

THE UNSUSTAINABILITY OF HYDRO-ELECTRIC POWER GENERATORS AND ITS EFFECT  
ON THE ENVIRONMENT

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INTRODUCTION:

Pollution and disturbance on the environment has become inevitable since the development of power plants. Irrespective of whether it is a conventional or non – conventional power system, every power plant has some bearing on the environment. In order to restrict the damage made by the power plants to the environment, there are various legislations across the world. Over the last century or so, the construction of hydroelectric power plants has drastically increased. Hydroelectric power generators use large amounts of water to turn a turbine which in turn produces energy (electricity). Unlike other power plants that burn coal (fossil fuels) to produce energy, hydro-electric power plants have a benefit of working by water. Comparatively, it causes lesser pollution in terms of air quality. The importance of the development of hydropower is immense. The crisis of electricity or energy shortage was solved by the constructions of hydroelectric power plants.<sup>1</sup> In fact, permission was granted to build hydro-electric power plants in India was mainly considered as a major contribution to the production of energy in the country. It is one of the most important and beneficial renewable resources but does it makes it sustainable? In the case of **Alaknanda Hydro Power Co.Ltd vs Anuj Joshi**<sup>2</sup> , it was decided that implementation of hydro-electric power plants would cause adverse environmental hazards. The court also declared that “not to grant any further environmental clearance or forest clearance for any hydroelectric power project in the State of Uttarakhand”.The law makers have to bear in mind the importance of fuel growth as well as pollution control while dealing with this issue. The benefits produced by these power plants are not worth the costs of our environment.<sup>3</sup> The power generator damages the quality of water and the system of food and thereby disrupts the placement of thousands of people and even worse could cause tragedy like the Uttarakhand floods. Large hydroelectric power plants are found to

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<sup>1</sup> Prof. [Dr.] Sairam Bhat and Ms. Raagya Priya Zadu, “Hydropower Plants in India: Sustainable and renewable?”, Last visited on: 12th February, 2021), From:

<http://rsrr.in/2019/10/26/hydropower-plants-in-india/>

<sup>2</sup> 2018 Utt 933

<sup>3</sup> Sue Nichols, “Large Hydropower Dams ‘Not Sustainable’ in the Developing World”, “National Science Foundation and Brazil’s Fundacao de Amparo a Pesquisa do Estado de Sao Paulo, Last visited on: 13th February, 2021, from: <https://research.msu.edu/hydropower-innovations-and-avoiding-international-dam-shame/>”

have damaged the river ecology and decompose flooded lands and forests. It is also found that these power plants have released substantial amounts of greenhouse gases in the environment. The US and European government are removing Hydro electric power plants considering its dangerous and unsustainability impact on the society. The power plants were installed without considering its ill effects.<sup>4</sup> In this paper, the ecological unsustainability of Hydro-electric power plants will be discussed along with few case laws. The recent Indian case of uttarakhand flood tragedy will be discussed in detail.

## STATEMENT OF THE RESEARCH PROBLEM:

Often hydroelectric dams are being promoted as a power system that does not emit any greenhouse gas and is a renewable source of energy. However, it does contribute to the diminishing of the environment in its own way. In the case of **Narmada Bachao Andolan V. Union of India**,<sup>5</sup> the court observed “to preserve the ecological balance, sustainable development would come into play. Sustainable development means what type or extent of development can take place which can be sustained by nature/ecology with or without mitigation.” The court also said that it is the duty of the government to ensure availability of quality water to people. The case of **M.Periyasamy v. The State Of Tamil Nadu**,<sup>6</sup> has dealt with sand mining and the environmental hazards such activities pose. So, if sand mining causes such disruption to the environment, constant use and reusing of river water would cause adverse environmental issues. In the case of **The State of Karnataka by its chief V. State of Tamil Nadu**, the court observed that the river water is being polluted on account of hydroelectric power generators, deforestation and industrial development. One of the major pollution threats hydroelectric plants pose is harming the wildlife habitat and the water quality. Recently, researchers have found out that hydroelectric power stations pose greater threats to the society than its usefulness. Especially hydroelectric power generators that are made in large scale have adverse effects on the environment. It is important to note that governments all over the world have only considered profit-making out of less energy irrespective of whether it would pose a threat in future. Thus, the study attempts to address the above mentioned issues related to hydro-electric power generators.

## OBJECTIVES OF THE STUDY:

The objectives of the paper are as follows:

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<sup>4</sup> Matt McGrath, “Large hydropower dams 'not sustainable' in the developing world”, Last visited on: 14th February, 2021, From: <https://www.bbc.com/news/science-environment-46098118>

<sup>5</sup> (2000) 10 SCC 644

<sup>6</sup> 2017 Mad 35271

- To understand the benefits of hydroelectric power generators in comparison to other modes of power generators.
- To discuss the origin of hydro-electric power plants in India.
- To study the negative effects of hydroelectric power plants on the environment in general.
- To discuss how large scale hydro-electric power plants contribute to the destruction of the environment.
- To analyse few case laws that has dealt with the issue of hydroelectric power plants on the environment along with few opinions of scholars across the world.

### **SIGNIFICANCE OF THE STUDY:**

Considering the number of incidents that are related to the destruction of environment through large scale hydro-electric power generators, it is important for an in-depth study of this topic. The findings of this research would help the government and the law makers to find a solution to save our environment from the ill-effects of hydro-electric power generators. For scholars and environmentalists, this paper would help them to understand various problems surrounding dams through various case laws, mainly the Uttarakhand flood tragedy in India. Finally, the study tries to establish the understand of the harmful effects and the laws that look into the effects of hydro-electric power plants.

### **SCOPE AND LIMITATIONS OF THE STUDY:**

The research paper seeks to analyse the hazardous effects of the Hydro-electric power plants in the environment. The ecological unsustainability of the hydro-electric power generators re also discussed in this paper. The paper discusses why hydro-electric power generators are preferred over other systems of power generations. Since the subject under the analysis is vast, the researcher would only focus on the origin of hydro-electric power generators, its benefits and hazardous effects on the environment with few case laws along with the Uttarakhand flood tragedy.

### **RESEARCH METHODOLOGY:**

The research methodology that will be used in this research paper titled “Hydro - electric power generation and pollution” would be doctrinal in nature. The background, objectives, research questions and the outcome of the final project would also be in doctrinal method of research. Since this research involves various statutes of environmental law and case laws, the research would be mostly based on doctrinal methodology.

Doctrinal research methodology is a form of conducting research which is purely legal analysis. Most of the typical research done by law students and professionals follow this type of research methodology. This paper is doctrinal in nature because the research involves various provisions of laws, case laws and precedents while analyzing the hydroelectric power generation and pollution.

## REVIEW OF LITERATURE:

### 1. **Matt McGrath, “Large hydropower dams 'not sustainable' in the developing world”<sup>7</sup>**

The author in this article talks about the ill effects of hydro-electric power generators especially in terms of climate change all over the world. He talks about the importance of removing dams that has been constructed since the 1970s because of various causes such as the social, behavioral, cultural, economic and political disruption. The population who stay in the banks of such rivers on which these dams are constructed face various set of problems which are discussed in this article. This article helps the researcher to draw a conclusion in this current research paper and also to suggest various points as to how to restore the damage that has already been caused by the power plants to the environment as well as the people who have suffered a loss.

### 2. **“Emilio F. Moran, Maria Claudia Lopez, Nathan Moore, Norbert Müller, and David W. Hyndman”, “Sustainable hydropower in the 21st century”<sup>8</sup>**

This research published in the journal Proceedings of the National Academy of Sciences of the United States of America, has provided for the adverse effects of the construction of huge dams. The report talks about its side effects on the environment. The article by the authors mainly looked into how the construction of dams has to be done by considering the climate change and the challenges involving the compensation charges. It also talks about how the benefits of hydro-electric power are overrated and its cost on the environment is under estimated. Through this paper, the researcher was able to study the potential adverse effects of the power plant on the environment.

### 3. **David Harrison, Jeff Opperman and Brian Richter, “Can hydro power be sustainable?”<sup>9</sup>**

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<sup>7</sup> Matt McGrath, “Large hydropower dams 'not sustainable' in the developing world”, Last visited on: 14th February, 2021, From: “<https://www.bbc.com/news/science-environment-46098118>”

<sup>8</sup> “Emilio F. Moran, Maria Claudia Lopez, Nathan Moore, Norbert Müller, and David W. Hyndman”, “Sustainable hydropower in the 21st century” (2018), last visited on: 16th February, 2021, from: “<https://www.pnas.org/content/115/47/11891>”

<sup>9</sup> David Harrison, Jeff Opperman and Brian Richter, “Can hydro power be sustainable?”, (2007), Last visited on: 15th February, 2021, from: <https://www.waterpowermagazine.com/features/featurecan-hydro-power-be-sustainable/>

This article written by the mentioned authors explores whether hydro-electric power generators are sustainable or not. Plants, animals as well as humans are affected through the implications of hydro-electric power plants. Those who are dependent on the functioning of the river ecosystem on which the dam is built are the most affected since the power generators transport the sediment of the water. The article claims that no hydro-electric power plant is completely sustainable (i.e.100% sustainable). This research paper ponders over the same and tries to discuss the causes briefly. Through this article, the researcher was able to understand the basic aspects of the hydro-electric power generators that contribute to the diminishing environment.

#### **4. Prof. [Dr.] Sairam Bhat and Ms. Raagya Priya Zadu, “Hydropower Plants in India: Sustainable and renewable?”<sup>10</sup>**

This article looks into the applicability of Indian laws on hydro-electric power generators. The article talks about the Damodar Valley Corporation Act, Indian Electricity Act, 1910, Environment Protection Act, 1986, Environmental Impact Assessment notification of 2006 and National Green Tribunal orders in relation to the hydro-electric power plants. The article also notes the recent Uttarakhand flood tragedy and the causes of the incident. The author claims that the hydro-electric power plant is only semi-sustainable and not fully sustainable as many guarantees. Through this article, the researcher was able to analyse the laws in relation to the topic especially environmental laws.

#### **5. Rajesh Kumar Singh, “Hydropower dams face public anger after Uttarakhand flood tragedy”<sup>11</sup>**

This newspaper article throws light on the hydro-electric power dams related to the Uttarakhand floods that occurred recently. Through this article, the researcher was able to research more on the aspect of the construction of dams that cause extreme floods. The construction of such large dams not only disrupt the natural flow of the river water but also uses large-scale blasting, tree felling and tunneling which ultimately causes the drastic impact. They contribute to the destruction on massive levels. This article looks into why new large dam projects are being criticized worldwide which will be discussed in this paper.

#### **ORIGIN OF HYDRO-ELECTRIC POWER PLANTS:**

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<sup>10</sup> Prof. [Dr.] Sairam Bhat and Ms. Raagya Priya Zadu, “Hydropower Plants in India: Sustainable and renewable?”, RGNUL Student Research Review, Last visited on: 12th February, 2021), From: <http://rsrr.in/2019/10/26/hydropower-plants-in-india/>

<sup>11</sup> Rajesh Kumar Singh, “Hydropower dams face public anger after Uttarakhand flood tragedy”(2021), last visited on: 15th February, 2021, from: [https://www.business-standard.com/article/economy-policy/hydropower-dams-face-public-anger-after-uttarakhand-flood-tragedy-121021201474\\_1.html](https://www.business-standard.com/article/economy-policy/hydropower-dams-face-public-anger-after-uttarakhand-flood-tragedy-121021201474_1.html)

In India, Hydro-electric power plants were introduced by the British in the North eastern states first followed by Karnataka. After a while, the benefits of hydro-electric power plants were realized by the rest of the country and the same was implanted in other states as well. Damodar Valley Corporation Act is the first Act that was introduced in the year 1948 with respect to hydro-electric power plants. The act was enacted to regulate the production of electricity in the states of West Bengal and Bihar. The government after realizing the potential of hydro-electric power generators laid down the perception for the same through this act. Section – 13 of Damodar Valley Corporation Act not only further the production of electricity through hydro-electric power plants but also advanced the supply of water for the purposes of irrigation. This actively demonstrates that the development of hydro-electric power plants in India with the aim of making it one of the main contributors of the energy mix in the country.

In already developed countries, huge hydro-electric power plants were built and the costs of building new ones became too high in the late 1960s. The hydro-electric power plants were then replaced by other renewable sources such as wind, coal and solar energy. Later on, already built dams were being removed because of its lives being exhausted and their negative effects were unaccepted in those societies. This situation was the exact opposite to the situations in the developing countries. Just when the dams were being constructed considering the benefits in the developing countries, the developed countries started removing them considering their negative impacts.

### **BENEFITS OF HYDRO-ELECTRIC POWER PLANTS:**

It is proved that compared to other sources of electricity power generators, hydro-electric power plants are semi-sustainable and it is one of the largest dependable sources of energy. This took effect since the year 1948 especially in countries like India. Unlike other sources of energy, fuel is not required for this method of power plant. Compared to coal or natural gas, this method will not pollute the air as much. Each and every state can rely on this method of energy production as it is stable price wise and it is not necessary to be relied on the international sources of energy or fuel. “Some hydropower facilities can quickly go from zero power to maximum output. Because hydropower plants can generate power to the grid immediately, they provide essential back-up power during major electricity outages or disruptions.”<sup>12</sup> Construction of huge dams also reduce floods, increases irrigation purposes and also water supply. Hydro-electric power plants store large amounts of rain water as it works on that. However, the rain water that is stored can also be used as drinking

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<sup>12</sup> Benefits of Hydropower, Office of energy efficient and renewable energy, energy.gov, Last visited on: 20<sup>th</sup> April, 2021, from: <https://www.energy.gov/eere/water/benefits-hydropower>

water for those who live nearby. It not only is renewable but also improves the economy of a region by bringing in industries and commerce to the societies. It in turn expands the access to health and education, and improving the quality of life.<sup>13</sup> If used properly through alternative methods, Hydro-electric power plants can be a fundamental tool for economic as well as sustainable development of the country. The needs of the future generations need not be compromised in case of hydro-electric power sources.

## **LAWS REGARDING HYDRO – ELECTRIC POWER PLANTS:**

After the enactment of Damodar valley Corporation Act in the year 1948, the statute was not improved or amended. However, recently a draft policy for Hydro power was released. The draft does not cover the sustainability of the same. The act has only very little focus on the environmental impact by the projects. Though a specific statute has not been enacted so far for hydro-electric power generators, the Environment protection Act of 1986 covers few aspect of the pollution caused by the power generator. The intention of the law makers while formulating this act is to assess the ill-effects a project would be causing the environment once the project is implemented. The act would also asses the benefits of the said project to the society at large.

In the year 1988, a policy for hydro power was formulated for the development of more hydro-electric power stations with the recommendations of the committee on hydro-power. However, the objectives only were with respect to ensuring the capacity and the growth of the power plants to be implemented at a faster rate. It did not focus on the environmental effects, whatsoever.<sup>14</sup>

Laws has to be formulated in such a way that it focuses the benefits of the ecology of water and the population staying near the hydropower dams. Laws have to be formulated even for removal of certain dams like in the European countries. The hydro-electric power plants that pose as a threat in Uttarakhand high terrains should be processed for removal as the negative effects are overshadowing the benefits and there should be an

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<sup>13</sup> “Hydroelectric Power: Advantages of Production and Usage”, Usgs Gov, Last visited on: 21<sup>st</sup> April, 2021, From: [https://www.usgs.gov/special-topic/water-science-school/science/hydroelectric-power-advantages-production-and-usage?qt-science\\_center\\_objects=0#qt-science\\_center\\_objects](https://www.usgs.gov/special-topic/water-science-school/science/hydroelectric-power-advantages-production-and-usage?qt-science_center_objects=0#qt-science_center_objects)

<sup>14</sup> “Government of India, Ministry of power”, Policy on Hydro Power development, Last visited on: 22<sup>nd</sup> April, 2021, From: <https://powermin.gov.in/en/content/policy-hydro-power-development>

alternative way of production of energy in those areas. Construction of new hydro-power plants in future has to be permitted only after thorough research and analysis of the place in which it is to be built to avoid future damage to the environment and the people as well.

New policies have to be drafted with respect to the safety of the quality of air and water when a hydropower plant is constructed. An alternative job and a place along with compensation has to be given to those who have already suffered losses due to already built hydro-electric power plants.

### **EFFECTS OF HYDRO-ELECTRIC POWER PLANTS ON THE ENVIRONMENT:**

Hydro-electric power plants spoils the ecology of the river in which it is built on. Once an ecological function is disrupted, it leads to other serious environmental issues.<sup>15</sup> The construction of dams in the rain forest areas lead to deforestation as well. Deforestation not only affects the ecology but also the hydro power plants as well. To increase the flow of water, trees would be cut down. By cutting down huge trees, it replaces ground water and lose less moisture by evaporation. However, broader deforestation near dams reduces rainfall and affects energy production as well. The power plant affects the population of fish that migrate. It blocks the flow of sediments and nutrients and thus destroys the entire aquatic and terrestrial biodiversity. While focusing on the production of electricity, the government loses its focus on the emission of greenhouse gases into the atmosphere. One of the major negative effect of Hydro-electric power plant is that it affects the livelihood of thousands of people who live nearby by disrupting the quality of food, water, agriculture as well as the air they breathe in. It even leads to displacing huge number of people from their natural habitat. The people who live near dams do not even get compensations or electricity access from the every hydro-electric power plant in most of the cases. Overall, the benefits of the construction of hydro-electric power plants are overestimated and the ill-effects are under estimated. Other impacts that are negative include “flow alteration, geomorphological alteration to habitats, changes in water quality, habitat fragmentation, and land use transformation.”<sup>16</sup>

Construction of hydro-electric power plants not only cause environmental degradation but also causes immense financial losses in case of a repair or removal of a dam considering its life. The financial costs outweigh the benefits. The concentration of the pollutant is increased by 11% when the flow of the river is

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<sup>15</sup> “Emilio F. Moran, Maria Claudia Lopez, Nathan Moore, Norbert Müller, and David W. Hyndman”, “Sustainable hydropower in the 21st century” (2018), last visited on: 16th February, 2021, from: “<https://www.pnas.org/content/115/47/11891>”

<sup>16</sup> Erik Olav Gracey & Francesca Verones, “Impacts from hydropower production on biodiversity in an LCA framework—review and recommendations”, Springer Link, Last visited on: 21<sup>st</sup> April, 2021, from: <https://link.springer.com/article/10.1007/s11367-016-1039-3>



disrupted.<sup>17</sup> Those who rely on agriculture and fishing, their livelihoods are altered drastically in negative ways as the ecology of the water the dams are built in is disrupted. The resettlement of the population is also a challenging aspect since they are used to such jobs as their daily livelihood.

## **UTTARAKHAND FLOOD TRAGEDY:**

Uttarakhand floods killed thousands of people and experts have found that hydro-electric power plants and its development has been a part of the cause for the same.<sup>18</sup> The construction of hydro-electric power plants cause immense negative effects to the environment especially to the river ecology. A committee of 11 members recommended cancelling the construction of twenty three dams that was proposed to be built in the northern parts of Uttarakhand. The disaster management of India has reported to the ministry of environment and forests that the influence of hydro-electric power plants has ultimately caused the flooding of Uttarakhand. The primary cause of hydro-power plants being the cause for floods is that it is being built on very fragile terrains in Himalayan region. The floods that killed many in the year 2013 has paved way for discussion even today and the matter is still not settled with respect to the Hydro-electric power plants e=being on eof the main reasons for the said tragedy. The views of the union and the state government is vastly divergent regarding this issue.<sup>19</sup> In the year of 2020, a plea was filed before the Supreme Court claiming that these dams has to be built in order to meet the shortage of power supply in the areas. The case keeps getting adjourned expecting a response from the government about the issue at hand. The government has to be blamed for the delay in providing guidelines for the construction or non-construction of the power plants in spite of reports highly supporting its non-construction in such fragile lands.

## **CONCLUSION AND SUGGESTIONS:**

In light of the above said points, the researcher concludes by saying that more policies have to be drafted with special reference to hydro-electric power plants and its effect on the environment. A national hydro-power policy needs to be implemented in order to regulate the newly built dams and already built large scale dams that are posing a threat to the environment. The future policies must include economic and environmental concerns in order to avoid incidents like Uttarakhand flood tragedy. A balance must be brought by the law

<sup>17</sup> National Research Council (1992) Restoration of Aquatic Ecosystems: Science, Technology, and Public Policy (National Academies Press, Washington, DC).

<sup>18</sup> Keith Schneider, "Uttarakhand Flood Disaster Made Worse By Existing Hydropower Projects, Expert Commission Says", water news, Last visited: 21<sup>st</sup> April, 2021, from: <https://www.circleofblue.org/2014/world/uttarakhand-flood-disaster-made-worse-existing-hydropower-projects-expert-commission-says/>

<sup>19</sup> Bhadra Sinha, "Caught between SC & Centre, 24 Uttarakhand hydel projects stuck on paper after 2013 floods", The print, Last visited on: 21<sup>st</sup> April, 2021, From: <https://theprint.in/india/caught-between-sc-centre-24-uttarakhand-hydel-projects-stuck-on-paper-after-2013-floods/605330/>

makers between the well-being of the environment and development of the state in terms of economy and feasibility. The only factor that is being focused by the government of the developing countries such as India is production of energy or electricity. But the focus has to be laid more on the negative effects as well such as the social and environmental consequences that would primarily be effected by dams that are built in the future. The present usual practices that are unsustainable should also be recognized and should find an alternative to that practice. Cutting down of tress for free flow of water is a usual custom that is being practiced. But that has to be changed while constructing dams in the future. The power production must ensure safety of food and the quality of water. Hydro-electric power plants can be moved more on to the side of sustainable and renewable source of energy production just like wind and solar sources. The needs of the population who live in the habitat near any dams have to be met and compensated according to the damages caused.

This paper has thus discussed the importance of why we should consider the climate change aspects and other serious negative effects of building hydro-electric power plants in the developing countries. By finding new alternatives to the current practices that cause more damage to the environment, hydro-electric power plants can still be built since the benefits are also immense.

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