.50%	13.10%
2014	6.30%	0.80%	4.40%	0.40%	1.60%	13.50%
2015	6.10%	1.10%	4.60%	0.40%	1.60%	13.80%

Source: EIA, LBNL, SEIA/GTM Renewable Electricity in the United States. November 2016 [20].

New studies show that many large-scale hydropower projects in Europe and the USA have been disastrous for environment and people. Dozens of these dams are removed every year as many of them are considered dangerous and uneconomic. But these facts are not recognized in developing world. Thousands of new dams are now planned for rivers in Africa and Asia. Researchers underline that dam building boom reached its peak in USA and Europe in 1960s and than declined. Today most of them are dismantled than

installed. For example, hydropower supply in US now is about 6% (Table 1) [20]. If we sum up renewable energy sources like: solar, wind, geothermal and biomass in 2015 we get 7.7 %that is on 1.6 % more than hydropower generation 6.1%. On global scale the correlation is differ. The renewable energy sources are 8.3% and hydropower generation is 15.9% and we believe that it is due to developing countries because they more depend on hydropower generation than renewable sources. We believe that we must take course towards renewable sources of energy generation than on hydropower. It must be underlined that governments of the developing countries are blinded by the prospect of cheap electricity without taking into account environmental and social consequences. More than 90% of dams built since 1930s damaged river ecology, displaced local population and contributed to climate change, resulting in greenhouse gases from the decomposition of flooded lands and forest ecosystems [21].

Conclusion

Summarizing the discussed problem we must underline that mountain rivers, even very small brooks are unpredictable after several hour heavy rains when they get together and may result in catastrophic consequences. The fresh example is 14.06.2015 Tbilisi flood [20]. The Vere River that in summer is a small brook of about 2m. wide and 30-50 sm. depth starting from high mountains flow through Vere valley. On 14 June after several hour constant heavy rain it got catastrophic size for narrow valley and struck several houses and Tbilisi Zoo on its way. 20 people died and 6 remained unaccountable. More than 40 families left homeless. Tbilisi Zoo lost more than 300 animals nearly half of its inhabitants. The majority of them were killed by flooding. Others escaped their cages and were walking on the Heroes' Square. The picture of hippopotamus walking on the square got in Internet and was very popular that time [21-26]. The damage was estimated in about 100 million Lari (Local currency). So, if this small brook can become so catastrophic after several hour heavy rain in mountains what can we expect from big river like Rioni on which they are going to construct the hydroelectric plant? Scientists agree that in future we must keep hydropower as part of the mix within the combination of multiple sources of renewable energy like solar, wind, biomass and geothermal (Table 2).

Table 2: Global Renewable Electricity Generation as a Percentage of Total Generation.

	Hydropower	Solar	Wind	Geothermal	Biomass	Total Renewables
2005	16.90%	0.00%	0.90%	0.30%	1.20%	19.40%
2006	16.70%	0.10%	1.10%	0.30%	1.20%	19.40%
2007	16.40%	0.10%	1.30%	0.30%	1.30%	19.30%
2008	16.60%	0.10%	1.70%	0.30%	1.30%	20.00%
2009	17.20%	0.10%	2.20%	0.40%	1.50%	21.30%
2010	16.60%	0.30%	2.60%	0.30%	1.60%	21.30%
2011	16.40%	0.40%	3.00%	0.30%	1.70%	21.70%
2012	16.30%	0.60%	3.40%	0.30%	1.80%	22.40%
2013	16.20%	0.80%	3.70%	0.30%	1.80%	22.90%
2014	16.30%	1.00%	4.20%	0.30%	1.90%	23.60%
2015	15.90%	1.20%	4.70%	0.30%	2.10%	24.20%

Source: REN2 Global Renewable Energy Development/ November 2016 [20].

Refernces

1. (2017) Facebook account of Namakhvani HPP Cascade Project.
2. https://mtisambebi.ge
3. Adeishvili D (2020) Namakhvani HES is absolutely unsustainable project.
4. Vakarchuk RN, Tatevosian RE, Aptekman ZH, Bykova W (2013) The 1991 Racha earthquake. Caucasus: Multiple sauce model with compensative type of motion. Izvestya, Physics of the Solid Earth 49: 653-669.
5. (1991) Racha earthquake.
6. Yibson RW, Prentice CS, Borisoff BA, Rogozhin EA, Langer CJ (1994) Some observations of landslides triggered by the 29 April 1991 Racha earthquake. Republic of Georgia. Bulletin of the Seismological Society of America. 4: 963-973.
7. Nikolaeva E, Walter TR (2016) InSAR Observation of the 2009 Racha earthquake, Georgia. Natural Hazards and Earth System Science 16: 2137-2144.
8. Nikolaeva E, Walter TR (2016) InSAR observations of the 2009 Hacha earthquake, the Republik of Georgia.
9. 9 Nikolaeva E.,Walter T.R. 2016. Interactive comment on InSAR observations of the Racha earthquake, the Republic of Georgia. Natural Hazards and Earth System Science.
10. REGinfo (2020) reginfo.ge
11. Sopho Afriamashvili (2020) netgazeti.ge
12. (2020) mtisambebi.ge
13. Dato Kokishvili (2020) netgazeti.ge
14. The World's Most Dangerous Dams (2014)
15. Iraq town lives in shadow of world's most dangerous dam.
16. Enguri hydropower station.
17. Enguri Dam.
18. Top 5 Dams-5 world's most dangerous.

19. These countries have the most ‚alert' age dams. World Economic Forum.

20. (2015) Renewable Energy Data Book-NREL.

21. Matt McGrath (2018) Large hydropower dams, not sustainable' in the developing world. Future Planet- Solutions for a Sustainable World.

22. (2015) Tbilisi flood.

23. https://www.newpress.ge

24. https://en.wikipedia.org

25. https://www.tbilisi.gov.ge

26. https://en.wikipedia.org