Impact of Hydropower Projects on Economic Growth of AJK

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Abstract

According to official estimates, territory of Azad Jammu & Kashmir has a potential to generate about 4600 MW of hydroelectricity, the cheapest source of energy. Total deficit in energy Pakistan is facing these days is about 5000 MW. So, only AJK can fulfill more than 90% of deficit of now demanded energy for entire country. Beside this direct and explicit advantage of hydropower projects to power sector, these projects may be extremely useful in improving many economic and social indicators at local and national level. Many socioeconomic indicators reveal that Azad Kashmir is there is huge gap in development level of AJK and National level. Development of power sector is extremely important to fill this gap. In this paper, we analyze effect of possible implementation of these projects on various economic and social sectors at local and national level. We discuss the obstacles in implementation of projects and recommendations are given at the end.

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1. Introduction

Share of Azad Jammu and Kashmir[1] to the population of Pakistan is about 2.4% but share in national output (GDP) is just 1.5%[2]. The reason for this low performance is not lack of economic potential rather it is under-utilization of potential resources. One example of such under utilization is power sector. The current power crisis that Pakistan is facing is due to deficit of about 5000 MW[3] and according to the official figures, in AJK, there is potential of production of 4635 MW of electricity[4] of , which is, if utilized efficiently, sufficient to meet energy requirement in current crisis faced by entire Pakistan. One of the major problems entire world is facing is provision of energy for household, industry and transport etc. In this scenario it will be a bad luck of nation if it remains unable to efficiently utilize available power potential.

Present study highlights two important points that are worth thinking but failed to get due attention of intelligentsia so far. First, for AJK, conventional sources of economic activities are insufficient to provide basis for sustainable future economic activities. These resources suffer lack of physical resource input, and little improvement is possible in these sectors under the constraints of inputs whereas in power sector, AJK has so called comparative advantage. Second, we argue that investment in power sector carries some benefits which other types of investments do not have. Power sector is a stimulator for economic activities and hydroelectric projects (HEP) can do this job more efficiently.

Investment in power sector carries some benefits which other types of investments do not have. In fact overall performance of economy depends on performance of power sector and no industry can be efficiently run without having good power infrastructure. Hydroelectric power projects, as we shall discuss, carry more plus points than other power

[1] Official Website of Planning and Development Department, Govt. of AJK
[2] Annexure 1, Economic Assessment of Quake-hit Areas, 2005
[3] Investor information guide, Board of investment, Govt. of Pakistan; the documented estimate is 5529 MW energy demand by 2009-10.
[4] Hydel power potential, Private Power infrastructure Board

generation projects because of various reasons. HEP carries low cost of production, less environmental problems and is a sustainable source of energy; therefore it should be preferred over other sources of consumable energy.

Beside direct benefit to power sector, implementation of a hydroelectric project (HEP) may carry extensive benefit for many economic, social and environmental indicators at local and national level. Unfortunately, detail study of these impacts did not achieved due attention of researchers and academicians so far. For Azad Kashmir, importance of such projects is further more important due to certain factors which we shall discuss briefly. To understand how an HEP effects economic indicators, consider the effect of possible construction of a tunnel etc. for power project on employment. Multiple mechanisms can be identified through which, such a project effect employment level (with some mechanisms not presents in usual investments). First mechanism is direct creation of employment opportunities of worker on the project. Secondly purchase and communication of construction material will generate further employment opportunities in industries and transportation. Third mechanism is increased employment opportunities due to multiplier effect of increased expenditures. Increased power production will create more opportunities for new industries i.e. fourth mechanism to generate employment. Moreover hydroelectricity is the cheapest source of energy among entire sources and provision of cheap electricity to industry may create surplus revenue for the firms which may further enhance investment which in-turn create further employment. This is fifth mechanism through which an HEP effects employment. Many other economic and social indicators are related to such projects either directly or indirectly. Sectors like infrastructure, agriculture etc. have direct or indirect dependence on HEP. This paper is aimed to create due interest of researchers and policy makers in (i) further analysis of possible cost and benefits of such projects and (ii) motivate them to struggle for practical steps toward implementation of projects. We have tried to use maximum facts and figures in our analysis but due to lack of similar studies, too little data is available for the analysis. In this situation, reliance on qualitative discussion is inevitable. A non-technical discussion on power-lead growth

possibilities in various sector including output, energy, employment, infrastructure, agriculture, industry, human development, forests, tourism and education is presented.

Rest of study is organized as follows: In section 2, we review economic conditions in AJK, compare socioeconomic for AJK with National indicators and discuss how much the conventional sources of economic activities can contribute in future development. In section 3, we discuss growth possibilities due to improvement in power sector. In section 4, we discuss some obstacles in practical implementation of hydroelectric projects. Section 5 consists of conclusion and recommendations.

2. Economic conditions and the basis of sustainable development and in Azad Jammu & Kashmir

Potential sites for hydroelectric project are located in Punjab, NWFP, Northern Areas and AJK, and most of our analysis is valid for any site where HEP can be implemented, but our special focus is AJK. One reason for this is the speculation that no other sector of economy cannot provide basis for long term development planning in Azad Kashmir.

Existing major ingredients of AJK economy are agriculture, forestry and live stock etc. But, as we will present, there are certain reasons to believe that these sources cannot provide basis for sustainable development in future. However, when supported by strong power sector infrastructure, these economic sectors can help in improvement of economic condition of AJK, whereas power sector growth is much helpful for growth in these sectors (agriculture, livestock and forestry) as well.

Below we present some socioeconomic indicators which will help in understanding true worth of our analysis. Than we will show that to improve these indicators, some revolutionary innovation is necessary and perhaps promotion of HEP is most suitable innovation.

AJK is divided into 8 administrative units (Districts); key figures about these units are presented in Table 1. Now, as we presented in the introduction, per capita output of AJK is much less than that of Pakistan. Moreover the distribution of resources is uneven in

AJK. Mirpur, is perhaps most advanced Dist. of Azad Kashmir followed by Kotli and most underdeveloped are Dist. Neelum, and Rural area of Dist. Muzaffarabad.

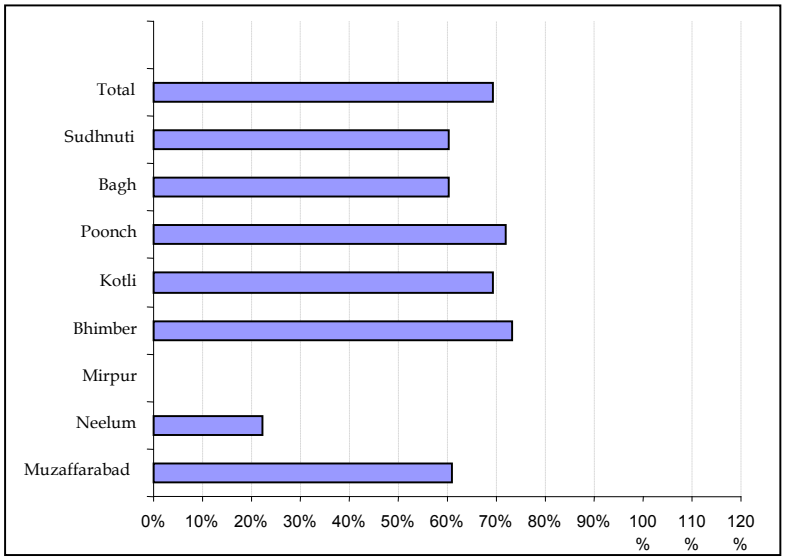
Table 1: District-Wise Area, Population, Density, Growth Rate & Household-Size in Azad Kashmir

District	Area (Km^2)	Population (Millions)		Density 2006, (Persons/ Km^2)	Growth rate	Household size
		1998	2006			
Muzaffarabad	2496	0.620	0.770	307	2.80 %	7.1
Neelum	3621	0.126	0.159	42	2.80 %	7.1
Mirpur	1010	0.334	0.395	391	2.09 %	6.8
Bhimber	1516	0.302	0.370	244	2.60 %	6.7
Kotli	1862	0.563	0.690	370	2.59 %	7.3
Poonch	855	0.411	0.490	573	2.24 %	7.6
Bagh	1368	0.393	0.460	336	2.00 %	7.4
Sudhnuti	569	0.224	0.262	460	1.99 %	7.3
Total	**13297**	**2.973**	**3.596**	**270**	**2.41 %**	**7.2**

Source: Official Website of Planning and Development Dept. Govt. of AJ&K

Figure 1 gives an idea of level of development in various areas of AJK. This figure presents percentage of households with electricity connection. As depicted in fig, most underdeveloped area is Dist. Neelum with only 22% houses electrified. Bagh, Sudhnoti and Muzaffarabad show almost equal level of development.

Fig 1: Percentage of households with Electricity Connections



Source: Official Website of Planning and Development Dept. Govt. of AJ&K

But again, inside these districts, the distribution is also unequal. Nakial sector of Dist. Kotli, Forward Kahota of Dist. Bagh, and Hattian sector of Dist. Muzaffarabad are significantly underdeveloped than other areas of same districts. There are certain areas and villages having no access to electricity and sharing very little to economic activities. To uplift economic activities at grass root level, planner should consider how these areas can be brought into network of economic activities. It is necessary for sustainable development planning to focus on these areas.

The level of development that we anticipate looking at the fig, is somewhat illusionary. There are some electrified areas with very low quality power infrastructure and having electricity for less than 50% of days. In some areas where micro hydro-projects are working, electricity is available for night, and cannot be utilized for commercial purposes. Many areas suffer absence of electricity for whole season of winters. So, the presence of electricity does not support any economic activity in the area. Some other socioeconomic indicators are reported below to depict level of development in AJK compared to national development indicators.

Table 2: Comparison of some Socioeconomic indicators for AJK

with National Indicators		
	AJ&K	**National**
Literacy	60%	53 %
Metalled Road (Per Sq. Km)	0.35	1.70
Per Capita Power Availability (kWh)	335	N.A
Infant Mortality Rate (Per 1000 live Births)	56	77
Maternal Mortality Rate	350 per 100,000 births	98 per 100,000 birth
Life Expectancy (Years)	64	65
Population Per Hospital Bed	2092	1530
Population Per Doctor	5650	1310
Full Immunization of Children Under 0-11 months	87%	87%
Primary Health Care Coverage	58 %	45%
Source: Official Website of Planning and Development Dept. Govt. of AJ&K		

The socioeconomic indicators reported here indicate that the conditions are worse in AJK compared to national indicators. In order to bring this area at a comparable level, much effort is needed. According to official planners, conventional sources of economic activities in rural population, which is 88% of total population, depends on forestry, livestock and agriculture.

But unfortunately, little improvement is possible in economic conditions by focusing on these sectors. The economic sectors that currently contribute to the output of AJK are agriculture, forestry and livestock. Agriculture and livestock sectors suffer lack of input necessary for growth whereas forests suffer sustainability and threatening environmental problems. As for as agriculture sector is concerned, following Table 3 gives us an idea of agriculture sector in AJK.

Table 3: Agricultural Resource input in AJK	
Area Under Cultivation	411270 Acres
Cultivated Area Per Family	1.43 Acres
Cultivated Area Per Capita	0.19 Acres
Estimated % of families holding farms	89%
Average farm size	1.9 Acres
Source: Official Website of Planning and Development Dept. Govt. of AJ&K	

With only 1.43 acre agricultural land per family, it would be over-optimistic to assume that agriculture sector can provide basis for sustainable development. Even if we assume productivity of land to be equal to land in Punjab, this quantity of land cannot provide livelihood to its owner for overall year. Most of area of AJK grows only one crop per year leading to half of the productivity that one would anticipate. Moreover, technology based methods of farming are not feasible e.g. one can not bring a tractor on the hill for sowing. Most of people, who declare themselves as farmer in official documents, have their side business. So, development planning needs to focus on some other sector.

Similarly, livestock and forests also suffer lack of necessary natural input. Following figures give us idea of prevailing situation in these two sectors.

Table 4: Livestock and Forests resource input in AJK

Livestock

	Total	Per capita
Cattle	459225	0.127918
Buffaloes	457395	0.127408
Goats	1026204	0.285851
Sheep	199324	0.055522
Poultry	3716095	1.035124
Camels	828	0.000231

Forests

Total (Acres)	1400000
Per capita	0.389972

Source: Official Website of Planning and Development Dept. Govt. of AJK

There is nothing debatable in that, in such a situation, forest and livestock sector too, cannot provide basis for sustainable development. The area under forests is too small to provide sound economic base for growing population. Moreover, the area under forest is decreasing rapidly and if it becomes basis of economic activities, it will decrease much rapidly. Sustainability of forests is facing serious threats by increasing population pressure.

Planning of sustainable development cannot rely on forests as a major contributor to economy. Similarly, livestock sector is also incapable of providing sound basis due to lack of input and due to geographical and climatic constraints. That is why these sectors contribute to 40% of household income[5], and people involved in these businesses are also engaged in some side businesses e.g. people of snow covered often travel to Pakistan in winter to earn livelihood for their families. No doubt attempts can be made to improve conditions in these sectors, and these sectors can be made more efficient economically, but these sectors are incapable of supporting an emerging growing economy.

However, hydroelectricity is a source which is sustainable and can be helpful in improving many economic and social indicators. Future planning cannot ignore hydropower potential and we suggest that this should be major contributor to the sustainable development planning for the reasons we will present below. Development of hydropower sector can also be helpful in development of conventional sources of economic activities i.e. agriculture, forest and livestock sector. Our viewpoint is that, Azad Kashmir has so called comparative advantage in power sector and the state should specialize in this sector. Many other allied sector will grow automatically as a consequence of Power Sector Development.

3. Power-lead Growth Potential in AJK

In this section we will analyze impact of possible implementation of hydropower project on various social and economic indicators. We believe that it is only inertia that causes slow development in sustainable growth and if once it catches momentum; the same inertia will stop slowing down of development process. We will analyze power-lead growth possibilities in various sector including output, energy, employment, infrastructure, agriculture, industry, human development, forests, tourism and education. Since a major part of our analysis consists of our own views, we do not emphasis that our analysis must be true. We welcome comments, suggestions and advices from honorable academicians, experts, students and other audience. Focus of our analysis is on Azad Kashmir, but many

[5] Department of Planning and Development, Govt. of AJK

views presented here are (at least in our thought) equally valid for other areas with similar features like Northern areas and NWFP.

According to Survey of Energy Resources (2004) by World Energy Council, with good planning and good management, hydropower is a catalyst for the sustainable improvement of people's lives. The integrated use of water and energy is an important component of sustainable development. Wherever suitable sites are available, hydropower offers the possibility to assist in meeting both of these basic human needs. In addition to water and energy security, well-conceived schemes can foster developments relating to better health services, increased agricultural productivity and environmental management.

The growth process has complex interlinked mechanism and growth in one sector stimulates growth in many other sectors.

Fig 2: Growth Mechanism lead by Power Sector Growth

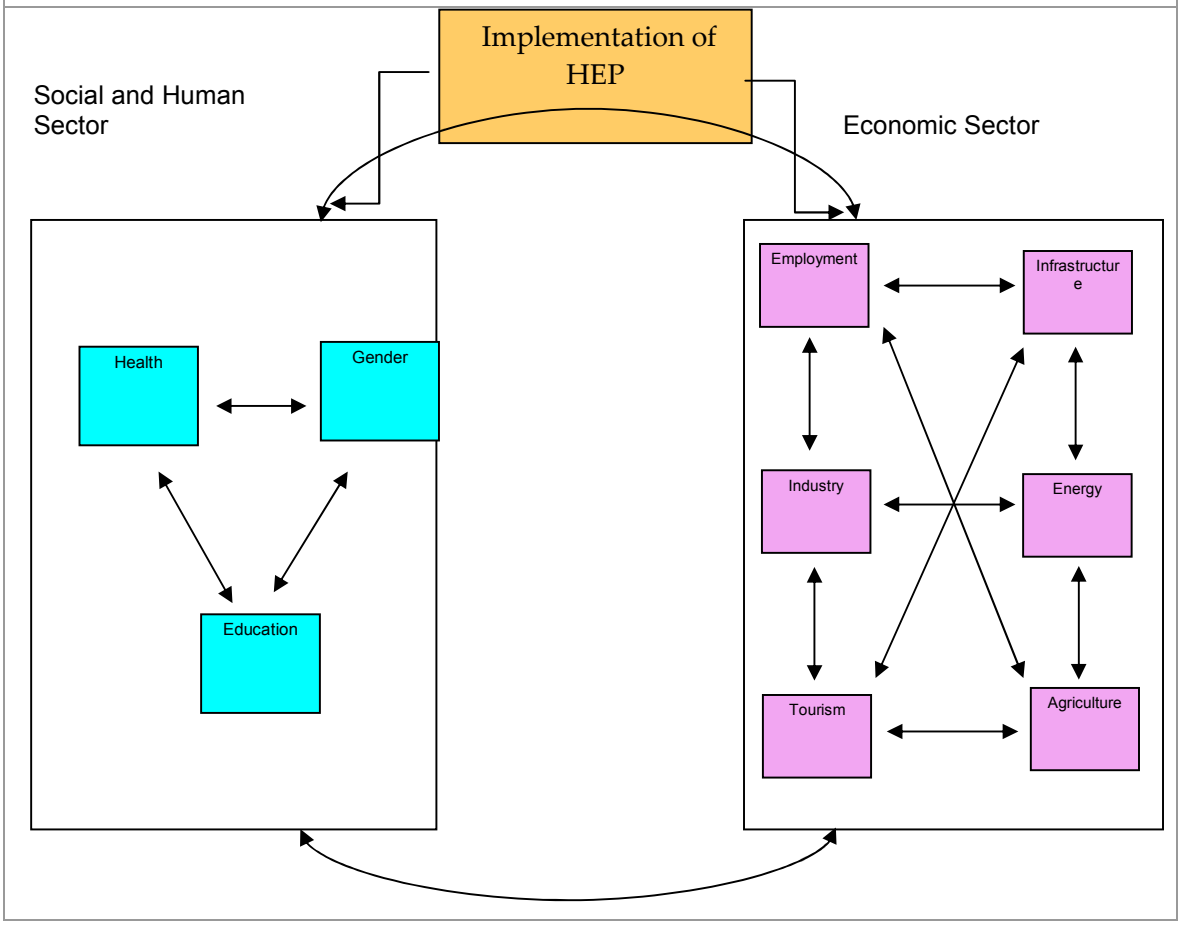


Figure 2 illustrates how growth in one sector stimulates growth in many other sectors. For example, power sector development leads to development of physical infrastructure and development of infrastructure stimulates employment, tourism and industry simultaneously. Similarly, electricity provides a chance to chance to female to get a quality education at their doorstep, which they cannot get otherwise. So there is an improvement in education as well as in gender gap. Increased education creates health awareness which in turn improves health situation and again health improvement of female implies gender development. So, the process has circular dependency.

And investment in power sector directly stimulates growth in many sectors simultaneously, and each sector stimulates more than one sector and a chain of development stimulators emerges. It is quite difficult simultaneously analyze overall mechanism of this 'development fission', and hence analysis of individual sector growth is based on 'Ceteris Paribus' assumption.

Output

As we discussed in introduction, share of Azad Kashmir to national output is 1.5% whereas population share is 2.4% to population of Pakistan. Single most important contributor to this share in GDP is Mangla Project, by producing 1000 MW of electricity. Second significant contributor is Jagran Project with production of 32 MW of electricity. If we put these projects aside, share of rest of whole economy to national output is disappointing. But when we look at potential that AJK have, our belief in concern of Islam about scarcity is further strengthened. According to official figures, there is a potential of generating 4635 MW electricity in AJK. In identified (completed feasibility study) projects, major project are presented in table 5.

Table 5: Identified Hydropower Potential in AJK with capacity larger than 50 MW

S. No.	Project Name	Capacity MW
1	Neelum Jehlum	969
2	Kohala	600
3	Mangla Upraising	300
4	Mahl	245

5	Karoti	240
6	Azad Patan	222
7	Rajdhani	132
8	Chakothi Seri	131
9	Patrind	130
10	Kotli	100
11	Gulpur	100
12	Jagran II	90
13	New Bong Escape	79
14	Sehra	65
Total		3403
Source: Private Power Cell, Govt. of AJ&K		

These are projects with identified sites and initial feasibility reports. This does not include projects with less than 50 MW capacities. Beside these, there are certain reasons to believe that actual capacity is much more than presented here. Anyway, if working of these major projects have had started, these projects would be able to provide multiple of total budget of AJK. Power sector contribute this growth potential both directly and indirectly. Direct contribution is due to expected revenue generated by selling of electricity, and indirect contribution is due to stimulation of growth in other sectors lead by power sector growth. The indirect impact on output through the channels we list below is surplus. So, HEP is easy and effective tool to uplift output at local and national level.

Energy

Today, one of major problems entire world is facing is provision of energy for household, industry, transport etc. In fact, power sector is the soul of all economic and social activities. In recent decades, two economies of region i.e. China and India showed extra ordinary performance in economic sector. No doubt one of the reasons of this wonderful performance is provision of cheap electricity to industry. It would be interesting to know that China 43000 small schemes with an aggregate installed capacity of 26 GW that are currently in operation[6]. This has contributed substantially to the provision of electricity to the nation's rural areas.

[6] World Energy Survey (2005), World Energy Council

In 2005, total installed power projects in Pakistan were having capacity of about 19,379 MW and share of hydroelectricity to this production was 6494 MW, which is 34% of total production. According to official figures, shortage of energy that Pakistan[7] will face by 2009-10 is 5,529 MW. Pakistan must tackle this increasing energy demand to maintain the growth process and to meet this demand; two options are available i.e. hydro or thermal projects.

Hydro-power potential, wherever available, is perhaps most feasible source of creation of consumable energy. Its priority onto other sources is due to multiple reasons e.g. (i) sustainability; unlike fossil fuel, hydropower generation source is not dependent on underground stock of fuel and can be utilized whenever Allah blesses some region with rainfall. It is not a phenomenon of years and decades rather forever. (ii) Economic efficiency; hydropower generation is the cheapest source of energy and can be very helpful in provision of cheap energy to household and industry. (iii) Minimal environmental disturbance; unlike energy sources that depend on combustion of hydrocarbons, generation of hydroelectricity does not depends on any combustion process which in turn creates serious threats to environment. Allah blessed Pakistan with lot of potential in this energy source and according to official figures; total potential in Pakistan is about 41,000 MW. This potential, if utilized, can fulfill total demand of energy allowing thermal resources to be utilized for other purposes e.g. motor fuel, production of fertilizers etc. Even after fulfilling local demand, we may have surplus energy for export, by proper utilization of hydro-resources only.

Employment

As we discussed in introduction; implementation of an HEP affects employment opportunities through multiple channels with all channels having positive impact on employment level. Brief analysis of these channels is as follows:

[7] Pakistan Energy Book, 2005, Govt. of Pakistan

Mechanism 1: *Direct creation of employment opportunities;* this include labor force required to work on construction of project and labor force required to draw and maintain transmission lines. Both skilled and unskilled manpower would be employed in such projects

Mechanism 2: *Employment opportunities for production and transportation of construction material;* construction an HEP might stimulate employment opportunities in many industries like cement, steel, as well as in transportation

Mechanism 3: *Creation of employment due to multiplier effect caused by increased expenditures;* it is well known to economists that increased expenditure raise level of income which in turn raises demand for good and services. Hence stimulate employment opportunities

These three mechanisms which relate investment to employment are valid for any type of investment however, remaining mechanisms are specific for power projects and they are:

Mechanism 4: *Creation of employment opportunities due to provision of electricity to more and more industries;* Azad Jammu and Kashmir is severely underdeveloped in industries and one major reason for this low performance is absence of electricity. Provision of electricity might stimulate industry, creating more employment opportunities.

Mechanism 5: *Creation of employment through surplus revenue;* this mechanism is more specific i.e. specific to hydropower projects. Hydropower projects are perhaps cheapest source of creation of consumable energy. Providing cheap energy to industries might create surplus revenue for firms which can be utilized for further investment creating more employment opportunities.

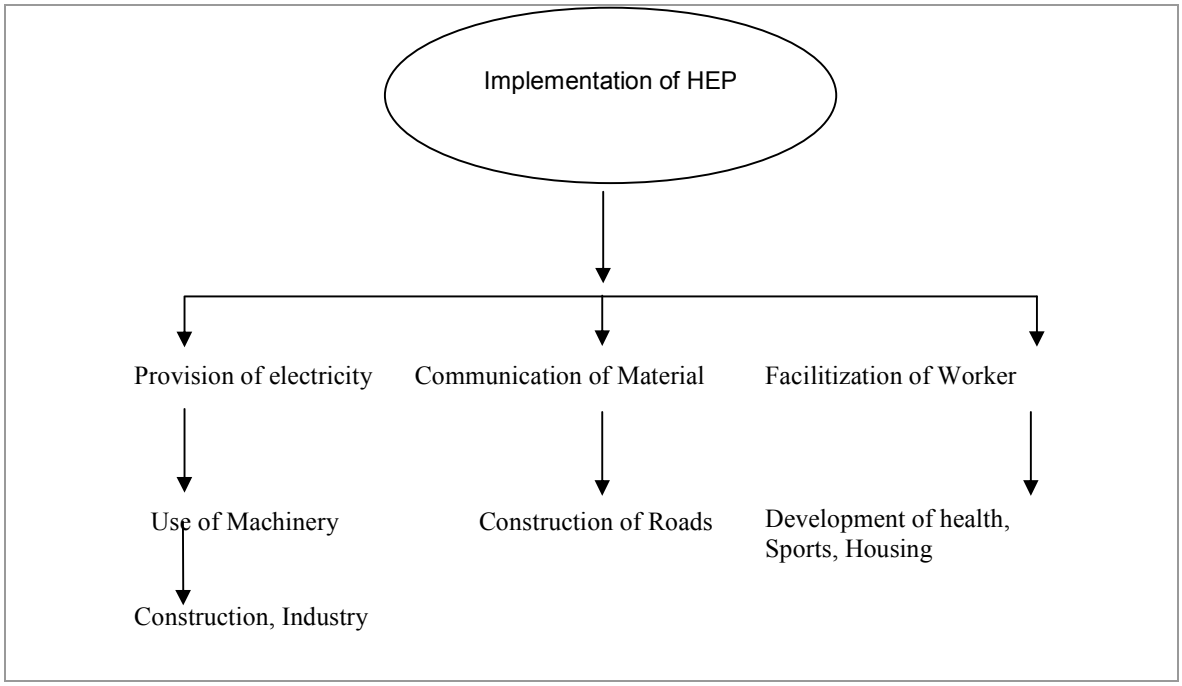
Mechanism 6: *Creation of employment through Gender Development;* in some rural area of AJK, participation of female in economic activities other than household is negligible. Beside few women engaged in teaching, there is no other economic activity available to these women. Provision of electricity may give rise to household industry creating opportunities for female as well.

Therefore, to uplift level of employment at local and national level, HEP can play very important role.

Infrastructure

Condition of physical infrastructure in AJK is not very good. A serious shock to existing infrastructure was the terrific earthquake making conditions even worse in this sector. Some areas of AJK faced warlike situation for more than one decade and frequent fight of troops destroyed civilian infrastructure as well. In Athmoqam, the headquarter of Dist. Neelum, none of public utility building was usable in 2004, when war on line of control was cooled down. Sharda, historical and most beautiful site in AJK, is another example of such destruction. Similar situation was faced on entire area of line of control. Roads and public utility buildings like schools and hospital are less than sufficient in most areas of AJK. To explain condition of roads and transportation, it would be sufficient to tell that Kel town which is at a distance of 160 KM from Muzaffarabad, the capital of AJK. To reach Kel, more than 10-12 hours are required. This is self speaking evidence on quality of road infrastructure.

Fig 3: Infrastructure Development lead by Power Sector Development



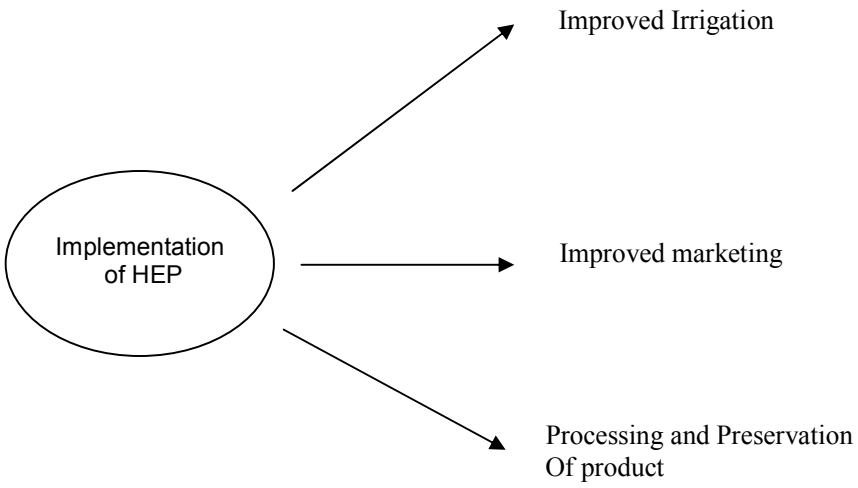
The documented evidence for inferior position of infrastructure is in table 1, which shows that length metaled per square kilometer in AJK is 0.35 Km compared to 1.70 Km at national level. Implementation of a power project might be helpful in development of infrastructure by several ways-the area that does not have access to electricity, it is not possible to use advanced technology to develop infrastructure and this condition can be altered by provision of electricity. Development of roads is necessary to communicate construction material at site of project that might improve transport related infrastructure in the area of implementation of project. Technical institution to train manpower to share in development of physical infrastructure can be done only by provision of electricity.

Agriculture

In most of cases, power projects need formation of canals/tunnel/storage which can also be utilized to provide water to agriculture at local level. Mostly, the projects that are identified in AJK does not have associated plan of reservoirs, however, tunnels and canals are part of projects. These tunnels/canals can be used to provide water for agriculture as well. Furthermore, provision of electricity can be useful in processing/preserving

agricultural products so that marketing can be done. AJK is rich in many types of fruits like apple but their marketing can hardly be done in absence of modern technology of preservation and transportation of these products.

Fig 4: Agriculture Development lead by Power Sector Development



For example, Wild Cherri is a unique delicious fruit having very small life (less than one day) without preservation. This fruit is found in far-off hilly area and can not be marketed even in Muzaffarabad. Local marketing of product will also develop by number of channels e.g. improved purchasing power, sale to outsiders working in area etc.

Forests

Forests of AJK are enriched with world famous 'Deodar' and 'Cheerh (Pine)' trees carrying very high prices in national and international market. But for locals of Azad Kashmir, these trees are nothing more than fuel for combustion. Majority of resident of rural areas of AJK have forest as only source of fuel for daily use. The far-off areas like Neelum valley, Leepa valley, Nakial, Forward Kahota etc. are rich in forests but have forests as only source of fuel. Obviously, this creates heavy threat for forests. According to official figures 42% of area of AJK consists of forests but in last 60 years after independence a large portion of forests has been chopped down. Following example would be sufficient to realize tremendous loss we are facing in this sector. Neelum Valley has a

population of over 169,000 and assuming average family size to be 7, there are about 24000 families in the valley. Each family cuts a full grown tree at least once in two years and hence 12000 full grown trees are chopped down. The trees chopped for building purpose are not included. Average size of a full grown tree is 200 cubic feet carrying about Rs.120000 price in Islamabad. So, every year we burn the forest worth Rs.1.5 billion just in one region i.e. Neelum Valley. Similarly, Leepa Valley, Forward Kahota, Nakial and many other areas totally depend on forests as a fuel.

Hydroelectricity can be used as alternate source of energy, decreasing dependency of locals on forests. For this, it is not necessary to create heavy system of transmission lines in far off villages of the area; rather each village has potential to create electricity for it and surrounding as well. The small and medium size projects implemented in rural areas would be he helpful in this regard. Provision of electricity not only saves valuable amount of forests, but also have positive impact on environment.

Industry

Industrial sector is very poor in AJK except for Mirpur city. Small industrial units which one can count on fingers are there in AJK with no medium or large units except in Mirpur. According to official figures, only 12000 people are employed in industrial sector which is 0.33% of total population.

A lot of mineral resources, forests, and medicinal herbs are found in AJK which can provide basis for industrial infrastructure. Below is the table that shows potential of mineral resources found in AJK.

Table 6: Potential of Important Minerals in AJK

Mineral Name	Reserves	Mineral Name	Reserves
Gypsum	05.000 Million Tons	Ruby	44.000 Million Grams
Coal	30.000 Million Tons	Tourmaline	Un-assessed
Bauxite	07.000 Million Tons	Dolomite	03.000 Million Tons
Cement Material	100.000 Million Tons	Pozolana	01.000 Million Tons
Marble	34.000 Million Tons	Bentonite	08.000 Million Tons
Graphite	01.000 Million Tons	Granite	15.000 Million Tons

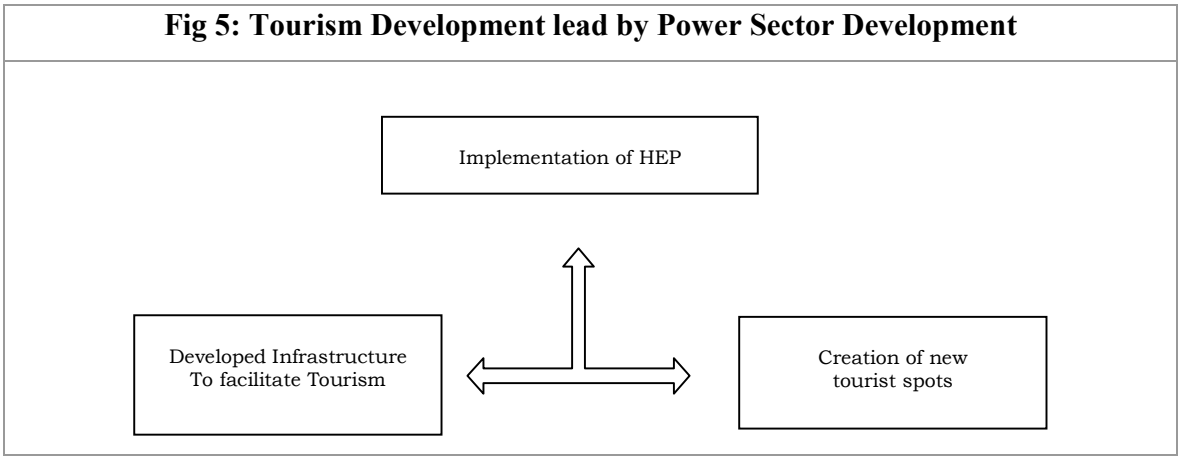
Limonite	0.065 Million Tons	Feldspar	01.500 Million Tons
Soapstone	0.065 Million Tons	Slate	01.500 Million Tons
Source: Directorate of industries, Muzaffarabad			

Industrialization needs electricity, which we have presented, is not there in many rural areas. As for as potential is concerned, if instead of using fuel, limited trees from forests are allowed to be processed to make furniture, AJK can be converted into industrial state. But this is not possible without provision of electricity at village level. Stocks of many minerals and precious stones have been discovered so far in AJK. Units can be installed for processing of these stocks to be put in market. Precious medicinal herbs and botanical material is there in the forests of AJK and it is possible to develop these items in local industrial units provided electricity is there.

Tourism

Again there are multiple channels linking implementation of HEP to tourism. Developed infrastructure might facilitate tourist visiting natural beauty of lush green scenic valleys of AJK. Creation of tunnels/reservoirs/canals for HEP create more places for tourists to visit and enjoy.

Fig 5: Tourism Development lead by Power Sector Development

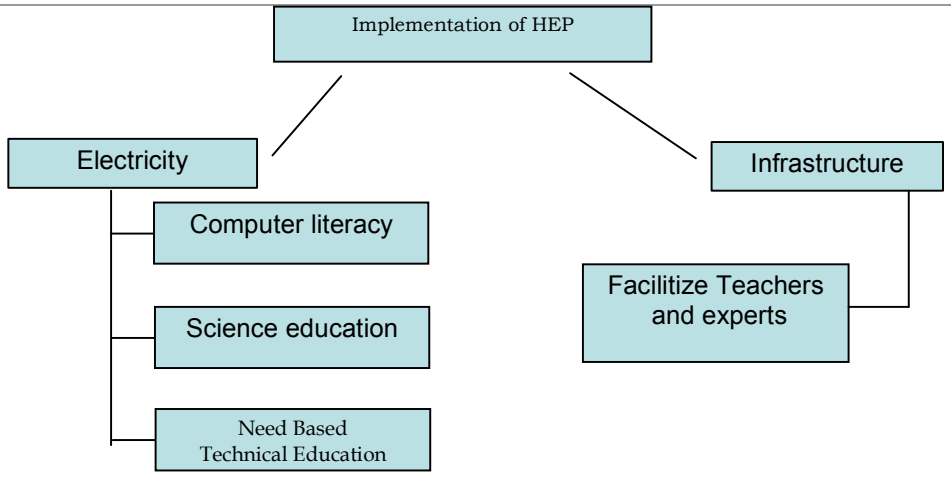


Education

No computer education is there in most of rural areas of AJK simply because there is no electricity. Similarly other student's activities needing electricity are not possible in

such areas. In snow covered cold and long nights of winter, provision of electricity could lead to utilize time which can not be utilized otherwise.

Fig 6: Education Development lead by Power Sector Development

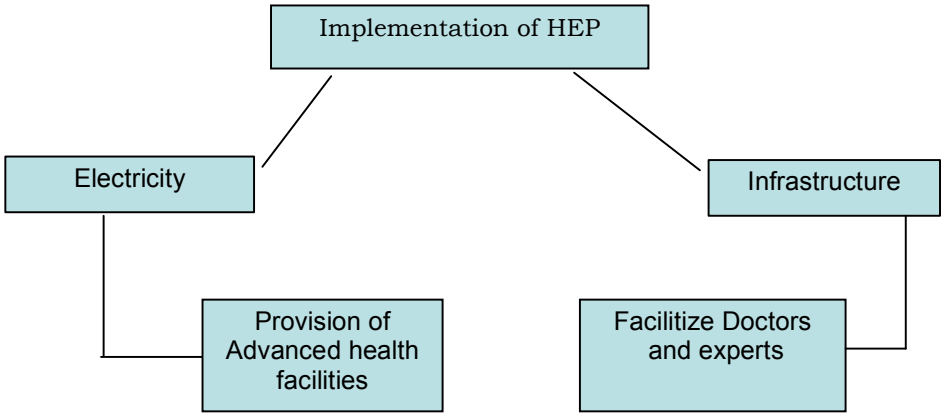


Need based technical education to meet requirement of HEP is also expected. Developed infrastructure can help teachers from outside of far off valleys to stays in educational institutions and improve educational conditions there.

Health

Health facilities play crucial role in rural development and provision of modern health facilities is possible only if electricity is there. Without proper health facilities at local level and very weak situation of transport facilities, far-off villages are suffering a very bad situation. Villages need health infrastructure at local level and for this HEP can play very important role.

Fig 7: Health Development lead by Power Sector Development



Secondly, experts and doctors are unlikely to stay in an area not having even facility of electricity. There are indirect channels as well linking HEP to health situation.

Gender development

Gender gap is very obvious in many far-off areas of Azad Kashmir. The reasons are obvious, in the snow covered winters; people are more reluctant to send their girls to schools. People of middle class send their children to cities for education, but sending a girl to a far-off school is much more problematic for them. No economic activity other than household is available to women of rural area.

By similar channels as discussed above, an HEP is expected to improve female's situation in the rural areas. That is, improved infrastructure can facilitate external experts and educationists to reside in the area. Computer literacy and Science Education is possible in local institution, household industries are possible which can provide a pastime to women in snow covered winters with an extra source of revenue.

4. Case study; do on real situation favors our analysis?

Our analysis presents a beautiful picture of hypothetical AJK with multiple power projects. But does on ground situation supports our analysis; this question is crucial.

We have two cases as examples both supporting our analysis. First case is Mirpur, where Mangla hydropower project is working, producing about 1000 MW of electricity. There is no conflict in the view that Mirpur today is most developed city in AJK. There is a valuable share of this city in national development. It is only city of AJK with large size industries. However there may be alternate view on reasons of development of this city, but role of HEP cannot be neglected in any line of argument.

Second example is town Kutton, located near Jagran HEP. This town is located in far-off Neelum Valley and is perhaps most developed town in the entire valley. This town has tourist resort, hospital, educational institutions and regional offices of many NGO's working in that area. All villages near this town are electrified and metaled road runs between the town. Before implementation of project, situation of this town was not different from other towns of area but as a consequence of implementation of HEP, it is now well developed town in the area.

These two examples, to some extent, support the analysis presented in the study. However, there are certain reasons to believe that the potential progress is partially achieved in these two projects. For both projects, the local govt. has no share royalty of projects so the development of local infrastructure is less than potential development. In case of Jagran project, the area remain serious effectee of cross border conflicts and hence only partial impacts of potential development can be achieved. However, we need a further deep investigation of possible costs and benefits of such projects.

5. Obstacle in implementation of hydroelectric projects:

We have seen so far, that to uplift multi-sector development process HEPs can play a role which no other investment can play. Now we discuss what type of obstacles are there in implementation of such projects. There may be three types of obstacles in implementation of such projects i.e. financial, political and technical. No doubt Govt. of AJK does not have enough resources to launch a mega project, but this obstacle can be removed with the help of Federal Govt. and other countries. For Govt. of Pakistan, it is

necessary to launch power projects either thermal or Hydel in order to maintain economic growth. So, instead of financing a thermal project, an HEP is in the benefit of local resident and nation. Second problem is political. An example of such political problem is implementation of Kala Bagh project which is pending due to political reasons. But historical record is evident that people of AJK shown more responsible behavior in this regard. Extension of Mangla Project is an example. Moreover, political problems have a political solution as well which our policy makers should be thinking for. Third possible problem in implementation of project is technical obstacles. Technical obstacles may be of two types, lack of expertise or lack of necessary infrastructure. These are the problems which policy makers should focus and should some solution for them and it is not an impossible job.

6. Recommendations:

Since power problem is one major problems Pakistan is facing these days, HEP offer a good opportunity tackle this problem. Moreover, growth in power sector stimulates growth in multiple dimensions, so it needs due attention of competent personalities. For Azad Kashmir, implementation of such projects is further more important because it provides basis for sustainable development in the area. The conventional contributor to economic activities i.e. agriculture and forests can not provide basis for sustainable development because former suffer lack of potential and later is a diminishing source.

Furthermore research is needed in more technical way about costs and benefits of possible implementation of HEP's. This issue is worthy for serious attention of academicians and researchers.

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