Journal of Energy Technologies and Policy
ISSN 2224-3232 (Paper) ISSN 2225-0573 (Online)
Vol.7, No.2, 2017

Hydropower Issues in Pakistan

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Abstract
Pakistan is challenging veritable energy crises paying little mind to the way that nature has favored Pakistan with tremendous energy potential. The power division in Pakistan is a blend of renewable and non-renewable energy sources, however among them hydro is the most valuable one that shows up a fundamental renewable hotspot for its achievability in sweeping scale energy creation. Hydropower is renewable, clean, and, as it, without carbon, and speaks to an adaptable pinnacle stack innovation and is overseen by two vertically fused open portion utilities that are Pakistan Water and Power Development Authority and K-Electric (Former KESC).This paper reviews the inter-connections between hydroelectricity and four factors i.e. environment, infrastructure, socio-culture and finance and the significance of these variables in conquering the deficiency of power (created through water). Different thought parts exist when building hydropower plants; whether the anxieties are worldwide or near to, each has been measured while examining this renewable energy source.
Keywords: Environment, Finance, Infrastructure, Socio-Culture

1. Objective

- To free the country from chronic power shortage.
- To pinpoint the challenges and opportunities regarding hydroelectricity.
- To create awareness regarding mobilizing funds for investment in generating, transmitting and distributing hydroelectricity.
- To give hints for maintaining infrastructure for facing and resolving environmental and other problems.
- To show ways in resolving the social and culture issues in hydroelectricity projects.

2. Introduction

“In spite of the fact that water is accessible on this planet in vast amount however it is not uniformly conveyed. It possesses 70% of earth surface from which 2.5% is viewed as fresh water and the staying 97.5% is exceptionally saline Ocean” (Lenine, 1983).

“Appropriation of water has dependably been an issue all through the mankind's history. Appropriation is not an issue when item like water is accessible plentiful and each co-offer get his acceptable offer. It turns into an issue when water is hard to find, that prompts contradictions and question. Water has frequently been a wellspring of contention among shareholders. At the point when a debate emerges over water asset, peace can't be accomplished without determining the topic of water right” (Rajput, 2007).

Water that is both clean and renewable is also used for the production of electricity (i.e. hydroelectricity through hydro plant) but depletion in rainfall, increase of sedimentation in reservoirs which have resulted in dropping of many storage levels of already build dams, increases in population, inadequate national water

strategy and public's careless attitude towards water preservation are major factors behind the water shortage in Pakistan which lead to hydroelectric crises. A great part of the world increment in renewable power supply is energized by hydro power. Hydro drive is open in a sweeping extent of errand scales and sorts. Exercises can be expected to suit particular needs and specific site conditions.

According to Afia Malik: "Increase in demand, high system losses, and insufficient generation capacity such factors are gradually expanding the demand and supply gap of electricity which has resulted in regular load shedding. Reason for this problem is that the area covered for the production of hydropower is not enough or unreliable, as the substantial investment are much minimum."

The principle issues to pushing ahead with the usage of hydroelectric Energy are how to minimize the problems that arise from the implementation process itself. Issues, for example, managing the general population who get to be dislodged due to new dam development would need to be determined, how to back the costs of building huge and medium measured dams, and managing the aggravation of eco-frameworks would all must be tended to. Dams are to a great degree costly to manufacture and monetarily strapped governments are as of now searching for private monies to back their development. Sadly, dam development has not been an effective business wander in the past because of costly mistakes in construction and planning, which has made financial specialists bashful away.

The goal in this research study is subsequently to look at the issues and imperatives confronted by the force segment in Pakistan. The research paper will attempt to assess the reasons behind the present Energy emergency in spite of present government responsibility and activities taken to take care of Energy issues. The hypothesis to be tested is whether the explanation for current Energy emergency is that 'the legislature has neglected to react satisfactorily to conquer the Energy emergencies or whether the administration has moved in the wrong bearing.' The research will analyze the source of the present emergency; the rising interest supply hole; the issues confronted by the force area; and steps taken by the present government.

3. Literature Review

According to Michael M.Cernea (2004): Production of electricity through water (hydro plant), energy that is renewable and clean, is subject to critique and increased public concern. Negative social factors have not subsided; on the contrary, it has increased, such as boom town effect or land dispute, and is producing hindrance in dam construction and its operation. Because of these unfavorable social impacts, the sustainability and legitimacy of dams are being extremely questioned.

Abdul Waheed Bhutto, Aqeel Ahmed Bazmi and Gholamreza Zahedi (2012) pointed out: Continuous release of greenhouse gases from increasing energy-intensive industries has eventually increased the risk of environmental degradation. The single renewable most environmental friendly energy resource that Pakistan possesses in abundance is hydropower, use of which can reduce chronic power shortage, is also negatively affected by uncontrollable environmental factors turning hydro plants into ineffectual/ inoperative.

According to Afia Malik (2012): Increase in demand, high system losses, and insufficient generation capacity such factors are gradually expanding the demand and supply gap of electricity which has resulted in regular load shedding. Reason for this problem is that the area covered for the production of hydropower is not enough or unreliable, as the substantial investment are much minimum.

Muhammad Umar and Anwar Hussain said: Due to distant location and low density of population, it becomes too expensive to make accessible power administrations to country groups through ordinary means. There are also some issues of abuse and abuse of energy at house hold and modern level. Line misfortunes, power burglary and bungle on the huge influence ventures are different components that have fundamentally added to the Hydroelectricity emergency.

Anonymous said: The need of power is expanding day by day as a result of new innovations and high populace, yet the matter of settling Pakistan's supply against the interest for power has remained to a great extent unsolved matter. Transmission and Distribution misfortunes happen therefore of deficient interest in the strained transmission arrange as of the influence burglaries by different gatherings and people.

According to Iram Khalid and Ishrat Begum (2012): Increase in population, inadequate national water strategy and public's careless attitude towards water preservation are major factors behind the water shortage in Pakistan which lead to hydroelectric crises. It is the duty of State to allocate water according to the each province's population, agricultural and industrial requirements. There is urgent need to increase water availability by building new storage and reservoir.

Sifat Shah and M.K. L. Bhatti (2009): Pakistan's energy emergencies issue gets to be distinctly basic amid the summers. Huge quantities of purchasers must be disengaged from the energy supply framework to stop over-burdening the producing stations (load shedding). The energy emergency is predominantly because of absence of estimation and planning. The legislature discussed Pakistan's thriving economy yet neglected to comprehend the requirement for meeting the energy needs of the blast.

Farah Hayat and Dr Danial Pirzada: Energy is the essential component during the time of economic

advancement. Pakistan, energy lacking nation, subsidize with tremendous energy assets as rich water, electric influence can never again be delayed. The fantasy most likely is troublesome however it is in no way, shape or form as intense as it shows up.

Irshad Ahmad, Dr. Allah Bakhsh Sufi, Shahid Hamid and Wassay Gulrez (2012): Today's focuses on proper and equitable utilization of available water resources are more than ever before due to depletion in rainfall and increase of sedimentation in reservoirs which have resulted in dropping of many storage levels of already build dams, causing a shortage of water for hydroelectricity production.

Kamal A. Munir and Salman Khalid (2012): Pakistan's hydroelectricity crisis arises primarily from inadequate policy and secondarily from governance issues. The case of corruption, inability to collect bill payments, the government's lack of ability to pass on the full costs of electricity production, or its failure to meet its obligations to investors who are left with no choice but to stop producing hydroelectricity.

4. Theoretical Framework

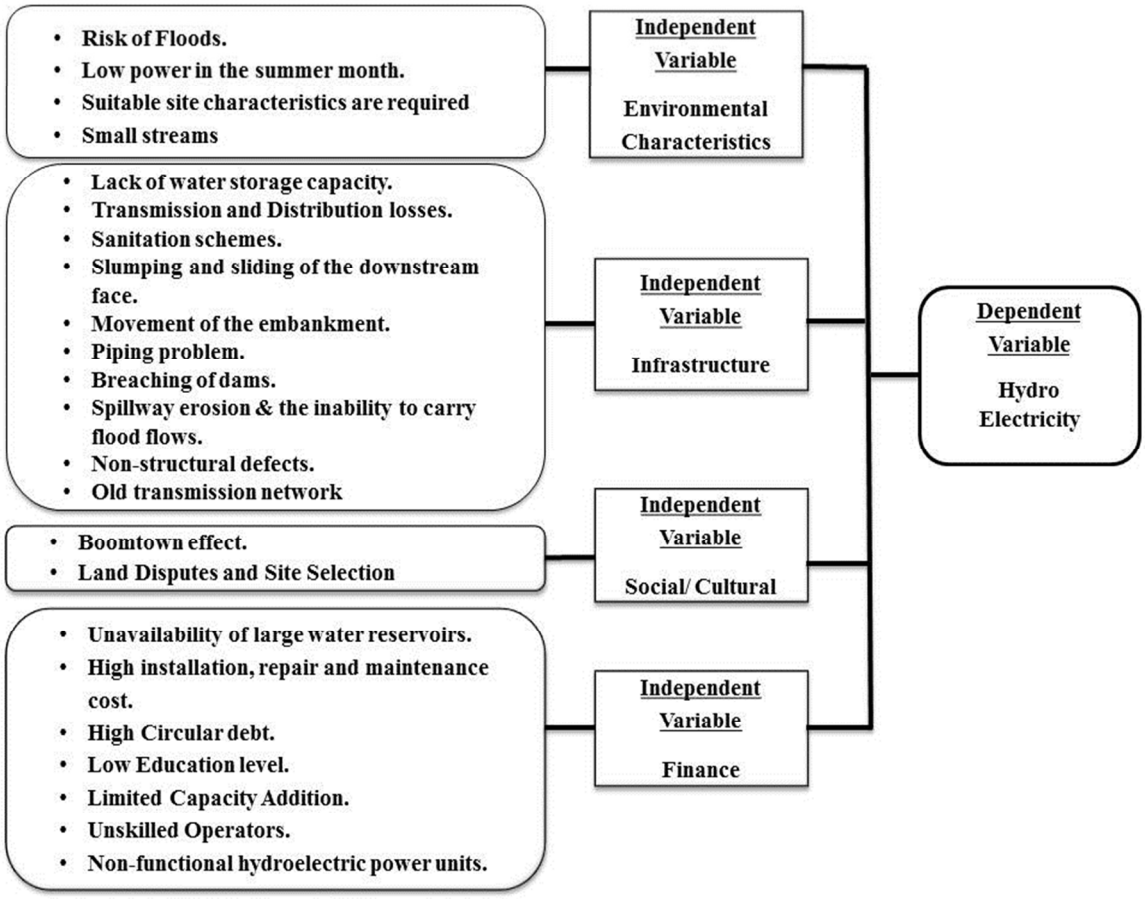
4.1. Environment: Ecological variables, for example, overwhelming and stormy rainfall (expanded danger of floods), lessened rainfall in summer (diminished water level in the dam), rain bolstered zones, fruitless land (dam development is unfavorable without appropriate site determination), arrangement of little streams (don't give enough compel and water), make unfavorable conditions or conditions that decrease the odds of compelling execution. The stable the environmental factors are, the more noteworthy the likelihood of progress or effectiveness in hydroelectricity production.

4.2. Infrastructure: Infrastructure is the fundamental and generally lasting system which underpins a superstructure and is bolstered by a substructure. Proper and maintained infrastructure of dam gives an existence maintaining asset to individuals in all areas, for example, water for drinking and irrigation, power era and so forth. But improper and unmaintained base is a standout amongst the most unsafe component influencing the advancement. The outcomes are, rising level of silt (diminished water stockpiling limit), erosion of downstream surface (cause slumping and sliding of the downstream face), internal erosion (leads to seepage and damaging of pipes), old and inappropriate transmission and distribution network (results in tripping/breakdown of power, risk of falling poles, electricity theft etc.), unstable slopes (causes movement of embankment), spillway erosion (brings flood) etc. In this manner, the more stable and adequate the framework is, the more prominent is the likelihood of powerful hydroelectricity production.

4.3. Socio-cultural: Socio-cultural dispute almost creates all those scenarios that produce hindrance in the completion of hydro projects and productivity of hydroelectricity, such as boom town effect (conflict between local residents and in-migrants) and land dispute (conflict of two parties/ tribes over a patch of land). Thus, the more effectively socio-cultural dispute is resolved, the quicker and calmly the hydro production and venture goes.

4.4. Finance: Finance is the money accessible/gave by government or privately owned businesses, through assets and speculations to spend on business needs. Inaccessibility or lack of such variables for hydro ventures makes inconvenience, to overcome high maintenance, installation and repair cost, paying of high circular debt, provision of education and technical training for illiterate and unskilled operators and transform hydroelectric power units into out of commission/non-practical. Therefore the greater the government and public organization invest, the more noteworthy the extent of powerful hydroelectricity production.

5. Schematic Diagram



6. Scope

The scope of the research includes:

- This study concentrates on distinguishing and assessing an idea about territories inside Pakistan that have both high topographic help and substantial catchment ranges that might guarantee for hydroelectric advancement.
- Key strategies and administrative system supporting the advancement of renewable power sources (hydro power).
- To characterize/build up the hydro scientific classification to clear up the terminology utilized as a part of the hydro plant region and enhance correspondence among industry, the scholarly world, investigate foundations, and government organizations.
- This would not just help in tackling power issues crosswise over Pakistan even in rustic ranges and lessen utilization of non-renewable sources.
- Position yourself to pick up the most extreme favorable position of the business' development potential.
- Its extreme objective is to recommend new innovation pathways that will lessen the cost of improvement and empower potential locales to wind up practical and dispatched destinations.
- Suggest how industry and government can accomplice to execute inquire about, advancement.

7. Significance

- Hydropower is fueled by water; it won't pollute the air like power plants that burn fossil fuels, such as coal or natural gas.
- Hydroelectric power is a domestic source of energy, allowing each state to produce their own energy without being reliant on international fuel sources.
- It creates reservoirs that offer a variety of recreational opportunities, notably fishing, swimming, and boating. Most water power installations are required to provide some public access to the reservoir to allow the public to take advantage of these opportunities.
- In addition to a sustainable fuel source, hydropower efforts produce a number of benefits, such as flood control, irrigation, and water supply.

- Another advantage of dams is that they create power as well as recoveries and stores water so that the water is not squandered into seas and oceans. So it resembles two points of interest in a solitary parcel.
- The costs of fuels continue expanding on and off. Because of which the cost of power additionally continues changing yet because of rainfalls the rate of hydroelectricity stays consistent to some degree and does not build much. Hydropower source can help the nation all day, every day entire year.

8. Methodology

The research being conducted "Hydropower issues in Pakistan" aims at focusing the past, present and future scenario of Pakistan. It is empirical in nature and follows the quantitative method.

For this Research paper 40 questionnaires were distributed among the educated and experienced respondent. Response rate was 80%. The questionnaire was structured in two sections. Section one include the demographic profile of respondent. Section two includes only one question based on 21 factors interval scale.

In order to test the hypothesis SPSS was used. The statistical technique used for analyzing and interpreting the data is Regression. The dependent variable in this research entitled is broke down in understanding to different factors with a specific end goal to decide the variable which causes Hydropower issues in Pakistan.

Primary data is collected from Industrialists, Bankers, Journalists, Dam employees and management, Researchers, Capitalists, Energy producers etc. both men and women, of Pakistan with different income classes and Secondary data is collected by Published journals, articles and internet.

9. Hypothesis

9.1. Environmental Factor

HO: There is no relationship between hydroelectricity and environment.
HA: There is a significant positive relationship between hydroelectricity and environment.

9.2. Infrastructure

HO: There is no relationship between hydroelectricity and infrastructure.
HA: There is a significant positive relationship between hydroelectricity and infrastructure.

9.3. Socio-Cultural Factor

HO: There is no relationship between hydroelectricity and social/culture.
HA: There is a significant positive relationship between hydroelectricity and social/culture.

9.4. Financial Factor

HO: There is no relationship between hydroelectricity and finance.
HA: There is a significant positive relationship between hydroelectricity and finance.

10. Results

10.1. Environmental Factor

Anova Table 2
Sig (0.035) ≤ α (0.05)
Ho rejected
HA accepted
Coefficient Table 3
y= a + b1x1
y= 0.339 + (0.804) x1
y= 0.339 + 0.804x1
Environmental factors α Hydroelectricity
There is a positive relationship between hydroelectricity and environment i.e. the stable the environmental factors are, the more noteworthy the likelihood of progress or effectiveness in hydroelectricity production.

10.2. Infrastructure

Anova Table 5
Sig (0.034) ≤ α (0.05)
Ho rejected
HA accepted
Coefficient Table 6
y= a + b1x1
y= 0.344 + (0.581) x1

y= 0.344 + 0.581 x1
Infrastructure α Hydroelectricity
There is a positive relationship between hydroelectricity and infrastructure i.e. the more stable and adequate the framework is, the more prominent is the likelihood of powerful hydroelectricity production.

10.3. Socio-Cultural Factor

Anova Table 8
Sig (0.011) ≤ α (0.05)
Ho rejected
HA accepted
Coefficient Table 9
y= a + b1x1
y= 0.820 + (0.357) x1
y= 0.820 + 0.357 x1
Socio-cultural factors α Hydroelectricity
There is a positive relationship between hydroelectricity and Socio-cultural factors i.e. the more effectively socio-cultural dispute are resolved, the quicker and calmly the hydro production and venture goes.

10.4. Financial Factor

Anova Table 11
Sig (0.033) ≤ α (0.05)
Ho rejected
HA accepted
Coefficient Table 12
y= a + b1x1
y= 0.651 + (0.448) x1
y= 0.651 + 0.448x1
Financial factors α Hydroelectricity
There is a positive relationship between hydroelectricity and financial factors i.e. the greater the government and public organization invest, the more noteworthy the extent of powerful hydroelectricity production.

11. Conclusion

This research has discussed the issues that emerges for pushing ahead the use of hydroelectricity and has fined the route in the matter of how to minimize the issues that emerges from the implementation process itself. In this exploration four factors are chosen (environment, infrastructure, social/culture and finance). The research use empirical scale to evaluate the hydroelectricity crises causing by different variables. Data which we have gathered shows Infrastructure have greater impact on hydroelectricity crises then Finance, social/culture, and environment factors. This exploration demonstrates that framework elements are the most imperative to be illuminated to handle with the hydroelectricity emergencies. The problems most likely are troublesome however it is in no way, shape or form as slippery as it shows up.

12. Recommendations

- Sedimentation of existing reservoirs is enhancing with time thereby decreasing the water accessibility.
- It is emphatically suggested that development of storage of ready multi-purpose projects ought to be begun instantly.
- There is nonattendance of skilled administrators and staff for productive operation in plants. To handle the issue, the governing body should develop particular planning foundations to allow major aptitudes to the heads of the plants.
- The lawmaking body should arrange a genuine institutional game-plan to handle the issues of surges, fixing and other social problems associated with hydro control ventures.
- Workshops ought to be set up with a particular true objective to give repairing organizations at adjacent amount.
- To improve the adequacy and sensibility of hydel plants, mindfulness workshops ought to be orchestrated the group individuals, with the objective that they can use the vitality supportably by keeping up a vital separation from manhandle and incidents.
- Urgent improvement in billing and recoveries to improve the cash flows.
- Liquidating circular debt.

13. Limitations

- The absence of time to complete a review/ carry out a survey.
- The absence of subsidizing/ funding important to do a study/ carry out a survey.
- The absence of sufficient data on a given subject because of factors/ variables.
- Difficult to comprehend context of a phenomenon.
- Data may not be sufficiently powerful to clarify complex issues.
- Related secondary data is sometimes not available or accessing available information is troublesome/ incomprehensible.
- The number of inhabitants in the exploratory gathering is little.
- The surveys in this study demonstrated adequate resolute quality; some of the questionnaires showed lower reliability than other questionnaires which may upsets identification of the normal impacts.

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Environmental Factors Tables

Table -1 Model Summary [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.373[a]	.139	.110	.45513

a. Predictors: (Constant), Environmental Factor
b. Dependent Variable: Hydroelectricity

Table -2 ANOVA [b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.004	1	1.004	4.849	.035[a]
	Residual	6.214	30	.207		
	Total	7.219	31			

a. Predictors: (Constant), Environmental Factor
b. Dependent Variable: Hydroelectricity

Table - 3 Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.339	.463		.733	.470
	Environmental Factor	.804	.365	.373	2.202	.035

a. Dependent Variable: Hydroelectricity

Infrastructure Factor Tables

Table - 4 Model Summary [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.445[a]	.198	.171	.43933

a. Predictors: (Constant), Infrastructure

b. Dependent Variable: Hydroelectricity

Table -5 ANOVA [b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.428	1	1.428	7.400	.011[a]
	Residual	5.790	30	.193		
	Total	7.219	31			

a. Predictors: (Constant), Socio Cultural Factor

b. Dependent Variable: Hydroelectricity

Table -6 Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.344	.376		.915	.368
	Infrastructure	.581	.213	.445	2.720	.011

a. Dependent Variable: Hydroelectricity

Socio-Culture Factor Tables

Table -7 Model Summary [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.375[a]	.141	.112	.45475

a. Predictors: (Constant), Socio Cultural Factor

Table -8 ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.015	1	1.015	4.907	.034[a]
	Residual	6.204	30	.207		
	Total	7.219	31			

a. Predictors: (Constant), Infrastructure
b. Dependent Variable: Hydroelectricity

Table -9 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.820	.250		3.280	.003
	Socio Cultural Factor	.357	.161	.375	2.215	.034

a. Dependent Variable: Hydroelectricity

Financial Factor Tables

Table -10 Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.377[a]	.142	.114	.45425

a. Predictors: (Constant), Financial Factor
b. Dependent Variable: Hydroelectricity

Table -11 ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.028	1	1.028	4.984	.033[a]
	Residual	6.190	30	.206		
	Total	7.219	31			

a. Predictors: (Constant), Financial Factor
b. Dependent Variable: Hydroelectricity

Table -12 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.651	.320		2.034	.051
	Financial Factor	.448	.201	.377	2.232	.033

a. Dependent Variable: Hydroelectricity