

**POLITICAL ECOLOGY
OF
HYDROPOWER DEVELOPMENT
IN BHUTAN**

*Dissertation Submitted to Sikkim University in Partial Fulfilment of the
Requirement for the award of the Degree of*

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Date: 31th July, 2014

DECLARATION

I, Kausila Timsina, hereby declare that the subject matter of this dissertation entitled "Political Ecology of Hydropower Development in Bhutan" is the record of work done by me, that the content of this did not form basis of the award of any previous degree to me or to the best of my knowledge to anybody else, and the dissertation has not been submitted by me to any other university/institute.

This is being submitted in partial fulfillment of the requirements of the degree of **Master of Philosophy** in the Department of Geography, School of Human Sciences, Sikkim University.

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List of Abbreviations

- BBPL = Bhutan Board products limited.
- BLSS= Bhutan Living Standard Survey.
- DGPC = Druk Green Power Corporation.
- DPR=Detailed Project Report.
- EIA = Environmental Impact Assessment.
- FAO = Food and Agriculture Organization.
- FDI = Foreign Direct Investment.
- GDP= Gross Domestic Product,
- GLOF = Glacial Lake Outburst Floods.
- IADB = Inter-American Development Bank.
- IFC = International Finance Corporation.
- Kw = Kilo watt
- Mw = Mega watt
- NHPC = National Hydroelectric Power Corporation Limited.
- PCAL = Pendent cement authority Limited.
- PHPA = Punatshangchu Hydropower Project Authority.
- PSMP = Power System Master Plan.
- PTC = Power Trading Corporation of India.
- SAARC = South Asian Association for Regional Cooperation.
- SAPTA = South Asian Preferential Trading Arrangement.
- SEIA = Strategic Environment Impact Assessment.
- THPA = Tala Hydro Power Authority.
- ULFA = The United Liberation Front of Assam.
- WAPCOS = The Water and Power Consultancy Services.

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Chapter - I
Introduction

CHAPTER I

Introduction

1.1 Introduction

The human and environmental interactions leading to environmental problems cannot be understood in isolation from political and economic context within which it is embedded. It becomes very essential to study the processes that generate these problems and the mechanisms that sustain them. Political ecology, according to Robbins is “a field that seeks to unravel the political forces at work in environmental access, management and transformation” and further focuses on processes, players, spaces and power relations (Robbins. P 2004). The economy and environment relationship is greatly defined by the use of natural resources. In the words of Bridge “oil is perhaps global capitalisms most important natural resources” so is hydro energy. “Hydro-capitalism”¹ in the past decade has led to amplification of hydropower development and till the year 2000, the world had built over 45,000 large dams (WCD 2000).

The modernized global hydro ecological politics bring the proponents and opponents of hydropower to controversies. The key types of actors in building of hydro power are the government, dam-building industries and engineering companies, multilateral funding institutions, environmental non-governmental activist groups, and the adversely affected people. The proponents of hydropower development legitimize their cause by depicting hydropower development as symbols of nation-building apart from other common reasons being fostering development, producing clean energy, better access to electricity, lower energy prices, integrated water management, irrigation, recreation, navigation and income for the local, national or regional economies.

The hydropower development proliferated to all Himalayan countries and the reliability of the readily available financing for most hydropower projects, the perennial rivers from the glaciers in the mountain regions, it has led to rampant hydropower development. The Himalayan kingdom of Bhutan is a young democratic monarchic country with a unique

¹ Capitalism led by the proliferated sale of hydro power.

philosophy of Gross National Happiness with its four pillars of the promotion of equitable and sustainable socioeconomic development; the preservation and promotion of cultural values; the conservation of the natural environment; and the promotion of good governance (Ura et.al 2012). With no deep rooted democracy the country is run by all state led decisions. Bhutan relies greatly for its economic growth in hydropower with a huge potential of 30000 Mw hydropower. Bhutan has taken up the run off river scheme in hydropower development for minimal environmental and social effects. Numerous major hydropower projects are being built and are being planned in the rivers of the country. The major financier of the hydropower in Bhutan is India. India provides not only financial but also technical, manpower and managerial assistance with it also being the only market where Bhutan presently sells its electricity produced.

1.2 Literature review

Dams as monuments to progress and prosperity and hydropower as a contributor to the ever , rising global energy demand under the banner of “Clean and Cheap”(Briscoe 2014) energy source has multiplied the number of hydropower constructions with the involvement of global funding agencies like the World Bank and International Monetary Fund. According to the International Commission on Large Dams (ICOLD), more than 40,000 large dams are being built across the rivers of the world holding back 15%of total annual global river runoff (Baghel et.al 2010).

Historically speaking the development of hydropower projects date back to eight thousand years when in the foothills of Mesopotamia, Tigris and Euphrates, dams were built for irrigation and water mills were used for grinding corns. The dam building culture percolated to the later middle ages and in the 19th century fast industrializing British power, which started building huge dams steadily all over their colonies (Mc Cully 2001). Other countries saw dam building as a sign of progress and dam building spread all over the world. Today dams have become a prominent feature all over the world (WCD 2000).

Now more than 150 countries produce hydroelectricity and China, United States and India are the largest players in the global world of electricity generation. China is the largest hydroelectricity producer, with 721 terawatt-hours of production in 2010 (Nasir 2013).The kingdom of Bhutan started with few micro hydropower projects until 1970s (3rd five year

plan document Gross National Happiness Commission 2011). First major hydropower development was started with Chuckha hydropower project of 366mw with the financial aid from India. Consequently Basochu I 24mw, Basochu II 40mw, Kurichu 60 mw, Tala 1020 mw were constructed. India and Bhutan in 2006 signed a umbrella agreement and Bhutan agreed to supply 5000 mw of energy every year. After the formation of a new democratic government in Bhutan in 2007 the umbrella agreement came into revision in 2008 and a total 10000 mw electricity was agreed to be supplied to India (DGPC 2013).

1.2.1 The Political Economy of Hydropower Development

The development of hydropower is the result of complex interplay of power relations among local, national and international actors. Major actors such as state agencies, companies, consultant firms, banks and international financial institutions, non-governmental organizations, local authorities and local communities are involved in the process of building mega projects. The major proponents of hydropower development are the state government and the bureaucratic power that have the power to make all the major developmental decisions of the country. Fostering development, producing clean energy, better access to electricity, lower energy prices, integrated water management, irrigation, recreation, navigation and income for the local, national or regional economies are the central focus of hydropower development. Thus the development of hydropower has seen much importance in the recent times. Banks and financial intuitions play a major role as development of hydropower is a capital intensive venture and hydropower development projects become a major pull force of Foreign Direct Investment.

In the case of hydropower development in Bhutan, it's state policies have played a crucial role not only in laying out the necessary infrastructures for development but also in establishing the social discourse to utilize natural resource like river systems for country's modernization and economic development. Energy development in Bhutan began with the country's need for infrastructural development in order to build the national political and economic security. The Hydropower development is for preparing the country to be ready for basic infrastructure development and attracting foreign investments (BSHDP 2008). Until 2002, Bhutan's energy sector was overseen by the Ministry of Trade and Industry and

Department of Power. In 2002, reforms in the executive Lhengye Zhungtshog² produced three new bodies under the Ministry of Economic Affairs: the Department of Energy, its subsidiary Bhutan Electricity Authority, the Bhutan Power Corporation and Druk Green Power Corporation (DGPC). While the Department formulates policy, planning, and coordination, the Authority is the main regulatory agency of the energy sector and DGPC the main implementing agency (BSHDP 2008). Hydropower is the major natural resource in Bhutan and a number of projects are being developed for its optimal use.

Bhutan is drained by four major fast, south flowing rivers Amochhu (Torsa), the Wangchu (Raidak), the Punatsangchhu (Sunkosh) and the Dangmechu (Manas) fed by Himalayan glaciers run through deep and narrow gorges of the mountainous topography of the country. The area above an elevation of 4000 m is covered with snow and ice year round. The glaciers as well as glacial lakes are the sources of headwaters of the rivers of Bhutan (Climate Summit 2011). The abundance of water and the rugged topography makes hydropower generation very favourable. The hydropower potential of the country is estimated at 30,000 megawatt and 91 potential sites for development of large hydropower stations (Droji 2013).

The 9th five year plan of the country had set an aim of electrifying 15000 households, which is expected to greatly benefit the rural communities by encouraging cottage industries, replacing fuel wood, improving level of education and health services, generating rural income and strengthening cultural identities. In 2011, 45 per cent of the kingdom's revenue came from its hydropower sector alone (Chin 2012). The three pillars of sustainable economic development of the country is identified as, (i) expanding hydropower, (ii) increasing agriculture self-sufficiency and (iii) expanding the industrial base (NESB 1998). Though with enormous potential the country faces major challenges in developing hydropower like finance, man power and management. The country strongly encourages Foreign Direct Investment (FDI) according to the FDI policy 2002. The major FDI flows in Bhutan from India and also funds from Asian Development Bank, World Bank, Austria, Japan and Norway. The inflow of FDI being US\$391 million in December 2004 (BCSP 2007-13). The major buyer of the hydropower produced in Bhutan is India but it does run the danger of market threat in the north eastern part of India as the north Indian states also possess similar power generating potential as of Bhutan.

² Cabinet of Ministers in Royal Government of Bhutan

Though the development of hydropower has raised the GDP and Per capita income from \$315.01 in 1980 to \$2,346.29 as of 2011 (Mundi 2011) and talks of poverty elevation and infrastructural development, electricity or all by 2013, the country has got into the problem of debt management and balance of payment. As of December 2003 the debt outstanding was USD 472193 million (PRSP 2004). The hydropower development does not seem to have good economic return as the cost of building one hydro project like in case of Tala cost 40 Nu billion while the GDP was Nu 31.2 billion in 2006. The problem of lack of privatization of hydropower development is also clearly evident in Bhutan (ESMAP 2007).

Private participation in Bhutan can be developed in various ways like contracting out, Build - Operate - Transfer (BOT), Build-Own-Operate -Transfer (BOOT), leasing, Management Contract, Franchise, Concession, Cooperatives, Divestitures, and Greenfield Projects (SHDP 2008) The Dutch disease and the inflation are some of the other economic major problems like in the case of Chuckha and Tala Hydropower projects (Kojo 2005). Along with economic problems Hydropower brings with it the issues of social and environmental problems in many ways – altering the flow of rivers, their access to and use of the rivers, bringing changes to the ecological systems and use of land. However, hydropower development is being challenged and contested in many river basins across the world and several local communities oppose the construction of the projects.

1.2.2 Ecology and Hydropower

Damming rivers has shown some devastating implications, where 60 percent of world's river basins fragmented and have changed the upstream and downstream morphology of river bodies, deltas and coast lines. 77 percent of the total water discharge in the 139 largest rivers are affected by the blockage caused by dams. 40,000 sq. km of forests and wetlands has been permanently lost to the dams. The diversion of water for irrigation has reduced the downstream flow and the sinking of Aral Sea in Central Asia. The pattern of flow variation is disturbed, rampant erosion and aquatic flora and fauna being affected. The chemical, thermal and physical change of water in the storage inside a reservoir for many months leads to the deterioration of water quality, temperature, nutrients, turbidity, dissolved gases and minerals. The massive algal boom in many dams has become a major water contaminator like in the Nasser dam in the Nile (McCully 2001).

The effect of dams on the rich flora and fauna biodiversity has also emerged as a significant problem. The worst to be affected by the river fragmentation and depleting water quality is the aquatic life and fishes. The river eco-system is altered by the fragmentation of rivers and the fish species become isolated upstream and downstream, cutting off migration and movements. The change from free flowing river to reservoir induced pond water results in massive reduction in the fish population and diversity. The introduction of new species like Hapia and Crab in the tropics and trout, bass and catfish in reservoir have increased many fold reducing the native fish population. Even the new species are said to thrive for the initial years and there is a massive decline in the fish population because of the isolated habitat in the later years. The fish ladders have destroyed salmon fishes in the Colombian river (McCully 2001). According to nature conservationists, the dams in Bhutan could affect the migration of the Golden mahseer and Deccan mahseer by blocking their migratory routes (Dema 2009).

The Northeast region of India, consisting of the eight states of Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim, known for its biological and cultural diversity is a home of a great number of indigenous communities and wildlife species such as the rhino, elephant, tiger, wild water buffalo, pygmy hog and gigantic river dolphin and three out of 34 biodiversity hotspots identified globally, it also houses 21% of Important Bird Areas within India. The unique Brahmaputra and Barak river system identified as India's 'future powerhouse' and at least 168 large hydroelectric projects have majorly altered the rivers morphology, and large dams are emerging as a major issue of conflict in the region (Vagholikar et.al 2010).

Northeast states such as Arunachal Pradesh and Sikkim are home to small populations of culturally sensitive indigenous communities. The construction of hydropower plants has directly and indirectly displaced local population. The entire population of the Idu Mishmi tribe is around 9500 and at least 17 large hydropower projects have been planned in the Dibang Valley in Arunachal. The over-900-day satyagraha in Sikkim by affected indigenous communities from 2007-2009 focused on the impacts of hydel projects on Dzongu, the holy land and reserve of the Lepcha tribe. The concerns being expressed in states like Arunachal Pradesh and Sikkim are not restricted to the issue of displacement but that the region's cultural and ethnic traditions rooted in the river and its environments (Vagholikar et al 2010).

A major catalyst to trigger the larger debate on downstream impacts of dams in Assam has been the repeated incidents of dam-induced floods across the state from upstream projects e.g. 405 MW Ranganadi in Arunachal Pradesh in recent years. Downstream impact concerns raised in the Northeast include: loss of fisheries; changes in *beel*³ wetland ecology in the flood plains; impacts on agriculture on the riverine islands and tracts, impacts on various other livelihoods due to blockage of rivers by dams in the Subansiri river. The Kaziranga National Park runs the danger of being flooded by the Subansiri Dam in Arunachal and The Manas National Park in Assam are also likely to be effected by the existing 60MW Kurichu and the proposed 720MW Mangdechhu hydropower projects in Bhutan. Both the Kurichu and Mangdechhu rivers contribute to the flow of the Manas-Beki river system, which considerably sustains the park. It is noted that the Kurichu dam has already affected the forests and wildlife of the park, when in 2004 it released excess water that caused an unprecedented flood in the Manas-Beki river system, washing away parts of the property and killing a large number of wild animals (Gowsami 2012).

The hydropower project in the Punatshangchhu river, could affect migration of the Golden Mahseer (*Tor putitora*) and Deccan Mahseer (*Tor khudree*), say nature conservationists. Dams in these rivers could block their migratory route and prevent the Mahseer from coming to Bhutan. Mahseer is mostly found in big rivers like Mangdechhu, Kurichhu, Dangmechhu and Punatshangchhu. They migrate to the Brahmaputra river in autumn and go back to Bhutan in the spring between April and May. In Bhutan, Mahseer is not listed as an endangered species but is an engendered species in India. While hydropower is very important for Bhutan, conservation of Mahseer becomes equally important (Dema 2009).

The white-bellied heron, which feeds on the fish and the reduction in the number of fishes could affect the birds too. The heron is quiet and shy by nature, and all the noise and infrastructure development of the projects can drive them far, few months ago, two herons died, when they fell on the iron wire installed across the river. The hornbill will get disturbed, if their habitat and food are disturbed. The project is located near the Dikchhu National Park which is likely to affect the park too (Dema 2013). The muck generation by 2.2 cubic meters could affect the land use due to submergence of 65 acres of land and muck disposal and the realignment of highway through rich riverine forest and the reduction in forest cover is a major concern. Fugitive dust from vehicular movement and removal of vegetation leaving the

³Wet land ecology.

soil exposed to wind is a matter of concern apart from the conversion of agricultural land to other uses (Kuensel Online 2010).

1.2.3 Environment Impact Assessment

The Environmental Impact Assessment (EIA) has to be carried out before any major projects are built. The EIA for the Nam Choan Dam in Thailand by a team of Canadian Engineering Company on downstream effects presumed that the area to be covered by the dam would have similar environment and predicted very less impact on the wild life sanctuaries which was later found to be not true and the sanctuaries were flooded causing massive damages (McCully 2001) The EIA reports for dams in Northeast India has been criticized by Dr. Anwaruddin Choudhury, renowned naturalist from Northeast India, examining EIA reports of at least five large hydroelectric projects – Kameng, Lower Subansiri, Middle Siang, Tipaimukh, and Dibang – and finds them all poor on wildlife aspects. “A common feature of his introductory comments on these reports has been: “contains innumerable (instances of) incorrect data, unverified and superfluous statements, and above all reveals the casual approach”(Vaghlikar et.al Page 5 2010). The faulty EIAs rightly prove the claim of McCully who said the EIA is being turned by governments into a bureaucratic formality. The International Environmental consultancies writing EIA have become a profitable business. British agencies earned 2.5 billion dollars in 1994. The actual findings are often turned down on the report. Bhutan maintains 72% of forest cover and the National Environment Commission (NEC) is the main body to look after environmental clearance. The EIA/DPRs (Detailed Project Reports) to be conducted before every project is built is given major significance in the Bhutan Vision 2020.

1.2.4 Marginalization and Conflict

The classic case of Sardar Sarovar Dam protest or popularly known as the Narmada Bachao Andolan is the one most powerful mass movement in the history of anti-dam movements. Started in 1985, against the construction of huge dam on the Narmada river, which supports a large variety of people with distinguished culture and tradition ranging from the indigenous (tribal) people and to the large number of rural population (Bavishkar 2004). The Sardar Sarovar Dam and Narmada Sagar would displace more than 250,000 people. The big fight is over the resettlement or the rehabilitation of these people. Led by one of the prominent leader Medha Patkar, it has now been turned into the International protest, gaining support from NGO'S all around the globe. Protestors are agitating the issue through the mass media,

hunger strikes, massive marches, rallies and several documentary films. The protestors are facing hardship being harassed, arrested and beaten up by the police several times (Eco India 2008).

The case of the largest dam (300 MW) ever built in Guatemala was the Chixoy dam which started operations in 1982 is no different than the Sardar Sarovar project. Chixoy dam project represented a complete disregard of the local people and their rights to land, culture, livelihood, and even life itself. The state company National Institute of Electrification built the dam with financing from the Inter-American Development Bank (IADB). In 1975 National Institute of Electrification began construction without notifying the local population, without legal acquisition of the land, and without having previously conducted impact studies. There were no plans to address compensation and alternative livelihoods for the almost 3,500 displaced Mayans and 6,000 affected people in the surrounding communities. Furthermore, the resettlement plan proved to be inadequate. In spite of this, the IADB Bank and the World Bank granted further loans. The failure to implement adequate programs for the local residents contributed to create conflict in the area. Dam affected residents refused to move and resettlement negotiations were organized with the presence of the military. The army forcibly evicted residents, and in at least two documented instances they massacred residents. In Rio Negro, 444 of the 791 villagers were killed. The dam affected communities have continued to suffer losses from lands, livelihood (Hirsch 2010).

Sri Lanka's Mahaweli Project in the 1970's stated that 60,000 hectares of irrigated land in the Mahaweli basin would be distributed among three ethnic groups the Buddhist Sinhalese, Hindu Tamils and Muslims according to their proportion in the national Population. The allotment was very carefully done by placing the Sinhalese in between the Hindu dominated North and South Mahaweli basin. It was a plan hatched to break the solidarity of Tamil minority and minimize the influence of Tamils in the Mahaweli area. Several Tamil militants were massacred by the Sinhalese settlers. Similarly the brutal violence and terror from the authorities of China's Xinanjiang Dam led to a wide protest by the native people who were force fully evicted from the areas making the oustees to walk for days to their resettlement areas. Many were dead because of hunger and cold and pregnant women giving birth in the road ways (McCully 2001).

The dam building business has led to marginalization of communities where millions of politically powerless people and ethnic minority are evicted from their home land. India and

China have outreached the numbers displacing 14 million people and 10.2 million in china. Most statistics include only the reservoir ousters and surpass those deprived of land and livelihood by the dam building projects. Mostly Indigenous people are evicted like the indigenous adivasi of India, 6% of India population were displaced (Eco India 2008). Similarly 4.7 million indigenous tribes displaced in Philippines. The Pastorals and indigenous people are hard hit who use river valleys for grazing, river fishing and collecting vegetables, timber from forests on which they have no legal rights and don not get compensated for it (McCully 2001).

There have been long stretched contestations and conflict in the hydropower building process in most of the dams built in countries like China, India, Thailand, United States, Africa etc. Major criticisms of the sector concern the lack of participation of local communities in the decision-making processes, the social and environmental consequences are underestimated and inadequately compensated for, and that costs and benefits are unequally distributed. Bhutan has been a peculiar case where it has not seen any form of contestations and conflicts in the dam building and operating process. Building of hydropower is a state led decision process and is represented to be clean and green and is an entirely depoliticized issue, though the country is facing indebtness, environmental implications and issues of displacement. The paradox of political ecological issues of hydropower represented to be green and clean and the depoliticized hydropower development is important to study.

1.3. Why Political Ecology Context of Bhutan's Hydropower Development

Applying the political ecology perspective the study tries to understand the state led decision making process of hydropower development and its political, economic and social implications in Bhutan. Political ecology, according to Robbins is a field that seeks to unravel the issues of Degradation and Marginalization, Conservation and control, Environmental Subjects and identities, Environmental Conflict, Political Objects and Actors. Hydropower makes an excellent area for political ecologist researchers because of the way in which hydropower development involves the issues of power relation and Bhutan being led entirely by state decisions, it is the powerful that have the say over the country's natural recourses on bringing capital, investment, export and regulating the profit. As Bhutan is not solely developing hydropower projects and is in alliance with other countries for hydropower development, like the agreement on finance and export with India, power relations are more

involved. India being the sole financier in big Hydropower projects in Bhutan, it is of immense importance to understand the role of India in the energy development in Bhutan.

Hydropower development have been associated with the issue of conservation and control of natural resource and further it involves the issues of degradation of environment like river diversion, erosion, land submergence, forest depletion, and effects on marine ecology which has lately been quite evident in Bhutan. Hydropower also involves the issue of marginalization of the people where they are displaced from their ancestral land and denial of the usage of the river which gives them identities of being environmental refugees. The environmental conflict that has been emerging to stop hydropower development all over the world is evident. The entirely depoliticized hydropower development process of Bhutan is also a major issue to be explored. The human and environmental interactions in the hydropower sector with an emphasis on actors, spaces and power relations that are at work makes political ecological research apt in the present context of studying hydropower development in Bhutan.

1.4 Statement of the Problem

Sustainable energy production from renewable natural resource like wind, water, solar, tide has gained much important in the international discourse of energy production. The discourse has stimulated the concept of “green energy” meaning energy that has least effect on the environment. Thus energy production from the renewable natural resource under the banner of “green energy” has seen proliferated development of energy generating projects all over the world from solar, wind, tide and most importantly water/ hydro power.

Hydropower generation has been legitimized using the umbrella of green and clean energy in Bhutan. A general outlook has been developed by Bhutan for hydropower to be green and clean energy and has recently developed a huge number of hydropower projects. The government of Bhutan envisages the project from the point of view of development imperatives with ambitious expectation of high electric production for economic interest. The country’s total need of electricity in 2006 was just 124mw including both industrial and household needs while it was already producing about 1500mw of electricity which after the construction of the 10 new major projects after the umbrella agreement with India in 2008 is expected to double.

As evident from the lack of critical studies to read the hydropower development in the context of its social, economic and Political background this study attempts to bridge such

gap Bhutan's well developed image of producing green hydropower energy appears to be problematic where there are sporadic cases of hydropower development in Bhutan to be not very environment friendly and involved with issues of rehabilitation. Therefore it is imperative to develop a critical perspective to understand the multiple dimension of hydropower development in Bhutan.

1.5. Study Area

The study was carried out in three important hydropower project sites in Bhutan, namely Punatshangchhu I and II in central west, Tala in south west and Amochhu in South and has been taken up due to their strategic location and the phase of functioning of these projects. Punatshangchhu I & II hydropower projects are under construction in western Bhutan, and Amochhu in Southern Bhutan is expected to start in the coming year where land acquisition and project site has been finalized. The three hydropower project sites taken for the present study will be the best representation as samples of the process involved in building up of hydropower projects in Bhutan.

1.6. Objectives

1. To study the social, economic and political forces that led to hydropower development in Bhutan.
2. To critically explore the reasons behind the representation of hydropower development in Bhutan is represented in an entirely depoliticized manner.

1.7 Research Questions

1. Whose interests are being represented by the development of hydropower in Bhutan?
2. Why the idea of hydropower development being green is represented in an entirely depoliticized manner in Bhutan?
3. To what extent does the depoliticization of hydropower development affect the ecology and displace the locals?

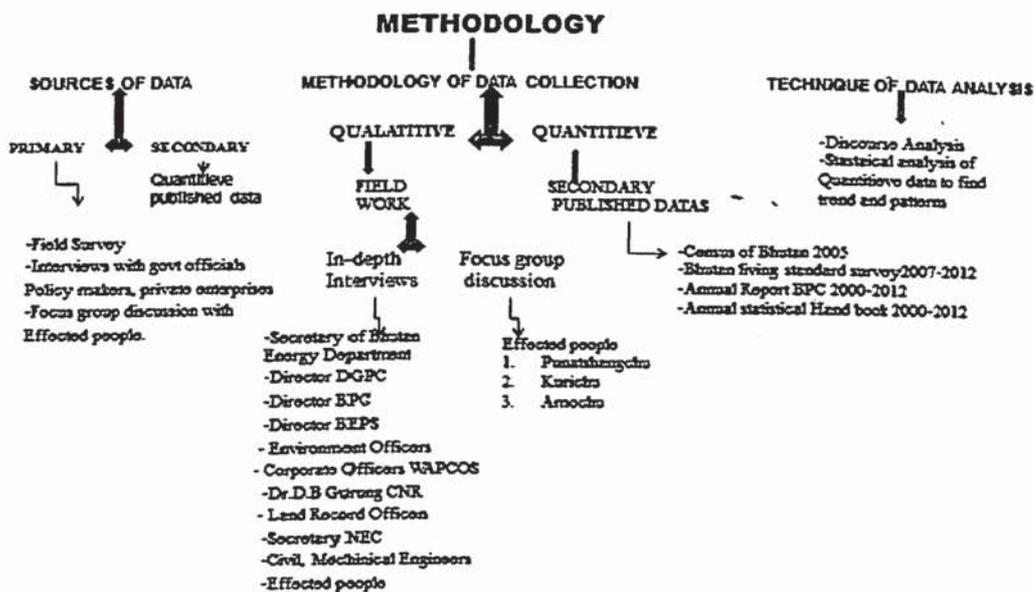
1.8. Approach to the Study

1.8.1 Sources of Data

The main data to be used in the study will be acquired through Primary and secondary sources.

Primary sources- primary sources of data were from field survey, interviews with the bureaucrats, policy and planning officials, the hydropower implementing agency. Focus group discussions were held with affected people. In-depth interviews with the local residents and outsets of the hydropower projects were also held.

Secondary source- secondary source of data were from review of existing literature like journals, newspaper articles, conferences proceedings and government published reports.



1.8.2 Methodology of Data Collection

The study will use both quantitative and qualitative data.

Quantitative data - were acquired through the field survey using random sampling of the ousters of the hydropower project. Using snowball technique the bureaucrats, policy and planning officials and the hydropower implementing agency were interviewed. Government produced data like census of Bhutan 2005, Bhutan living standard survey 2007 and 2012, annual reports of Bhutan Power Corporation, annual statistical handbook, Detailed Project Reports of Punatshangchhu I &II, and Amochhu were used.

Qualitative data – qualitative data were abstracted from review of the existing literature on the relevant topic. Using the ethnographic and observation technique, In-depth interviews and focus group discussions were conducted in the study area with the ousters and the local people residing in the project sites.

1.8.3 Methodology for Data Analysis

A discourse analysis was done for the acquired qualitative from primary and secondary sources. The quantitative data were analyzed using various statistical packages to gauge rate and effect. Cartographic techniques like GIS were used to map the affected areas by hydropower development in the different river basins of Bhutan.

9. Limitation of the Study

The study was completed in a period of two years and the limitations to conduct the study was mainly faced to cover the study area as the study site selected were distant from one another the physical accessibility was difficult. Data collection from the government offices in Bhutan was particularly difficult.

Chapter - II

*Evolution of Hydropower Development in Bhutan:
The Social, Economic and Political Context*

CHAPTER II

Evolution of Hydropower Development in Bhutan: The Social, Economic and Political Context

2.1 Introduction

Bhutan is a democratic monarchic country in the eastern Himalayas with a geographic area of 38394 square km stretching from Tibet Autonomous Region of China in the north to Indian states of west Bengal in the south and Arunachal Pradesh in East to Nepal in the west. The country has a mountainous topography except for few Dzongkhags⁴ in southern belts. Sparse settlements of 75030 people are mostly settled in 0.6% of the total area in the wide valleys of the mountains. The land cover is mostly forest with 70.46% forest cover, while Agriculture, Bare areas, degraded areas, Marshy land, snow cover, meadows, water bodies, built up area and Non-Built up Areas occupy rest of the land surface (National Statistical Bureau 2013). The climate varies with altitude the north is snow clad Year-round, heavy monsoon rains in west, drier but temperate central and eastern areas, humid and subtropical in south.

Rivers in Bhutan are generally fed by rainfall, snow melt and glaciers melt. 10% of the total country area in northern Bhutan is covered with Glacier which is key to the perennial water supply to the rivers. Bhutan has an estimated potential for hydropower generation of over 30,000 MW and 23,760 MW technically feasible till date in four major rivers Torsa, Wangchhu, Sunkosh and Manas (Choden 2005).

Bhutan is a multi-lingual and ethnically diverse country. It has about nineteen languages and many local dialects. The country has three ethnic group namely Ngalop people who mostly inhabit the Northern and Central Bhutan and speak Dzongkha⁵, Sharshop who are in the Eastern Bhutan and speak Sharshop kha. The Ngalops and the Sharshops constitute 50% of the population while other ethnic group like Lhotshampa the ethnic Nepalese who are in the southern belt and speak Nepali constituting 35% and small groups of the indigenous tribes 15% of the population reside in different pockets of Bhutan. Buddhism 75% and Hinduism 25% are the two widely practiced religions in the country (Mundi 2013).

⁴ Dzongkhags= Districts in Bhutan altogether has 20 districts in total.

⁵ Kha means language, while Dzongkha is the national language of Bhutan.

2.2 History of the Political Development

The heterogeneity in language, ethnicity and religion has brought a unique culture and tradition guiding the lives of the Bhutanese. This diversity and cultural richness is brought by an age long history dating back to 2000 BC, when Bhutan was inhabited by mountain aborigines, known as the Monpa who practiced the Bon religion (Worden 1993) Buddhism came to Bhutan in the seventh century with establishment of two Buddhist monasteries in Bumthang⁶ and Paro⁷ by a Tibetan king. Bhutan had no form of rule or governance existing till then, a number of Tibetan expedition and migration found way into Bhutan. By early 9th Century, small territorial monarchs came into power known as a *deb*⁸. Among the monarchs, the kingdom of Bumthang emerged as the most powerful and influential one. The society and polity of Bhutan by then was shaped by Tibetan Buddhism as it had taken root. *Dzongs* which are a protuberant feature today started to be built in various places by 17th century (Worden 1993).

In the 17th century the arrival of a Tibetan monk Zhabdrung Nagwang Namgyal who escaped to Bhutan after a civil riot in Tibet, united the country and established a Theocratic government becoming the temporal and spiritual leader. Under his centralised rule and the legal code (Tsa Yig) the country fought against many Tibetan, Mongal-Tibetan invasions, and got a path for government administration and social and moral conduct. While Zhabdrung was the head of the state and the ultimate power, the administration of the country was divided into two parts the monastic head was Je Khenpo and a theocratic civil government headed by the *druk*⁹ *desi*¹⁰. *Dzongs* were the nodal administrative offices and the summer capital of the government was picked to be at Thimphu¹¹ from 1527 and the winter capital at Punakha¹². The kingdom was divided into eastern Trongsa¹³, central Paro, and Punakha western regions governed by *ponlop*¹⁴ and the districts by *dzongpons*¹⁵. The *ponlos* performed a number of duties as tax collectors, judges, military commanders, and

⁶ Is a Dzongkhag located in north-central Bhutan

⁷ Is a Dzongkhag located in the south west of Bhutan.

⁸ King in Bhutan

⁹ Meaning thunderbolt in Bhutanese language

¹⁰ The secular ruler.

¹¹ The capital of Bhutan located in central Bhutan.

¹² The winter capital of Bhutan located in western Bhutan.

¹³ Is a Dzongkhag located in central Bhutan.

¹⁴ The Governor of a district in Bhutan

¹⁵ Head of a region

procurement agents for the central government. The major revenues came from the trade between Tibet and India and from land taxes (Worden 1993).

The administration ran efficiently till the death of Zhabdrung in 1651 shortly after which civil wars broke among the Druk desis, penlops and the dzongpons from 1728 to 1772. Major Wars were fought outside with Mongal-Tibetan force in 1714 and Sikkim till 1770. Consequently a major territorial conflict with the British who wanted a trade route to Lhasa in Tibet broke since 1772 and led to the Duar War where Bhutan lost leading to Treaty of Sinchula of 1865. The then Trongsa Penlop Ugyen Wangchuck, who had kept the country united through several civil wars and rebellions in 1882-85 was the most powerful person in Bhutan and knowing the critical geopolitical situation where Bhutan was sandwiched between Tibet incursion and British from the South he decided to assist the British and in 1903-4 took a British mission to Lhasa as a mediator. After which he continued to retain his power in Bhutan and by 1906 the whole civil administration of Bhutan came under the control of Ugyen Wangchuck. In November 1907, the dual system of governance was demolished and Ugyen Wangchuk was elected as first hereditary King /Druk Gyalpo of Bhutan (Worden 1993).

In January 8, 1910, the Treaty of Punakha was signed between Bhutan and British India. It amended two articles of the 1865 treaty where the British agreed to double their annual stipend to 100,000 rupees and "to exercise no interference in the internal administration of Bhutan." In turn, Bhutan agreed "to be guided by the advice of the British Government in regard to its external relations"(SID 2011 page 63). The Treaty of Punakha guaranteed Bhutan's security against China. The king then focused on internal reforms which included the introducing Western-style schools, improving internal communications, encouraging trade and commerce with India, and invigorating the Buddhist monastic system. In 1914 forty-six boys were sent to a Scottish mission school in Kalimpong. In the same year a school was started in Ha, and in 1915 one was founded at the king's palace in Bumthang, especially for his heir and a few other boys. Lack of funds however prevented many other projects from getting off the ground (Aris 1994).

After the first King his son, Jigme Wangchuck succeeded the throne and made an unrelenting effort of centralization and modernization. Thus more number of schools, dispensaries, and roads were built. The monasteries and district governments were gradually brought under imperial control. With the India's independence in 1947, Britain's relationship

with Bhutan also came to an end. India substituted Britain as the de facto protector of Bhutan, with no control over its internal matters but is a guide in its external relations. India also agreed to increase the annual subsidy to 500,000 rupees per year and returned the territory of Dewangiri¹⁶. Thus on August 8, 1949, Thimphu signed the Treaty of Friendship between the Government of India and the Government of Bhutan. Nevertheless, Bhutan largely remained isolated from international dealings (Sinha 2001).

The third successor to the Wangchuk dynasty in 1952 was King Jigme Dorji Wangchuck, his understanding on the existing geopolitical environment of Bhutan, its internal social economic and political situation, made him strongly believe that if Bhutan were to subsist as a nation, it had to revolutionize its economy and open itself to the outside world.

2.2.1 The Geo-Political and Socio Economic Backdrop

Located in a strategically shielded region between India and China, the regional environment demanded Bhutan for a cautious move towards its external relation. Treat to the country's independence was intense as it was exposed to external threats for many centuries. The century long Tibetan invasions to Bhutan from the sixteenth century onwards. The situation worsened with Chinese ferocity against Tibet in 1950 posing serious threat to Bhutan's security. As Bhutan had very strong cultural and historic ties with Tibet, it worried a lot about the conquest of its neighbour and after its conquest Bhutan remained the only buffer country between China and India. It became more threatening when in 1939 China included Bhutan in a list of its "lost territories" (Ueda 2003).

All the trade with Tibet was immediately ceased and the Bhutanese representative in Tibet's capital Lhasa was also terminated. In 1960, Bhutan closed its border with Tibet and all form of communication was withheld (Ueda 2003). The then Bhutanese economy was driven from sedentary agriculture and a barter system of trade was prevalent. Trade mainly happened between the Indian state of West Bengal especially Cooch Bihar, Assam and Tibet (Pommaret 1999). The Bhutanese economy was severely affected after the closure of trade with Tibet, as Bhutan's exports of her domestic products like rice, woollen cloth, munjeet (a type of dye) and wrought iron, including imported products from Bengal such as English broad cloth, indigo, tobacco, coral, leather and sandal-wood were stopped, the economy ran into great loss (Ray et.al ?).

¹⁶ Dewangiri= is a town in south east Bhutan presently called Dewthang located in Sambdrupzongkhar dzongkhag.

The social infrastructure of Bhutan was least developed Serfdom the country at the time Bhutan had an underclass of prisoners of war and their descendants, aboriginal or indigenous tribal peoples were generally treated as serfs or slaves (Worden 1991). Slave status was inherited, and the value of slaves varied according to age, caste, and sex Slavery in Bhutan was a common legal, economic, and social institution by the 19th century; Bhutan had developed a slave trade with Sikkim and Tibet (Googoi 2002).

Owing to the prevailing apprehensive geopolitical situation, weakening economy and deprived social conditions, Bhutan chose to be isolated as Aris states *in the 19th century the internal situation deteriorated to such an extent that if a foreign policy could be said to have existed at all it was one of isolation* (Aris 1979 P.269). But by 1960 Bhutan realised the need for a need to end the isolation and strong political, social and economic reform were introduced. The political reform was marked by the structural changes in the administration with the introduction of the National Assembly/Tshogdu Bhutan's first unicameral Parliament. The king also empowered the National Assembly to remove him or any of his successors with a two-thirds majority in 1953 (Sherpa 2014). Although the king could exercise veto power and question resolutions passed by the National Assembly. The establishment of parliament marked a foremost move toward being a constitutional monarchy. The abolition of slavery and serfdom, ceiling of land holding up to 20 acres the redistribution of land to the landless, tax waver to the poor in 1956 were the noteworthy socio economic reforms (Ueda 2003). Bhutan's Citizenship Act of 1958 was another political initiation. Thus, modernization was adopted fundamentally as a strategy for Bhutan's independence as the survival of a diminutive country surrounded by powerful nations largely depended on the tacit compliance and cooperation of its neighbours, no matter how well protected it is by natural barriers or how stable its government (Aris 1979).

2.3 Enactment of Five Year Plans and Hydropower Development

After 1953 Bhutan saw a new shift in socio economic and political arena, but was not enough for the socio economic and political security. There were around sixty Primary Schools in the country and no Junior or Higher Secondary School. Medical facilities include four hospitals and eleven dispensaries. Roads which were mostly foot paths or mule tracts huge task was to be done. Thus the first planned development begun for the country in 1961 with the help of India. India fully funded the first five year plan with an approved outlay of 1747

lakhs of rupees (Bhattacharya 1996). Thus with the formulation of the first five year plan, many developments were anticipated, of the many developmental activities like infrastructure development, agriculture, or development of natural resource especially hydropower development for economic benefit was predictable as the country did not have very long sustaining other natural resources than the water resources. Pertaining to it preceding discussions are mainly in the line of development of hydropower as per the five year plans for the development of the country, hydropower generation and its role in raising the GDP by selling power to India, correspondingly catering to the domestic needs and development of socio economic infrastructure associated with hydropower development.

The First five year plan established a hydel executive board and also marked the beginning of hydropower cooperation between Bhutan and India with the signing of Jaldhaka agreement in 1961. Two 360KW and 400 KW Hydel Projects were also to be constructed to serve the needs of Thimphu and Paro. Experts from Centre for water and Power Cooperation India were deployed to do a detailed survey and investigation of 10 micro hydel projects at different places in Bhutan. The study included detailed surface and sub-surface investigation of the Chukha Hydel Project (1stFYP 1961-66, Gross National Happiness Commission 2011). The Jaldhaka hydropower plant was to be located on the Indian side of the Indo-Bhutan border in West Bengal state. The main objective being benefit of cross-border energy trade and energy supply within Bhutan. The major part of power produced at Jaldhaka hydropower plant was to be exported to the southern part of Bhutan (De 2008).

In the Second Five Year Plan (1966-1971) and third plan (1971-1975), though the priority largely remained the infrastructure development The power sector also saw cumulative development receiving Rs. 80,00,000 in the second plan and 248 Lakh Rupees in the third. In the second plan the Thimphu and Paro Hydropower Project were expected to be completed by the end of 1966 and 1968 respectively, and a new 400KW Sarbhang Project was to start in 1968 and complete it by 1969. In the third plan Hydropower Projects was to rise from 760 K.W generation in 1971 to 4,000 K.W. by 1975. A severe power shortage experienced in demand for power supply exceeding the supply in by 100kw per year in Thimphu caught attention for producing more hydropower projects. The Dzongkhags in the south bordering India like Sarbhang, Bhur, Gaylegphug, Samdrup Jongkhar and Deothang from Assam

Electricity Grid. The first major 250 MW¹⁷ Chuckha Hydropower Project agreement was signed on 23 March 1974. In the eastern region, construction of Tashigang Project began (2ndFYP 1961-66, Gross National Happiness Commission 2011). The third plan was also to implement 1000 K.W Gidakom project to meet the growing need of Thimphu and Paro towns. 100 K.W Mongar Project, 5M.W Tongsa project to cater to the needs of Tongsa, Bumthang and Zhemgang districts (3rdFYP 1961-66, Gross National Happiness Commission 2011).

While in the Fourth Five Year Plan Chuckha hydropower plant started its construction. The Fifth Five Year Plan 1981 came with important features in the developmental goals. economic self-reliance, and decentralisation were discussed for the first time. The establishment of the Dzongkhag Yargye Tshogchung (District Development Committees) and Gewog Yargye Tshogchung (Block Development Committees) were major decentralisation process (4thFYP 1961-66, Gross National Happiness Commission 2011). For Economic self-reliance, Bhutan had to raise its economic activity. Thus the role of the hydropower generation as a revenue generating project was going to be significant. Samarasinghe states, "*The steep southern Himalayan river system has endowed Bhutan with an enormous hydropower potential that is yet to be assessed. It is only now that the country has begun to tap this relatively cheap source of energy*" (Samarasinghe P.561 1990). There were six small hydropower installed in Bhutan and various diesel electricity generators. So far 21 townships and 97 villages had been electrified and only 5% of electricity was used commercially. The first major investment run of the river scheme Chuckha hydropower project started with major finance from India. The Sixth Five Year Plan was the most important in the history of hydropower development in Bhutan as structural and methodical changes were formulated to build hydropower. Three aims were envisioned which were to increase government revenues through the generation of power for sale to India, to promote regional balance by investment in power projects, particularly in Eastern Bhutan and to work towards the goal of providing electricity to all parts of the country(6thFYP 1961-66, GNH Commission 2011).

Thus power sector received Nu 1,247.9million. To balance the regional distribution of hydropower development and supply of electricity for all, and to cater to the major industrial and mining activities to come in the area, a medium hydro project i.e Kurichu hydropower

¹⁷ Chuckha hydropower plant which was initially agreed to be 250MW plant later got revised and was upgraded to 336MW.

project with an installed capacity of 45MW at Gyeposhing near Mongar was to be established (6thFYP 1961-66, Gross National Happiness Commission 2011). One respondent¹⁸ during field work states that *Kurichu hydro power plant was chosen because of its strategic point because the whole of eastern Bhutan had no reliable source of electricity so the 60mw project today caters to almost 10 districts in the East. It is also because we are trying to link the east and the west grid as most of the hydropower generation is in the western part of the country and there is a dearth of electricity in the lean winter season thus the grid integration was very pertinent. In doing so government of India borne the financing with agreement of 60% grant and 40% soft loan in 5% interest.* The project would benefit the forth coming Dungsam Cement Plant, gypsum and coal mines. The power import from the Indian grid for the eastern region was to be replaced by the coming project. The energy export of the Hydropower generated to India through Naglam was expected to make substantial contribution to revenue generation. Thus four more mini hydro schemes 1 MW each have been proposed at Radi, Damphu, Zhemgang and Dagana. The regions where the grid extension was not feasible small mini hydro stations were to be installed. Rural electrification scheme was another important measure to make electricity available for all where at least 10,000 rural households were to be electrified through grid extension, establishment of micro hydro stations or installation of photo-voltaic power. Similarly power generation for the needs of urban areas were also proposed. Besides that, resolute efforts were taken to investigate and do feasibility studies for major hydro-electric schemes in larger river basins (6thFYP 1961-66, Gross National Happiness Commission 2011).

The rural electrification was a priority because only a total of 130 villages have so far had been electrified. The Sixth Plan, it was proposed to connect 9375 consumers to the existing and new grids by the extension of 949km of 11KV lines and 984 km of low voltage distribution lines. As the economy of its neighbours grew substantially in the 1990's Bhutan in the seventh plan made remarkable progress by signing two most important hydropower project agreements (6thFYP 1961-66, Gross National Happiness Commission 2011). An agreement on the construction of 45 MW Kurichu plant was signed on 18 February 1994. The implementation of the project was handed over an Indian agency, the National Hydroelectric Power Corporation Limited, (NHPC). The Water and Power Consultancy Services (WAPCOS) was the review consultants while other Indian companies like the M/s. Asian Techs Ltd, M/s. Hindustan Construction Company, M/s. Gammon India Limited for the M/s.

¹⁸ Karma Dorji is the director of planning in department of power systems under the ministry of Energy in Bhutan interviewed on June 24th 2013.

and some cultivated areas in the Middle Hills and the foothills (Dhakal 1990). The absence of large tracts of cultivated land in much of the Torsa river basin makes hydropower power plant development feasible with less social impact. The Torsa flows 145km in Bhutan till it drains to the Duars in India (FAO 2014) has huge hydropower generation potential. The river flows through the south most Town Phuntsholing bordering India.

2.3.2 The Wangchu

Originate from the glacier fields in northwest Bhutan, three major tributaries Ha chhu, Paro chhu, and the Thimphu chhu forms the Wangchu river. The Ha chhu is the smallest of the three and flows through the Ha valley in a south-easterly direction. Cutting through the dense mixed forests of the Middle Hills and the foothills travels 15 km south and enters the Alipore Duar plains of India. Wangchhu has a basin area of 4,689 and power potential generation of 2,740 MW. The river houses two major hydropower plants. The Bhutan's first major hydropower project Chuckha Hydel Project located 32 km downstream of the confluence of the river (Dhakal 1990).

2.3.3 The Punatshangchhu/Sunkosh

The longest river course is of Sunkosh with a catchment area of 6271 km², joined at Punakha²⁰ by its two major tributaries Mochu and the Pochu, originating in extensive ice fields of the Laya-Lunana region in the northernmost region of the country. The Punatshangchhu River has a total length of about 320 km from its source in Bhutan till it drains into Brahmaputra in India with a total capacity of 8035 MW of power generation (Choden 2005).

2.3.4 The Manas

Draining one-half of Bhutan Manas has the largest catchment with its four major tributaries basin, Chamkharchhu, Kurichhu, Drangmechhu, Mangdechhu all originating in Tibet flowing south easterly direction. The high volume fast flowing tributaries cut deep gorges until they merge with the Manas which makes run-of-the-river hydropower projects feasible than large high dam projects. The Manas river system has little scope for irrigation purpose, in the Middle Hills, the valleys are deep and narrow and offer no scope for irrigation. In the valleys of Tashigang²¹, the fast flowing rivers have huge differences in level between the river bed

²⁰ Is a district of Bhutan through which the Punatshangchhu flows.

²¹ Is a district in Eastern Bhutan.

and the cultivated areas. In the path of other tributaries the valleys have a very low population density and in the upper catchments but the cropping pattern require little irrigation because of the climatic conditions. With no use of the river for irrigation for agriculture the river is suitable for potential use for hydroelectricity generation of a total of 10581 MW. A 60MW run of the river hydropower project in the Kurichu river was already catering to the power need of the eastern Bhutan (Dhakal 1990).

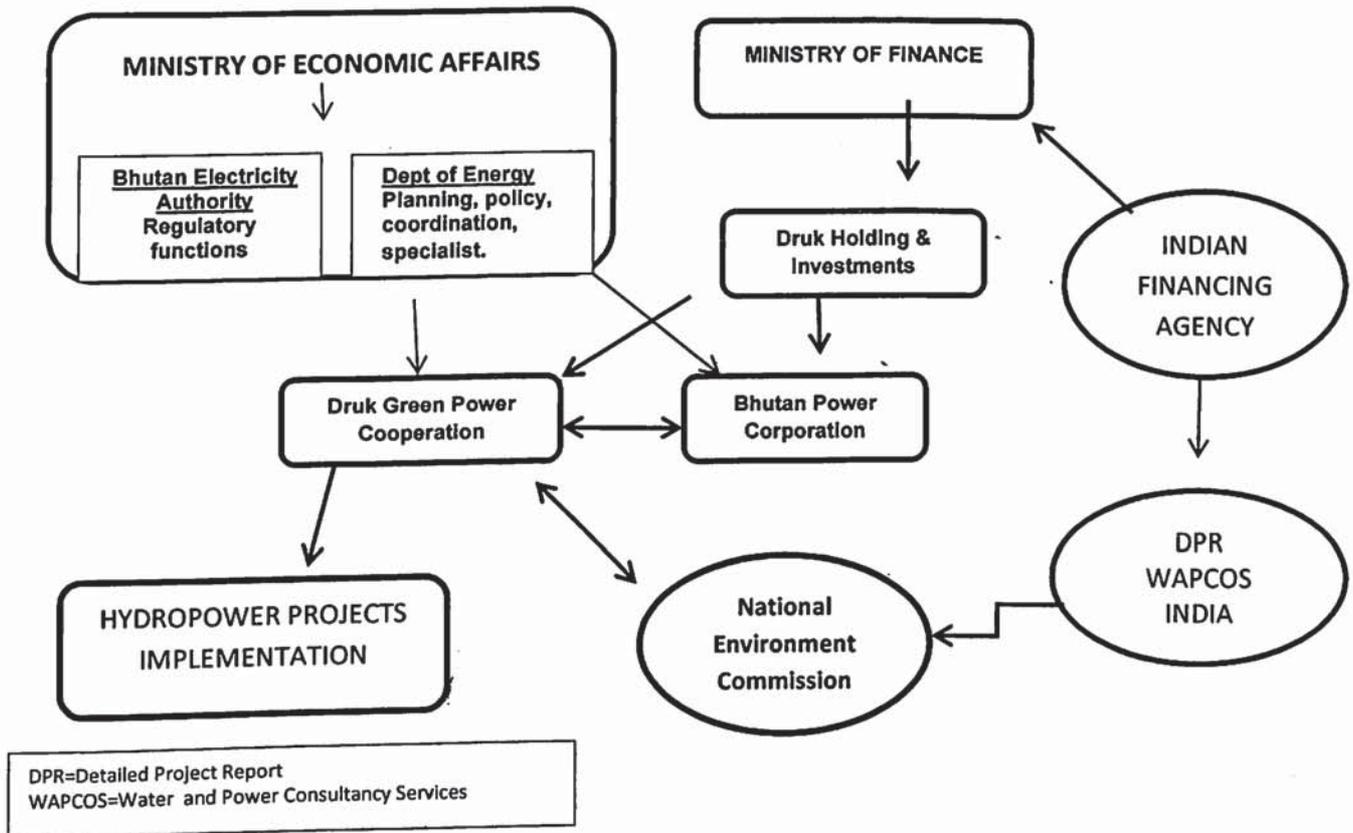
The projects which were functioning till then had their own independent link with the Indian government with their own set of management and board of directors. The enactment of electricity act in 2001 brought a reform to the existing Power Sector in Bhutan. The Power sector which was formerly functioning under Ministry of Trade and Industry as Power division, was corporatized from 01-07-2002 the power division was split into Bhutan Power Corporation was taken as the transmission and distribution utility, Bhutan electricity Authority as the regulator and planner and department of energy as the policy and planning division as a part of. As a part of reform study were taken to amalgamate all hydropower projects under one management and thus Druk Green Power Corporation (DGPC) came up in 2007 which is 100% state owned generating company. As per the Sustainable Hydropower Development Policy – 2008,

“DGPC is responsible for managing all hydropower plants fully owned by the Royal Government. It will also develop projects on its own or through joint ventures on behalf of the Royal Government as may be directed. Projects that are funded through bilateral assistance shall continue to be managed and supervised by the Ministry of Economic Affairs through formation of project authorities. Such fully Government owned generating plants shall be handed over to DGPC when the Project Authority is dissolved” (Sustainable Hydropower Development Policy Document – 2008 P 8).

So once Tala got completed in 2006 and the modality is create a special purpose vehicle for the construction of the calling it project Authority like in Tala there was Tala Hydro Power Authority (THPA), Punatshangchhu Hydropower Project Authority (PHPA), comprising of Managing director from India, Joint managing Director from Bhutan, Director Finance and Director Technical from India, with the understanding is that they will supervise, implement, maintain oversee all the construction work. Operate and maintain for two years and should be handed over to the Druk Green Power Corporation for operation and maintenance. Then after two years period the Authorities are dissolved (THPA, PHPA). Now the implementation of

the project is guided by the bilateral agreement between the two countries and the sustainable Hydropower development policy document 2008 passed by government of Bhutan (DGPC 2013). Thus the present structure of organization of the power sector is explained by the figure 2.2.

Fig. 2.2 Institutional Networks & Nexus of Hydropower Development in Bhutan



The ninth five year plan with the concept of Gross National Happiness, the department of power received 6,217.949 million Nu which was 8.9% of the total budget. Two Major projects Mangdechhu Hydroelectric Power Plant (360 MW) and Punatshangchhu Hydroelectric Power Plant (870 MW) were to be undertaken in the Ninth Plan. While sites were identified for four micro-hydel at Sengor, Sakten, Tang and Gasa and feasibility studies of 2,000 MW hydropower project sites at lower Bumthang Chhu, Kholongchhu in

Trashiyangtse and Punatshangchhu Stage II in Wangdue Phodrang were to be carried out in the Ninth Plan (9thFYP 1961-66, Gross National Happiness Commission2011).

Consequently a number of feasibility studies were carried out for various projects which were to be built in the next eleven years. Detailed project reports (DPRs) have been carried out for few projects like Dagachu, and Sankosh in the tenth plan and the eleventh plan aims at construction of all the 10 major hydropower plants aimed to fulfil the 2020 1000mw production agreement. The table 2.1 shows the various projects to be established under 10,000 MW by 2020 with Government of India assistance.

Table 2. 1 Hydropower Projects Under 10,000 MW By 2020

	Power Plant	Installed Capacity MW	Remarks
1	Punatshangchu I	1200	Under construction
2	Punatshangchu II	990	Under construction
3	Mangdechhu	720	Under construction
4	Sunkosh Reservoir	4060	DPR
5	Kuri Gongri	1800	DPR
6	Amochhu Reservoir	620	DPR
7	Kholongchhu	486	DPR
8	Chamkharchhu I	720	DPR
9	Wangchu Reservoir	900	DPR
10	Bunakha Reservoir	180	DPR
	Total	11626	

Source: Druk Green Power Corporation 2010.

Bhutan today starts with the eleventh five year plan where energy sector mainly aims at 100% electrification. While till 2013 92.82 percent electrification was covered by grid electrification, The remaining part of the country is expected to be electrified by other sources of energy like solar or biomass energy a respondent conveyed that *in the remote areas where the cost of reaching electricity is very high (6-7Nu per unit) like Merak and Saktan lots of solar panel are being given to the remote areas like Donkola, Phajoding but a drawback being Solar has limited use only for lighting not for cooking. According to the hydropower policy 2007 the country is aimed to be fully electrified by 2013. Today 92% of the country electrified through grid 3% through solar and 5% remaining and works are*

*proceeding and by the end of the year the country is expected to be fully electrified and each and every household has electricity*²².

Other than electrification and the plan to develop more hydropower projects, priorities have shifted to other issues effecting hydropower development like the Glacial Lake Outburst Floods (GLOF) management plan, system reinforcement and human resource capacity.

2.4 Guidelines for Hydropower Development

For any major developmental projects to be initiated in Bhutan, Environmental Impact Assessment (EIA) is a necessity. Hydropower development in Bhutan also requires the EIA to be conducted. EIA for almost all the major hydropower project in Bhutan is conducted by a Indian consultancy firm known as water and power consultancy service (WAPCOS) in alignment with fifteen different acts, policies and guidelines (see appendix I) of the kingdom of Bhutan relating to various aspects like environment, land, biodiversity, fish, Mining, construction, forest etc. The WAPCOS is responsible for conducting the EIA or popularly known as the Detailed project reports (DPRs) in Bhutan and is submitted to the National Environment Commission (NEC) which further conducts strategic environment impact assessment (SEIA) for verification of the DPR. This is the supreme body to pass the project and is routed through the parliament for final approval.

The special feature about the SEIA for hydropower projects in Bhutan is the SEIA is done by the NEC staffs that are basically Bhutanese and know the country well. The SEIA collects all the ground data to match with the DPRs and does the assessment of pros and the cons of the project. The secretary of NEC comments that after the finalization of DPR, SEIA is important basically because it is conducted in reference to the data produced by DPR by the Bhutanese nationals *who have more idea about the country and linguistically more comfortable to study the social impacts. It is more important because based on the SEIA and the DPR a environment management plan is made and based on it recommendations on management and mitigation measures are provided for water source. catchment area, likely flash flood, displacement, occupation, health, siltation.*²³

²² Interview with Dasho Chewang Rinzin Male 45 years, managing director of the Druk green power corporation, June 23rd 2013.

²³ Interview with Dr. Ugyen Tshewang Male, the Secretary of National environment commission, February 25th 2014.

Thus depending on the DPR's and SEIA reports Bhutan builds its hydropower projects. Till now six projects four completed and two running have gone through the process of EIA and follow the guidelines of kingdom of Bhutan. Presently there are eight other projects under DPR study by WAPCOS.

2.5 Prevailing Geopolitical Situations

While Bhutan adopted modernization and economic development as a strategy to safeguard its independence and has reached the eleventh five year plan, it continued to face dissent and distress from turmoil within and with its neighbouring nations. It becomes important to discuss the geopolitical environment as the economy progressed and its effect on the economy and in the pace of hydropower development.

The very first five year plan was held up the Sino-Indian War in 1962. Udea points out the fact that the incident made the geopolitical situation even critical for Bhutan. Nevertheless, the starting of Jaldaka power project and finalization of Thimphu, Paro and Chukha project in the very first year was a hall mark towards Bhutan's initial steps towards economic development. As with the Jaldaka agreement cross border energy trade came in forefront. The country also appears to have realized the importance of its development to defend against possible Chinese aggression and the event convinced India of Bhutan's significance to its security buffered between China and India, therefore agreed to give assistance to Bhutan's development programmes. After Bhutan joining the United Nations in 1971 Bhutan as an independent nation was recognised internationally.

While Bhutan had enhanced its socio economic infrastructure and was in the march for fourth five year planned development, the geopolitical situation began to be in turmoil. The kingdom of Sikkim who had similar Tibetan cultural and Buddhist religious bonds with Bhutan was taken over by India in 1975. The country was inhabited by aboriginal Lepchas, Tibetan migrated Bhutias and Nepalese who were immigrating to Sikkim from Darjeeling and eastern Nepal the population grew and there were numerous internal conflicts. The country had been a protectorate of British India (White 1970), and after India's independence in 1947 it came under India's purview. India as Bhutan's ally came to be questioned with annexation of Sikkim by India. Bhutan had to develop its rigor power to be able to stand as a nation from the vicious eyes of two giant neighbouring nations who had swamped a number of its next door neighbouring nations. Even through the strained situation, two major

economically prized large scale investments, Penden Cement Plant begun and agreement for first major hydropower project the Chuckha Hydropower Project was signed in 1974 and the construction works inaugurated.

The fifth year plan for Bhutan amidst the geopolitical situations came with strong aims for planned development, economic self-reliance, and decentralisation were discussed for the first time in the plan. Thus to achieve self-reliance economic activities were bound to rise, mainly hydropower. The country by the end of the plan had made tremendous progress. The country not only became a member of International monetary fund, World Bank and Asian Development Bank but also received aid from Kuwait, Japan, Norway, Denmark, Germany, United Kingdom and European Economic Community. Establishment of six hydropower projects and more being planned. GDP was amounting to Nu. 1020.5 million and infrastructure wise 192 schools and 27 hospitals were complete.

Ueda states that the time when the Sixth Plan was formulated in the mid-1980s people in Thimphu were starting to feel the negative effects of development. With accelerated urbanisation of Thimphu, it was regarded as the time traditional Bhutanese values started to decline. The fear of losing Bhutan's culture and tradition to modernisation, apprehension to preserve the culture and tradition which defines the national identity of Bhutan got intensified during that period. Essentially Ueda conveys the fact that the emphasis in preserving the national identity was associated with safeguarding the sovereignty and security of the nation. Even through the apprehension, Bhutan continued to focus on its economic development and the Sixth Five Year Plan was the most important in the history of hydropower development in Bhutan as structural and methodical changes were formulated to build hydropower. Three aims were envisioned which were to increase Government revenues through the generation of power for sale to India, to promote regional balance by investment in power projects, particularly in Eastern Bhutan and to work towards the goal of providing electricity to all parts of the country.

Along with economic development Bhutan had been very conscious about its cultural preservation. The unchecked infiltration of Nepali speaking people (Lhotshampa) in the southern Bhutan to bring the newly migrated people to the mainstream of the country intermarriages were encouraged and the Bhutan's Citizenship Act of 1985 in accordance to the Bhutan's Citizenship Act of 1958 was introduced to check the immigration and to bring

the people into the main streamline of the Bhutanese ways of life and preserve the culture. The Act mandated the people to follow the Driglam Namzha²⁴, Bhutanese code and decorum. The enactment of the Act was to be done through the first national census of Bhutan on 1988 to create a unique identity. This raised a commotion among the Lhotshampas, the upheaval intensified when in 1989 Nepali as a language of instruction in schools was terminated. By 1990 Violent ethnic strife and anti-government demonstrations in southern Bhutan was evident (Sinha 2001). Unrelenting plea for greater democracy and respect for Nepali rights were roaring in the air. The unrest led to military control and over 80000 Lhotshampas flee to Nepal (BBC 2010). While the ethnic strife in Bhutan had left the country in an ambulated situation, yet stress emerged from Militant organisations, such as ULFA (the United Liberation Front of Assam) and the Bodos in state of Assam in India for fighting for the independence of Assam from India. The ULFA and Bodo penetrated inside Bhutan in 1991/1992 and started to create serious problems for country with acts of robbery, killing and extortion posing serious threat to Bhutan's sovereignty. The activities needed to be handled carefully by Bhutan, as the issue could affect the India Bhutan relationship adversely (Ueda 2003).

The severe adverse conditions kept Bhutan's economic growth moderate while the economies of the region went under sweeping change with the adoption of more liberal and open policies in trade. The trade in the neighbouring economies witnessed 22 to 30 percent rise (Chiba et.al 2004). With the existing stark difference in its economy and its region, Bhutan started its seventh FYP in 1992. After 1992 developmental activities in Bhutan has not been hindered by any major turmoil. The execution of the five year plans have been smooth but occasional incidences of ULFA-Bodo attacking the Bhutanese is a problem to be solved yet. The ULFA Bodo issue was discussed in the national assembly in 2003 and the problem remains unresolved. Bhutan is also yet to solve the border dispute with China over its bordering landmass in the north and in the west despite the "Agreement on The Maintenance of Peace and Tranquillity in the Bhutan- China Border areas of 1998". Yet the hydropower sector has seen boom in development and four major projects Kurichu, Chuckha, Tala and Basochu are functional and ten more major projects are in pipeline.

²⁴driglam means "order, discipline, custom, rules, regimen and namzha means "system. Bhutanese national dress and custom code

2.6 Hydropower and Allied Industries

During the first decade of planned development in Bhutan, development of infrastructural facilities and agriculture remained the highest priority. In the 2nd five year plan document it is stated that, *Previously Bhutan was self-sufficient and even had a small surplus for export to Tibet. About 5,000 tonnes of grain have now to be imported annually including requirement of Border Roads Organisation. The increasing population and import of labour for development work is also proving a considerable drain on local resources* (2nd FYP Gross National Happiness Commission 2011 P 6). The developmental activities referred here is the development of infrastructure like roads Plan document and mini hydropower plants throughout the country for which huge influx of labour was seen. Thus to sustain the growing population local resources as mentioned above primarily food produce was not sufficient. Thus the agriculture sector received due attention and schemes like subsidies for minor irrigation to the extent of Rs. 2,50,000 in 1965 and 1966 and Rs. 5,000 for remodelling and repairing the existing canals and building new ones was allotted. The agriculture sector also saw some form of mechanization with the introduction of two Research Farms at Lungthenphu and Bhur started in 1963. Training classes provided in Lungthenphu, Paro and Bhur for cultivation of crops use of improved implements, fertilisers and seeds and soil conservation (2nd FYP document Gross National Happiness Commission 2011). Horticultural centre was started at Yusipang and two orchards at Gasa and Bhumthang. The schemes for distribution for fruit plants and vegetable seeds were started and about 61,027 plants and vegetable seeds worth about Rs. 10,000 have been distributed. To ensuring proper return to the farmers for their produce it is also proposed to establish Co-operative Marketing Societies. Veterinary services were also made available and new breeds of animals 77 cross breed piglets and 60 R. L R. birds were distributed in the area. The agriculture mechanization continued to fulfil the growing need research centres, training programmes and extension offices in 18 districts were introduced in the 4th five year plan (4thFYP Gross National Happiness Commission 2011).

Along with agriculture though other infrastructure facilities like health and education grew simultaneously, Transport Postal, Telephone and Telegraph services grew in line with Hydropower projects as *it was anticipated in due course departments such as Transport Postal, Telephone and Telegraph services and the Hydel power stations being established will become self-supporting and revenue yielding* (2nd FYP Gross National Happiness

Commission 2011 P. 4). Thus nine routes over 1,000 kms of roads were operational in Bhutan connecting various part of the country and India. Consequently Bhutan engineering service was opened which along with many other service was responsible for the installation of diesel generators at Thimphu, Paro, Phuntsholing and other important centres. The work of installing distribution lines and the distribution of power as well as maintenance and running of the three hydel generators at Thimphu, Paro and Sarbhang, After the completion and when the power houses were handed over to the Hydel Directorate they had to install distribution lines at Phuntsholing and Samchi for the power to be obtained from the Jaldhaka Project. Hydropower development has simultaneously developed transport sector 10,578.26 kilometers of various categories of roads, 337 numbers of bridges totalling 10,604.5 meters and 380 pedestrian bridges within Bhutan (11th FYP Gross National Happiness Commission 2013 P 208). In 2012 there were 21 operators managing more than 209 buses operating on more than 73 routes in Bhutan (11th FYP Gross National Happiness Commission 2013).

With Hydropower development, construction sector was significantly improved; during 1983-84 the share of construction sector to GDP was 18.9 million mainly due to several major construction works undertaken like the Chuckha Power Project (8th FYP Gross National Happiness Commission 2011). Till early 1990's the share of construction fell with no major projects undertaken. After 1994 with the starting of major projects such as Kurichhu power, the project would benefit the forth coming Dungsam Cement Plant, gypsum and coal mines. Along with Kurichhu hydropower project other projects like Basochhu power project, expansion of Penden cement plant, Punakha dzong renovation, Telecommunications, Flood protection works at Punakha, Thimphu and Phuntsholing Sewerage project, the contribution of construction sector to the GDP increased significantly. Towards the end of eighth plan in 2001, the sale of contributed 398.2million which was 9.9% to the GDP (9th FYP Gross National Happiness Commission 2011) whiles the construction companies share was 466.7 million to the GDP. After commissioning of Chuckha power project in 1988 the economy grew by 13.5% per annum. The hydropower project encouraged a number of other industries like the Pendent cement authority (PCAL), Bhutan Chemical and Carbide limited. Board products limited (BBPL). Ferro Alloys limited. Electricity generation alone contributed to Nu 244.9million in 1995 (7th FYP Gross National Happiness commission 2011). During the constructional phase of Tala Hydropower plant 1997 till 2006, Basochu and Kurichu project in 1997 the construction sector contributed to 8.1% to the GDP and by 2001 the construction

sector, grew by 17.3 percent, had a major share in the GDP (9th FYP Gross National Happiness commission 2011).

After the commissioning of major hydropower plants like Tala, the tenth five year plan other than the Economic development Policy 2010 had specific objectives related to hydropower like the power transmission programme which was needed for the upcoming energy intensive Dungsam Cement Project, the Matunga industrial estate, estate at Dhamdhum in Samtse., Jigmeling industrial estate etc. (10thFYP Gross National Happiness commission 2011).

The construction sector is yet to see significant growth with the starting of three mega projects Punatshangchhu I,II and Mangdechhu the construction sector contributed 13.1 % in the GDP while other sectors had minimal contribution like electricity 1.9% Industry 7.0%, and agriculture 1.5%. in 2012 With the coming up of the other eight major projects to fulfil the 10.000 Mw energy target by 2020 which is expected to be implemented in the 11th plan the construction sector is expected to see a significant rise.

2.7 Nature and Growth of the Bhutanese Economy

Bhutan has a small economy within the huge South Asian economy. Yet the country has one of the highest GDP per capita of \$ 6500 almost double to that of India in 2012 (World fact book 2013). The country opened up itself for economic development only in 1961 prior to which it had barter agrarian economy with trade relation in a very small scale with Tibet and Indian state of West Bengal. After its initiation of economic development its trading partner mainly remained India. Two decade after the five year plan introduction, it mainly focused on infrastructure development and only a few economically viable Distillery and a Fruit Preservation Factory in Samtse, Pended Cement Plant and few mini hydropower stations for domestic use was established and the economy mainly remained agrarian. Till late 1970s the only source of foreign exchange was the production of gimmicky stamps by Bhutan's postal service other than Indian rupees till it joined the International Monetary fund in 1970 and introduced its own currency in 1974 in par with the Indian rupees and in the same year opened itself for tourism. Thus infrastructure facilities for tourism, was built by the government and a high number of tourist started coming in the country with highest number of tourist arrivals recorded to be 2,486 in 1982-83 (Samarasinghe 1990).

It was only in the fifth five year plan when it came up with a main aim of Economic self-reliance; Bhutan had to raise its economic activity. The investment in revenue generating activities was targeted to be in the areas of industries, forests, tourism and power the total investment in the projects in the Fifth Plan was Nu.159.6 million. Limestone and dolomite were the only minerals exported to India in small scale. Bhutan had imported 434.3 million worth commodities while exported only 184.4 million worth export, which mainly consist of agricultural surpluses 27%, forestry products at 15% and the Pended Cement Plant accounted 27% of total exports. With a trade deficit of -249.9 million Bhutan had to develop its economic sector. Samarasinghe describes Bhutan's economy in the 90's to be not fully formed as the *Manufacturing and mining activities to be at a rudimentary level while Cottage industries are believed to account for about 25% of total output. The pendent cement plant accounted for 25% of industrial output and for about 50% of the 2,000-person industrial labour force in the formal sector. Other important factory industries were three alcohol distilleries, one food processing unit and paper pulp, plywood and block wood manufacturing. There are about a dozen small units manufacturing light consumer goods such as soap, confectionery, and wooden and steel furniture* (Samarasinghe 1990 P. 567).

1976 when the construction of Chuckha started it gave way to other sectors development like the construction and transport sector. The construction sector in 1984 alone accounted for 19.8 million Ngultrum to the annual revenue. In 1988 when the 337mw Chuckha hydropower plant commenced only 3% of the generation was domestically consumed while 97% sold to India, contributing to 10 percent rise in GDP. While the construction and transportation sector also had a major share in the GDP of 6.3% to 6.7% respectively 1989 (6thFYP Gross National Happiness commission 2011).

Though Bhutan saw an uplift of 8% in the economy in the 1980's with the Construction and commissioning of Chuckha hydropower plant, Bhutan still remains one of the poorest countries in the world with a per capita GNP of US \$150 in 1987. Yet Bhutan was able to meet two-thirds of its development budget from internal revenue, it indicated the growing strength of the Bhutanese economy. In the 1990's the economy saw a downfall where in the 90's the economy grew by only 6% with no major investment done in hydropower nor any other sector. Towards the end of the 90's when the construction of Kurichu, Tala and Basochu hydropower project started the GDP picked up and by 2001 besides mining which accounted for 19.4 percent, electricity contributed 12.3 percent and hydropower generation caused growth of construction, manufacturing, trade and other sectors, chiefly construction

sector contributed 17.5 percent to the GDP. The growth of the economy surpassed the 80's and 90's with starting of three mega projects Punatshangchhu I,II and Mangdechhu the GDP grew at an average of 9.6% over 2003 and 2007, along with GDP per capita of US\$ 1,414.01 in 2006 as compared to US\$ 835 in 2002. The major impetus for this was from the growth of electricity sector (GNHC 2011).

The Bhutanese economy is seeing a transformation from a primary sector mainly agriculture based economy to a hydro capital based economy with the change in structure of the contribution to the GDP the statement can be proved to be true. The growth of the primary sector with less than 2% growth has declined its share in the GDP while in 2002 the share of primary sector was 29% in the GDP its share declined to 18.6% in the period of five years by 2007. The share of Secondary sector 43.3% of GDP, and tertiary sector 36.4% of GDP surpassed the primary sector which accounted for 19.5% of GDP compared to 65% earlier, while electricity alone contributed 23.4% to the GDP. The secondary and tertiary sector would pick up more pace in the eleventh five years plan period (2013-2017) with the execution of the eight major projects aimed at fulfilling the 10000mw electricity generation target.

2.7.1 Occupational Structure and Employment

With a total population of 1,165,000 in 1981²⁵ Bhutan had its major human resource 613000 persons primarily employed in the agriculture sector which accounted for 94.3% of the total employment. Adversely other sectors were in an infancy stage with public services 3.4%, trade 1.4% and industry 0.9% employment (5th five year plan document Gross National Happiness Commission 2011). The main reason that made Bhutan remains predominantly an agrarian economy even after two decades of planned development because of the lack of manpower, especially trained manpower. As there was minimal growth of tertiary sector with few hydropower stations and only 36700 students receiving education within and outside Bhutan. Towards the end of 1980, there were 2500 trained man power of which 230 were graduates counting 35 engineers and doctors were all of them were not Bhutanese nationals. As of march 1982/3 of the total 46,311 secondary sector (termed as modern sector in 80's) employees 76.7 were non-nationals (5thFYP Gross National Happiness Commission 2011). In the early 1990's employment in other sectors continued to be minimal, as tertiary activities were limited from 157 industrial units, only 2,900 persons were employed and 11,228 people

²⁵ Bhutan's population was 1,165,000 in 1980's because the Lhotshampas were still in the country who later flew to Nepal

employed in the civil service (7thFYP Gross National Happiness Commission 2011). Thus the majority of the population continued to dependent on agriculture for incomes and employment. Even by the beginning of eight five year 85% of the Bhutanese population were dependent on agriculture. As the plan document states :*Employment in the modern sectors of the economy is limited, apart from public services of various kinds, and small-scale trade in the urban areas. Industrial development is as yet limited and does not provide significant employment* (8th FYP Gross National Happiness Commission 2011).

By 2003 the dependency on agriculture was reduced to 79.63 percent, only 21 percent of the population were employed in various other sectors 2.69 in Industries, 4.46 in service and 13.22 in others (Bhutan Living Standard Survey 2003) with an unemployment rate of 2.9% even though huge hydropower project construction Kurichhu, Basochhu and Tala were on-going in different parts of the country. Others like 103 Wood based industries, 3 distilleries growing tourism industry and manufacturing sector growing at 13.5% p.a, growing transport and communication sector, construction sector etc. were functional yet Bhutan continued shortage of man power and more than 50,000 foreign workers continued to work in the country. At the end of the eight five year plan in 2007 the dependency on agriculture was reduced to 66.6% because other sectors like industries (including hydropower) and service sector employment raised by 14.6% and 16.8% respectively while the unemployment rate was increased to 3.7%, with the commencement of major hydropower like Tala, Kurichhu and Basochhu and other industries like construction manufacturing, trade, transport, communication and financial and public sector. In 2007 the Labour and Employment Act 2007 was enacted and from then it directed the employment and working conditions in Bhutan (10thFYP Gross National Happiness commission 2011).

By 2012 when Bhutan was to complete the 10th five year plan in a year time there were other fifteen sectors of employment but were very insignificant compared to the agriculture sector the share of agriculture sector still remained the prime sector for employment where 62% of Bhutanese were employed in the sector. The Economic Development Policy 2010 aimed to achieve full employment²⁶ by 2020.

²⁶Full employment is defined as employment of 97.5 percent or unemployment rate of 2.5 percent.

2.7.2 Foreign Direct Investment

The Bhutanese economy which shows a progressive growth from the very first five year plan till the present eleventh plan period, the economy specifically shows a lack in the trained human resource it has to invest a large section of capital on developing human resource. The measures to encourage private participation in major developmental activities like hydropower development which is expected to increase in number in the coming years. All these demands huge capital investment thus the need for foreign investment is an essential factor.

Till the eight five year plan, Bhutan did not have any foreign direct investments. All the capital flow into the country were assistance or grant especially from India, the Asian Development Bank, World Bank, Denmark, Japan and the UN systems. FDI in the ninth plan increased from Nu.101 million in 2001 to Nu.3,238 million in 2006/07 (10th five year plan Gross National Happiness Commission 2011). The foreign direct investment policy was passed in 2002 was a step towards trade liberalization and economic integration. The FDI policy 2002 states that the FDI policy *is envisaged as providing a beneficial boost to private sector development and industrialisation, through easier access to capital, technology and markets. Increased levels of foreign investment are expected to contribute to the attainment of the objective of Gross National Happiness, through creation of additional economic benefits, in ways, which are consistent with the Kingdom's goal of preserving its environmental and cultural heritage* (FDI Policy 2002).

Mainly two sectors were targeted the manufacturing sector and service sector and others. The manufacturing sector got an investment of US\$ 1 million and the services sector US\$ 500,000, of which foreign investor can hold up to 70% of the equity (FDI Policy 2002). Of the intended FDI investment in various sectors, only tourism received the maximum advantage and other sectors were not benefited as expected. *Foreign Direct Investment over the Ninth Plan showed a positive growth trend but has largely been directed exclusive into the hospitality sector and has stagnated of late. In order to achieve the annual target 5% growth of FDI and actualize the benefits of foreign investments for export and employment growth, it will be necessary to further streamline the FDI regulations and promote incentives to increase and diversify investments* (10th FYP Gross National Happiness commission 2011).

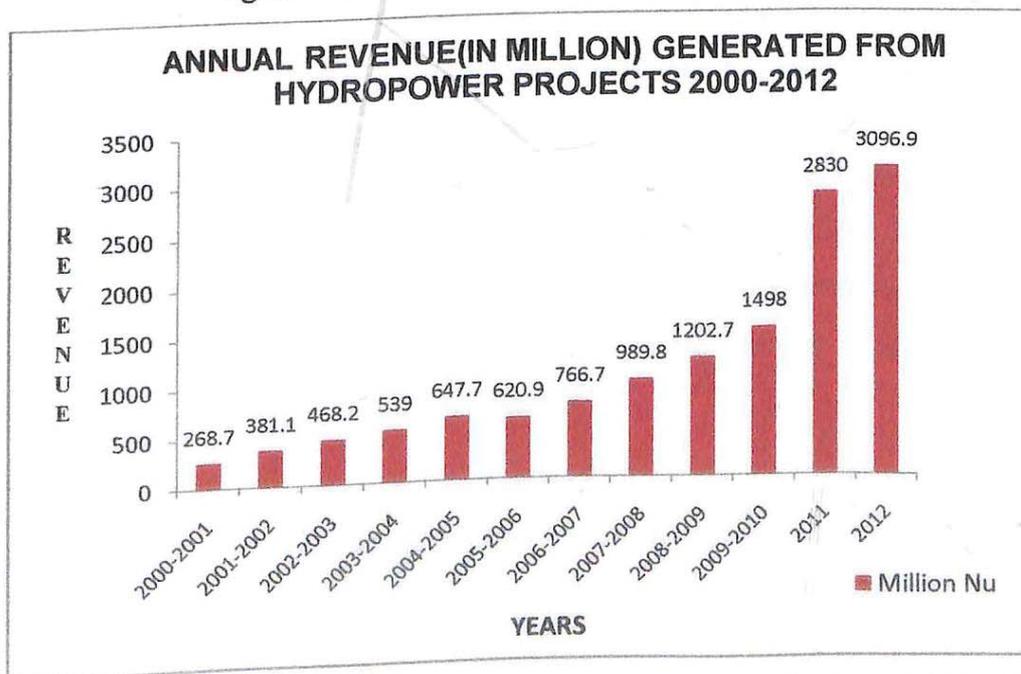
Thus the FDI policy 2002 was reframed and came out the FDI policy 2010 which was more liberal and 41 FDI projects were been approved of which 18 are operating and 24 projects

have been issued with FDI registration certificates. The FDI projects are in hotels, hydropower, pharmaceuticals, dairy, steel, water bottling and banking. The holding of foreign investors' range from 20 percent to 100 percent (FDI policy 2010, MoEA 2010)The key sources of FDI into Bhutan are from India, Hong Kong, USA, Japan, Singapore, Samoa, France, and Vietnam. Banking accounts for the largest share of FDI, with the International Finance Corporation (IFC) buying a 20 percent stake in the Bhutan National Bank, followed by the hydropower sector with foreign investment of Nu. 1.22 billion for the 115 MW Dagachhu hydropower project (11th FYP Volume I Gross National Happiness Commission 2013).

2.7.3 Economic Returns of the Projects

While many projects were planned to be established, the already commissioned projects like the Chuckha, Tala and Kurichu and Basochu were already supplying electricity to India. India's decision to invest in hydropower development in Bhutan has been largest income generator for the Bhutanese economy where in 2000-2001 annual revenue was 268.7 million ngultrum (National Statistical Bureau 2001) which rose to 3096.9 million ngultrum in 2012. The table below explains the rise in annual revenue with the sale of hydroelectricity (National Statistical Bureau 2001).

Fig.2.3 Annual revenue generation 2000-2012



Source: National statistical bureau, Royal Government of Bhutan 2000-2012

The figure above presents the growth in annual revenue generation from sale of hydropower in twelve years. The figure depicts a steady raising picture of the growth in gross annual revenue till 2010. The years saw development of mini and medium sized various hydropower plants. While the commissioning of the Tala hydropower projects in 2008 onwards the revenue generation shows a rise. While 2011 and 2012 mark the greatest rise with the annual revenue amounting to 2830 million ngultrum and 3096.9 million ngultrum respectively. The on-going construction of the 1,020 MW Punatshangchhu I Hydroelectric Project, 1,000 MW Punatshangchhu II and 720 MW Mangdechhu Hydroelectric Projects are expected to raise the annual revenue significantly after its scheduled completion by 2017-18.

2.7.4 Trade Relation with Other Countries

Regional trade relation and economic integration for a small kingdom of Bhutan is of prime importance. Bhutan has a low trade volume with imports exceeding export. Export mainly consists of electricity, forest products, mineral products and processed food. Its chief market is India while its products are also traded to Nepal and Bangladesh. Bhutan has also developed trade relationship with Singapore, Japan, Italy, Hong Kong, South Korea, China, Austria, Thailand Sweden and Switzerland, but its major market remains India. Bhutan got into trade relation with India after signing of the Indo-Bhutan friendship in 1949. The friendship treaty established a basis of bilateral trade and other economic developmental activities. Since then trade and commerce agreements have been revised and implemented the last one was the Trade and Commerce Agreement of 1995 and the Agreement on Trade and Commerce 2006 established the right of duty-free transit for Bhutanese merchandise for trade with a third country. Sixteen exit/entry points in India have been identified for Bhutan's trade (Bisht 2012). Economic corporation with India and Bhutan has been mainly in infrastructure development, hydropower projects, transport and communication. Major projects developed by Bhutan with Indian assistance are three major hydropower plants Chuckha, Kurichhu, and Tala while 10 others are in pipeline and are expected to be commenced by 2020. Other investments were made in the Dungsum and Penden cement plants; Paro Airport; Bhutan Broadcasting Station; Indo-Bhutan Microwave Link; building major highways; and exploration of mineral resources, etc. (Chiba et.al.2004).

Bhutan's trade volume in export to India accounted to Nu 21,480.02 million in 2008 and reached Nu 26,627.35 million in 2012 while import from India was Nu17,339.55 million in 2008 and Nu 41,722.18million in 2012 (National Statistical Bureau 2013).

In the sub region Bhutan shares trade relation with Nepal and Bangladesh. Trade with Bangladesh was about 5 percent (exports and imports) and Nepal accounted for 1 percent of Bhutan's total trade as of 2001, by 2012 the trade volume with Bangladesh saw a rise and only export accounted to 6.09 % of the total trade while with Nepal rose only by .46% accounting 1.46% in the total trade of 2012 (National Statistical Bureau 2013).

Discussions on trade relation of Bhutan with other countries will not be complete if role of SAARC, SAPTA in Bhutan's trade. In 1985, The South Asian Association for Regional Cooperation (SAARC) by south Asian countries, Bhutan, India, Nepal, Bangladesh, Sri Lanka, Maldives and Pakistan for regional corporation. The SAARC countries decided that a South Asian Preferential Trading Arrangement (SAPTA) would be established in 1991. SAPTA is based on a commodity-to-commodity approach and in its first two rounds of negotiations, 2,094 commodities were offered for concessions but 3456 items were included for tariff concessions. The tariff concession for items ranged from 5 to 100 percent. Bhutan agreed to provide concessions ranging from 10 to 20 percent on various commodities which is less than what India has provided but higher than Bangladesh and Nepal have agreed to (Chiba et.al 2004).

2.8 Role of Indian Government in Building Hydropower Sector

The socio economic upliftment of Bhutan discussed elaborately above in various sectors and specifically in hydropower sector is evident that hydropower projects have been developed mainly with the help of India since its inception of its first five year development plan. India not only guided Bhutan's foreign policy but also has a great impetus in its economic development. Being the only financing agency in the initial years to being major financing agency today, India has not only provided financial assistance to Bhutan but technical and man power assistance too. The very first modern school to the 10,578.26 kilometres of several categories of roads are mainly built by Indian agencies BRO/GREFF (Dantak) countrywide. The four major functioning hydropower plants and several mini hydropower plants are primarily built by Indian agencies. Thus it becomes important to discuss the role of Indian government in the development of hydropower in Bhutan.

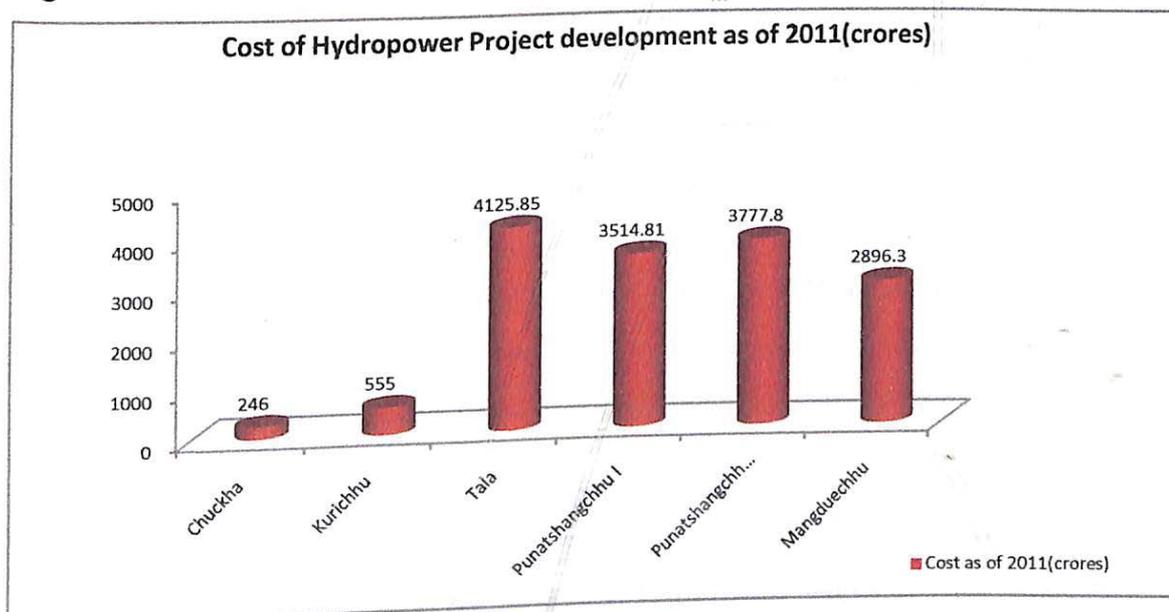
India Bhutan relation dates back to the 16th century when Bhutan used to trade with the state of west Bengal especially Cooch Bihar and the state of Assam. The relation became more conspicuous with the British India and Bhutan signing of treaty of the Treaty of Punakha

1910 where Bhutan agreed to be guided by British India in its foreign affairs. The adverse geopolitical situation with China made Bhutan keep closer ties with India. India's concern over its sovereignty from the China has made India choose to be a political and economic ally to maintain Bhutan as a strong buffer country. Bhutan's relation with India became more consolidated when after India's Independence in 1947 the treaty was Punakha was revised and the Treaty of Friendship between India and Bhutan was signed in 1949 where India continued to be the advisor to Bhutan on external relations (SID 2014). The country got into agreement with India to implement the first five year plan and subsequently has been the major financing agency in all the plans till date. While the 2007, revised India-Bhutan Friendship Treaty made significant changes were according to the article-II of the treaty, Bhutan will no longer be guided by the advice of India in external affairs was plunged but *'both countries shall cooperate closely with each other on issues relating to their national interest'* (MoE Indian-Bhutan Friendship Treaty document Article II. P.1. 2007) India-Bhutan cooperation was in a number of issues, like education, transport, communication trade etc. India's role in hydropower development becomes critical focus in the present context. Hydropower development in Bhutan is guided by bilateral agreements between the two countries within the framework of the Indo-Bhutan Friendship Agreement of 1949. The first bilateral agreement concerning hydropower development was Jaldhaka Agreement in 13th September 1961, followed by the agreement Chuckha was signed in 1974 for a 99-year period. The Kurichhu agreement on February 1994 and for Tala in March 1996 (Dorji?).

The projects are implemented with the technical, manpower and finance mostly from India through a project authority with representation from both the countries. The authority who builds the plant and after two years of commissioning is transferred to Druk Green Power Corporation for operation and maintenance. In 2006 under the 2006 Framework Agreement on Hydropower development & Trade India and Bhutan signed an umbrella agreement in July 2006 to facilitate, encourage and promote development and construction of hydropower projects and associated transmission systems as well as trade in electricity, through both public and private sector engagements. Under this agreement, India has agreed to minimum imports of 5,000 MW of hydropower capacity by 2020. The agreement will be valid for a period of 60 years and can be extended with mutual agreement (Dorji 2013). Under which 10 major hydropower plants were to be established under government of India finance which are listed in fig 2.2 above of which Punatshangchhu I, II and Mangdechhu are under construction though the funding modalities by India has been gradually changing. In building Chuckha,

Kurichhu Tala and Punatshangchhu I Hydropower projects 60 percent of the expenses were grant and 40 percent loan at a soft interest of 5%. While the Punatshangchhu II and Mangdechhu hydropower plant the funding modalities are reversed to 60 percent of the expense as loan and 40 percent as grant. Till 2011 all the India financed cost of the hydropower projects constructed and under construction are projected by figure 2.3.

Fig. 2.4 Cost of Various Hydropower Project Development as of 2011(Crore)



Source: www.cea.nic.in/reports/hydro/bhutan.pdf 2011

All the surplus power generated in Bhutan is being exported to India till date. The 2005 agreement was updated in 2009 with the coming up of new government in 2008, the major reform was on the quantum of power to be exported to India to rise from 5000MW to 10000MW. For the sale of power, Power Trading Corporation of India (PTC), an Indian power trader signed a power purchase agreement in 2002 for Chuckha and Kurichhu for 15 years and 25 years, respectively. The agreement specifically mentioned: (i) surplus power, i.e., all power other than that required for domestic use in Bhutan is exported to India; (ii) the rate for purchase of power is fixed for a defined period (four years for Chuckha though actual increase was different); and (iii) there is provision for Bhutan to import the power that it needs to meet domestic demand (ESMP 2007).

Role of India comes out more profusely in the financing of the hydropower projects in Bhutan from the very first Jaldaka project to all other mini and micro hydropower plants to large projects financing is done solely by India though the funding modalities have changed

over time. The Chuckha, Kurichu, Tala and Punatshangchhu I was financed by India on 60% grant and 40% loan while lately in the Punatshangchhu II and Mangdechhu project the project finance is 70% loan and 30 % grant from India. The only externally funded project till date is Basochhu by Austria. India and Bhutan is to build Dagachhu project on its own for the first time (Tashi 2013). Even though Bhutan has huge water resource its capability to harness it would be lacking with lack of capital, technical knowhow and shortage of manpower without India providing huge funds for the implementation of the projects. Realizing the fact the Director of DGPC points out correctly that *the only issue with the development of hydropower in Bhutan is, it requires huge investment initially projects like the size of Punatshangchhu 1 that is under construction today the cost of it is the size of Bhutan's GDP 90billion-120billion. Project like Punatshangchhu 1 cost at 93 billion which will require investment of the whole GDP. So finding the money to invest is a big issue. Fortunately the government of India has been forthcoming and provide an untied loan where only the surplus energy that is not used in Bhutan needs to be supplied to India. So the agreement is very worthy for Bhutan as it can after its domestic requirement sell rest to India.*²⁷

Bhutan also stands advantageous when coming to sale of its electricity with a readily available market in India where peak requirement in India was measured at 157,107 MW while the supply is said to be far below to meet the demand. Thus both the countries as mentioned by the Director stands at a “win win” situation as Bhutan India *provides very good financing packages and when the cost of the project is low, the cost of power supply from Bhutan becomes cheaper than Sikkim or Arunachal. Bhutan is also at advantage as it is given a certain portion in grant and needed loan, Bhutan has to make no investment, have the full ownership, gets to use whatever it want to use and on the investment made by government of India Bhutan get a reasonable return. India gets cheaper electricity supply rather than energy from coal or gas within India. The areas adjoining Bhutan like Assam, West Bengal Orissa, Sikkim Bihar also get reliability source of energy which was not the scene till before power was supplied from Chuckha Hydro Power*²⁸.

Despite benefits from low-cost and clean hydropower supply, Bhutan benefits in revenue earnings from the export of surplus power (85% of generation) and greater domestic supply

²⁷ Chewang Rinzin is the managing director of the Druk green power corporation. He was interviewed on June 23rd 2013.

²⁸ Chewang Rinzin is the managing director of the Druk green power corporation. He was interviewed on February 21st 2014.

(15% of generation). Benefits from hydropower development are also derived from export of goods and services to the project for India as many almost 33 Indian companies are at work in Bhutan especially in hydropower development.

In Bhutan hydropower sector creates employment opportunities and development of social and economic infrastructure, like development of roads and schools and health facilities. The establishment of Gedu College after Tala Hydropower project the head office is being converted to the college. Enhancement of Construction sector which contributes substantially to GDP.

From the lengthy discussion in this Chapter, Bhutan as a nation has evolved through various political and economic reforms from theocracy to monarchy and constitutional democratic monarchy. Bhutan stayed in isolation till the 1960 and itself initiated change in the time of crisis as Bhutan's strained geopolitical environment compelled it for adoption of change coupled with its adverse socio economic condition. With the initiation of planned development in 1961 with the help of India Bhutan stepped forward to modernization. The initial period of development especially two decades were entirely devoted to the much needed infrastructure like road, transport, communication and other social amenities. The economy remained largely agrarian in nature with about 94 percent population depended on it. The fifth five year plan brought Bhutan significant changes in the development path with aims like economic self-reliance and decentralization. In attaining the goal of self-reliance Bhutan gave way to important economic activities like the construction of countries first export oriented major hydropower project, the Chuckha hydropower project prior to which only small hydropower plants were being constructed for domestic use, and the pendent cement factory. The development projects brought a rise in the economy with improved construction and transport communication sector.

After the commencement of Chuckha hydropower plant the economy declined with no major development projects being implemented. While the pace of economic growth became strong with the construction of three major hydropower projects Tala, Kurichhu and Basochhu. The agriculture driven Bhutanese economy slowly saw a transition and became a hydropower driven economy. Bhutan's hydropower development can be seen through the lens of Indian rise as a hegemon in the region. The driving force for surplus generation from Natural resources of an economically, politically and socially weakly positioned nation makes a apt background for big capita to intervene and modulate the development process. All the major

infrastructure facilities and major developmental activities were mainly established with major aid from India, and India has emerged as the only major trading partner of Bhutan. India has a major role to play in Bhutan as from the time of Bhutan's initiation of planned development till the present decade India is not only the major source of finance but also a major player in determining Bhutan's development process and implementing its neoliberal ideas, as all the major developmental activities are developed by major 31 Indian companies. Bhutan's foreign policy has become more liberal in orientation aiming at more foreign direct investment especially in hydropower development as it has become the major revenue generator. In 2012 electricity trade alone earned Bhutan 3096.9 million ngultrum.

Bhutan aims at rising its hydropower generation to 10000 M W with assistance from India, to be sold to India and the equation is termed to be "win win" Bhutan is expected to benefit not only from the revenue generation point of view but also infrastructure development, trained manpower, employment and hydropower stimulated industries. On the other hand India is to benefit a low-cost, clean and reliable power supply directly to its seven states. More importantly for India's security an economically sound and developed buffer zone between India and China. Though Bhutanese economy is seen to be developing it is crippled with over dependence on other country especially on India and with no diversification of economy as the economy has become a hydropower driven economy. The big capitalist class of India and bureaucrats of Bhutan who are the actual development drivers. In such alignment of development of hydropower investments have mainly happened in the areas of infrastructure development which does not have link with development of Agriculture sector. Bhutan being predominantly agricultural economy, the hydropower development has hardly any forward and backward linkages with its agrarian economy.

Chapter - III

*Hydropower Development and Its Implementation
Impacts: Reflection from Primary Survey*

CHAPTER III

Hydropower Development and Its Implementation Impacts: Reflection from Primary Survey

3.1 Introduction

Development of hydropower as discussed in the earlier chapter has seen an accelerated pace in the recent years in Bhutan and has become increasingly the major driver of the economy. The hydropower generation has significantly raised the GDP of the country with 40% of the national budget coming from hydropower and has encouraged other industries like construction, transport and service sectors, generating employment and training manpower. The country to become self-reliant is focusing on encouraging foreign direct investments which are rooted through the government on building more hydropower projects. By 2020 development of 10 new projects in agreement with the government of India to supply 10000 Mw energy. Thus to fulfil the target the implementation of hydropower projects is at a steady pace. The under constructional phase Punatshangchhu I and II, Mangdechhu projects are the part of 10000 Mw by 2020 project and eight others are in pipeline. The major existing projects are Kurichu, Basochu, Chuckha and Tala which caters to the domestic need and exports the surplus to India. Taking the back drop of socio economic and political context in which a state led top down development approach, hydropower is developing in a rapid pace in Bhutan , this chapter takes into account three hydropower projects in different phase of development, i.e. developed Tala hydropower Project, developing Punatshangchhu II and the planned to be developed Amochhu Hydropower project, to understand what are the impacts of the rapidly developing hydropower in terms of conflict and corporation, environment and ecology, displacement and resettlement and socio economic amenities.

3.2 Trajectories of Hydropower Development across the World

The universal demand for energy is predicted to rise over the years, the energy need is to grow one third i.e. 70% by 2035. Of the 70% rise, the major consumers will be the gigantic developing economies with their energy intensive development plans like China, India and the Middle Eastern countries consuming about 60% of the total energy (UNESCO 2014).

According to the International Energy Agency, *for the fulfilment of the growing high demand for energy and to control the escalation of oil price, in total a capital investment of \$48 trillion has to be spent in the energy generating sector in the world by 2035* (IEA <http://www.iea.org/> 2014). Thus for the context of fulfilment of the rising energy demand, the Hydropower generation over the years have evolved as the most important renewable form of energy generation after the concerns of the other fossil fuels exhaustion and effect on environment. From 2014 to 2035 hydropower received 26% of the total expenditure. As of 2010 there were 150 countries producing energy from hydropower plants with China as the leading producer of hydropower. Hydropower has emerged as the single largest renewable energy generation and contributes about 17% of the total energy generation of the world (IEA 2013).

The development of hydropower projects as mentioned earlier is an age old phenomena. Hydropower was built in the foothills of Mesopotamia, Tigris and Euphrates. Dams were essentially built for irrigation and water mills were used grinding corns purposes. According to McCully, the art of dam building infiltrated to the rest of the world starting from the middle Ages. While it accelerated in the 19th century when the era of industrialization was spread by the British power in their colonies (McCully 2007). After the colonial era, dam building became a sign of progress and recently has become an acclaimed renewable, clean and revenue generating source of energy. Thus dam building spread all over the world and today dams have become a prominent feature all over the world. Hydropower generating plants are built in about five different ways and different sizes of depending upon the location, geology and river discharge (Energy.Gov 2014).

Thus with the changing global economies generation of hydroelectricity has received a rigor development and is the chief driver of the economy like Bhutan, Nepal, Brazil, Canada, China, Norway, and the United States (World bank 2014). Along with the socio economic benefits of the hydropower generation, it has posed immense multifaceted challenges in the process of building it. Depending on the location, methods and size of hydropower plants, the difficulties vary in magnitude and scale.

Thus it becomes imperative to discuss the hydropower development led multifaceted complexities in various forms and scales in different parts of the world. Large scale hydropower have brought benefits to society and economy with the development of improved

infrastructure, skilled manpower and revenue at large, but the cost of it has been resettlement of whole communities, the flooding of vast tracts of land, deforestation and significant changes to river ecosystems. Large scale reservoir induced hydropower development is especially favoured for large scale energy supply. The large scale profit oriented hydropower developments have caused numerous impacts on the environment, riparian communities and the social and cultural attributes of a society at large. In European and North American region hydropower development are in advance stage with 65% and 61% respectively of the targeted hydropower development complete (Lipponen 2014). The Latin American and the Caribbean countries have seen an extensive hydropower development accounting to 20% of global hydropower generation is the second largest hydropower technical potential (Jouravlev. et.al. 2014). 60% of the African region, hydropower potential is in the Congo and Ethiopia (Donkor et. al 2014) while in Asia, Potential hydropower sites are in the upstream countries of South-East Asia and South Asia. Huge capacity was added to hydropower generation in 2011, while the adverse effects have also been very prominent (UNESCAP 2014).

While hydropower development has spread all over the world for economic motive, the hydropower development has not been free of destructive consequences. The conflict and corporation due to development of hydropower has taken different nature in different aspect.

3.2.1 Transboundary Conflict and Corporation

Conflict and discontentment exist in the sharing of Trans Boundary Rivers for irrigation and hydropower development in the lean season in rivers like the Sava, Bosna, Morača, Vjosa and Devoll in South-Eastern Europe. Similarly in Central Asia dams built for hydropower generation and irrigation purposes on the trans boundary rivers Naryn, Tejen and Vakhsh have become a common ground of disputed between the riparian countries due to concerns about transboundary effects (Lipponen 2014). The case of The Syr Darya river conflict in central Asia emerges to be an important case of discussion for transboundary river sharing conflict in line of hydropower development. The Syr Darya river shared by the Kyrgyz Republic, Uzbekistan and Kazakstan. Conflict arises over the Toktogul reservoir built in the upstream in Kyrgyz Republic. The reservoir has an active storage capacity of 19 billion cubic meters and during summer it releases 45% of water and 55% in winter in 1990 till 2000. As a consequence, Uzbekistan and Kazakhstan faced irrigation water shortages in summer and flooding in winter (Abbink 2005).

Brazil which is one of the largest hydropower generators is in conflict over major hydropower projects like Itaipu and Yacyreta built over La Plata River basin has been a major transboundary river disputed area. The Itaipu dam is located in located on the border between Brazil and Paraguay, the bi national dam has been one of the largest power generating projects with 98.6 TWh power generated in 2013. The dam building process saw a military aggression over the border of Brazil and Paraguay over the Guaira waterfalls until mutual cooperation was reached to build the Itaipu hydropower project. Similarly the Yacyreta dam downstream of Itaipu dam, between Argentina and Paraguay has not been a very successful story owing to its environmental and social bearings (Newtonet.et. al.?). While in Asia, transboundary dispute arises in the Aral Sea, Ganges-Brahmaputra River, Indus River and Mekong River basins (UNESCAP 2014).

3.2.2 Effects on Ecology and Environment

Construction of hydropower plants in various rivers has shown some very distressing effect to its surrounding environment and the river ecology. 60 percent of world's river basins are fragmented and have changed the upstream and downstream morphology of river bodies, deltas and coast lines. 77percent of the total water discharge in the 139 largest rivers are affected by the blockage caused by dams. 40,000 sq. km of forests and wetlands has been permanently lost to the dams. For the construction of Itaipu dam on the world's biggest Guaira waterfalls which was disputed between two countries was completely destroyed by the hydropower plant. The diversion of water for irrigation has reduced the downstream flow and the sinking of Arial Sea in Central Asia, further the pattern of flow variation is disturbed and there is rampant erosion and aquatic flora and fauna is affected. The chemical, thermal and physical change of water in the storage inside a reservoir for many months leads to the deterioration of water quality, temperature, nutrients, turbidity, dissolved gases and minerals. The massive algal boom in many dams has become a major water contaminator like in the Nasser dam in the Nile (McCully 2001).

The effect of dams on the rich flora and fauna biodiversity has also emerged as a significant problem. The worst to be affected by the river fragmentation and depleting water quality is the aquatic life and fishes. The river eco-system is altered by the fragmentation of rivers and fish species become isolated upstream and downstream, cutting off migration and movements, the change from flood plain river to reservoir river results in massive reduction in the fish population and diversity. The introduction of new species like Hapia and Crab in

the tropics and trout, bass and catfish in reservoir have increased many fold reducing the native fish population. Even the new species are said to thrive for the initial years and there is a massive decline in the fish population because of the isolated habitat in the later years. The fish ladders have destroyed salmon fishes in the Colombian river (Robbins 2004) The western Himalayas in India especially in the state of Himachal in Kullu valley Patlikuhl trout hatchery in the Sujan stream of the Beas river produced more than 50 metric tonnes of trout in 2011 and was sold far to the eastern Himalayan region of Bhutan and Sikkim the development. The major driver of the economy and livelihood of the Kullu valley residents are severely threatened by small scale hydropower development in the Beas river (Baker 2014).

The Northeast region of India, consisting of the eight states of Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim, known for its biological and cultural diversity is a home of a great number of indigenous communities and wildlife species such as the rhino, elephant, tiger, wild water buffalo, pygmy hog and gangetic river dolphin and three out of 34 biodiversity hotspots identified globally, it also houses 21% of Important Bird Areas within India. The unique Brahmaputra and Barak river systems identified as India's 'future powerhouse' and at least 168 large hydroelectric projects have majorly altered the rivers morphology, and large dams are emerging as a major issue of conflict in the region (Vagholikar et.al 2010).

Northeast states such as Arunachal Pradesh and Sikkim are home to small populations of culturally sensitive indigenous communities. The construction of hydropower plants has directly and indirectly displaced local population. The entire population of the Idu Mishmi tribe is around 9500 and at least 17 large hydel projects have been planned in the Dibang Valley in Arunachal The over-900-day satyagraha in Sikkim by affected indigenous communities from 2007-2009 focused on the impacts of hydel projects on Dzongu, the holy land and reserve of the Lepcha tribe. The concerns being expressed in states like Arunachal Pradesh and Sikkim are not restricted to the issue of displacement but that the region's cultural and ethnic traditions are rooted in the river and its environment (Vagholikar et.al 2010).

A major catalyst to trigger the larger debate on downstream impacts of dams in Assam has been the repeated incidents of dam-induced floods across the state from upstream projects e.g. 405 MW Ranganadi in Arunachal Pradesh in recent years. Downstream impact concerns

raised in the Northeast include: loss of fisheries; changes in wetland ecology in the flood plains; impacts on agriculture on the riverine islands and tracts impacts on various other livelihoods due to blockage of rivers by dams in the Subansiri River. The Kaziranga National Park runs the danger of being flooded by the Subansiri Dam in Arunachal (Ahmed 2012).

3.2.3 Displacement and Resettlement and Its Impacts

About 10000 households near Paraná River were displaced for the construction of Itaipu dam in the border of Brazil and Paragua. Similarly the Yacyreta dam downstream of Itaipu dam, between Argentina and Paraguay has not been a very successful story owing to its environmental and social bearings (Newton et. al.). A classic case of displacement and marginalization is of the Sardar sarovar dam in the Narmada Valley in India flowing through three states of Madhya Pradesh, Maharashtra and Gujarat. The Sardar Sarovar project is one from the 30 major dams to be built in Narmada river, the sardar sarovar project alone was to built 135 medium and 3,000 minor dams (Baviskar 1995). 37,000 hectares of land for the reservoir, and 80,000 hectares for the extensive canal works was expected to be submerged. The project was to displace at least 100,000 people including indigenous tribes in 245 villages and 140,000 additional farmers will be affected by the canal and irrigation system (Flood 1997). According to Flood, the people affected by the project would be fit to call environmental refugees as they have been forced to leave their traditional habitat, temporarily or permanently, because of a marked environmental disruption (Flood 1997).

The fate of the residents around the 300 MW Chixoy dam built in Guatemala built in 1982 is no different than the Sardar Sarovar project. Chixoy dam project represented a complete disregard of the local people and their rights to land, culture, livelihood, and even life itself. There were no plans to address compensation and alternative livelihoods for the almost 3,500 displaced Mayans and 6,000 affected people in the surrounding communities with no consent of the residents or proper resettlement. When the Dam affected residents denied to move from their ancestral land, military action was taken against them forcibly evicting them where many residents were massacred. Similarly in Rio Negro, 444 of the 791 villagers were killed. The dam affected communities have continued to suffer losses from lands and livelihood (McCully 2002).

Brutality for dam construction was also seen in Sri Lanka's Mahaweli Projects. In the 1970's 60,000 hectares of irrigated land in the Mahaweli basin was claimed to be distributed among three ethnic groups the Buddhist Sinhalese, Hindu Tamils and Muslims according to their

proportion in the national Population. The allotment was very carefully done by placing the Sinhalese in between the Hindu dominated North and South Mahaweli basin. It was a plan hatched to break the solidarity of the Tamil minority and minimize the influence of Tamils in the Mahaweli area. Several Tamil militants were massacred by the Sinhalese settlers. Similarly the brutal violence and terror from the authorities of China's Xinanjiang Dam led to a wide protest by the native people who were force fully evicted from the areas making the oustees to walk for days to their resettlement areas. Many were dead because of hunger and cold and pregnant women giving birth in the road ways. The same happened with the 4.7 million indigenous tribes displaced in Philippines (McCully 2001). Similar military actions could be seen in the Indian state of Himachal Pradesh where 49 small scale hydropower development has not only created false promise of permanent employment and Local are development ,where only 22 hydropower plants have provided employment but and major failure of the local area development plan, but have also led to hydropower development led disasters like landslide, decline in crop productivity by destroying irrigation systems. Risks of incidence of death have also crippled people of the Himachal Pradesh. Owing to the problem when people protested they were captivated in Jails (Baker 2014).

The dam building business has led to marginalization of communities where millions of politically powerless people and ethnic minority are evicted from their home land. While many have faced ill faith dam building have been advantageous to some areas like Tajikistan which has been an example of a gain from small scale hydropower development where rural communities in Bozorboi Burunov Jamoat have seen improvement in access to social services and secure energy. Similarly countries like Korea, Indonesia, Malaysia and the Republic of Korea, island states in the Indian Ocean, Pacific Ocean and South China Sea, are also expected to benefit from the small hydropower development scheme (UNESCAP 2014).

From the detailed above discussion on hydropower development, various implementation impacts have come to the front. Hydropower developments have brought various adverse effects on the hydrology of river by fragmentation of the river course coupled with depletion of marine ecology. With huge tracts of forest and land lost to the hydropower development land use and land pattern have also been changed around the hydropower plant environment. Displacement and rehabilitation of the indigenous and riparian communities which have earned them identity of being environmental refugees deprived of their land and property and options of livelihood. While negative impacts have been many positive impacts have also been observed communities have benefited from better social amenities, infrastructural

development and reliable source of energy. In this context the various hydropower project developments in Bhutan, which in the previous chapter was learned to be adopting various environmental policies, various guidelines for social mitigation and strong EIA, it becomes prerequisite to understand operational impact of this projects.

3.2.4 Recent Issues on Hydropower Plant Development in Bhutan

Bhutan has not been free of the complexities of hydropower development. In recent times doubt have been raised on the hydropower development process in Bhutan. Some of the recent issues concerning hydropower development in Bhutan need to be discussed. The Kurichu hydropower project located in the eastern Bhutan joins the Manas river and flows as Brahmaputra in India has been reported to cause damage to the Manas wild life reserve. Das in his work Head, Water, Climate & Hazard Programme states that *The existing Kurichu HEP (60 MW) and the proposed Mangdechhu HEP (720 MW) power projects in Bhutan are likely to affect the forests and water bodies of Manas National Park (MNP) in a way which would make the ecosystems less supportive of wildlife* (Das.et.al 2013P. 2).

Das points out that the Kurichu and the Mangdechhu rivers which are major tributaries of the Manas-Beki river system, the construction of the dams have already effected the flow of Manas. The Kurichu dam is said to have affected the forests and wildlife of the manas national park. The Kurichhu dam is believed to have caused large flood in 2004 and the Project's excess water released flooded several rivers in Assam like the Hakua, the Beki and the Manas. The frequent flood killed a large number of wild animals and the extreme siltation has affected large tract of agricultural land making them less productive crippling the livelihood of the farming community in Assam.

While the authorities in Bhutan do not agree with the facts claimed for Kurichu hydropower project and the coming up of the Mangdechhu hydropower plant to have flooded huge tracts of land in Assam and effects to the Kaziranga national Park. Rinzin when asked about the claimed facts, he puts the assertion to be untrue. *The flooding in the plains of Assam where Manas rivers drains to is not due to the Kurichu hydropower plan nor will the upcoming Mangdechhu in the river course will affect the flow nor discharge of the river as both the hydropower projects are of run of the river scheme. The Indian authorities from central water commission and from Assam were called in the Kurichu hydropower site to show the*

60mw run of the river project was not responsible for the flooding. He says the floods were caused naturally due to heavy rains during the monsoon²⁹.

Though the impacts of Kurichu hydropower project seem to be claimed untrue, the construction of 720MW Mangdechhu hydropower project in upstream tributary of Manas has raised issues of concern. The threats to the Manas national park in Assam have made Bhutan give an detailed information to the World Heritage Committee regarding the impact of the Mangdechhu hydroelectric project on the Manas National Park (Goswami 2014).

Issues of distress are looming within the country with immense socio effect on the indigenous residents being a big issue. One of the effected villages by the Mangdechhu Hydropower plant is the Samcholing village under Dragteng gewog in Trongsa with 218 households who are basically sedentary agricultural farmers and many sharecroppers. The access road which cuts amidst the village has already fragmented the village. The construction activity generated dust have not only raised the respiratory diseases, but have lowered the agricultural produce and fodder for animals. Drainage and canals lateral to the road are severely hindered making water supply erratic for agriculture and drinking purposes in meeting needs of thousands of project staff and workers. Thinley states that *the assumption that such a big project will boost the local community's economy is not true* (Thinley <http://www.thebhutanese.bt/2014>). The project has given very less business prospect and few clerical jobs and daily wage work. The scheme of compensation of the project activities are also severely criticised for being very limited and inconsiderate given an option to choose between the cash compensation and land replacements which is very minimal for socio-economic benefits (Thinley 2014). Tashi further points out *the lack of good water governance. Traditional nature of a top –down decision taking approach has overshadowed the new approach of decision making the bottom-up or grassroots. The government's effort to call for a greater national interest; leaving a section of affected society unhappy for years to come in GNH driven society* (Tashi ICIRD 2013 P 1).

While the social economic and environmental repercussions in the recent times have been discussed above other hydropower projects like the Punatshangchhu I and II which are upstream of the Mangdechhu power plan have also raised a number of issues of discussions like the displacement and resettlement of indigenous people. Effect on the river ecology

²⁹ Chewang Rinzin MD of the Druk green power corporation interviewed February 26th 2014.

especially the endangered fish population including endangered bird species feeding on the fish of the Punatshangchhu river. Thus Keeping in view the above mentioned issues three hydropower project site in Bhutan including Punatshangchhu I and II are taken for the present study, the details of which are discussed below.

3.3 Study Area

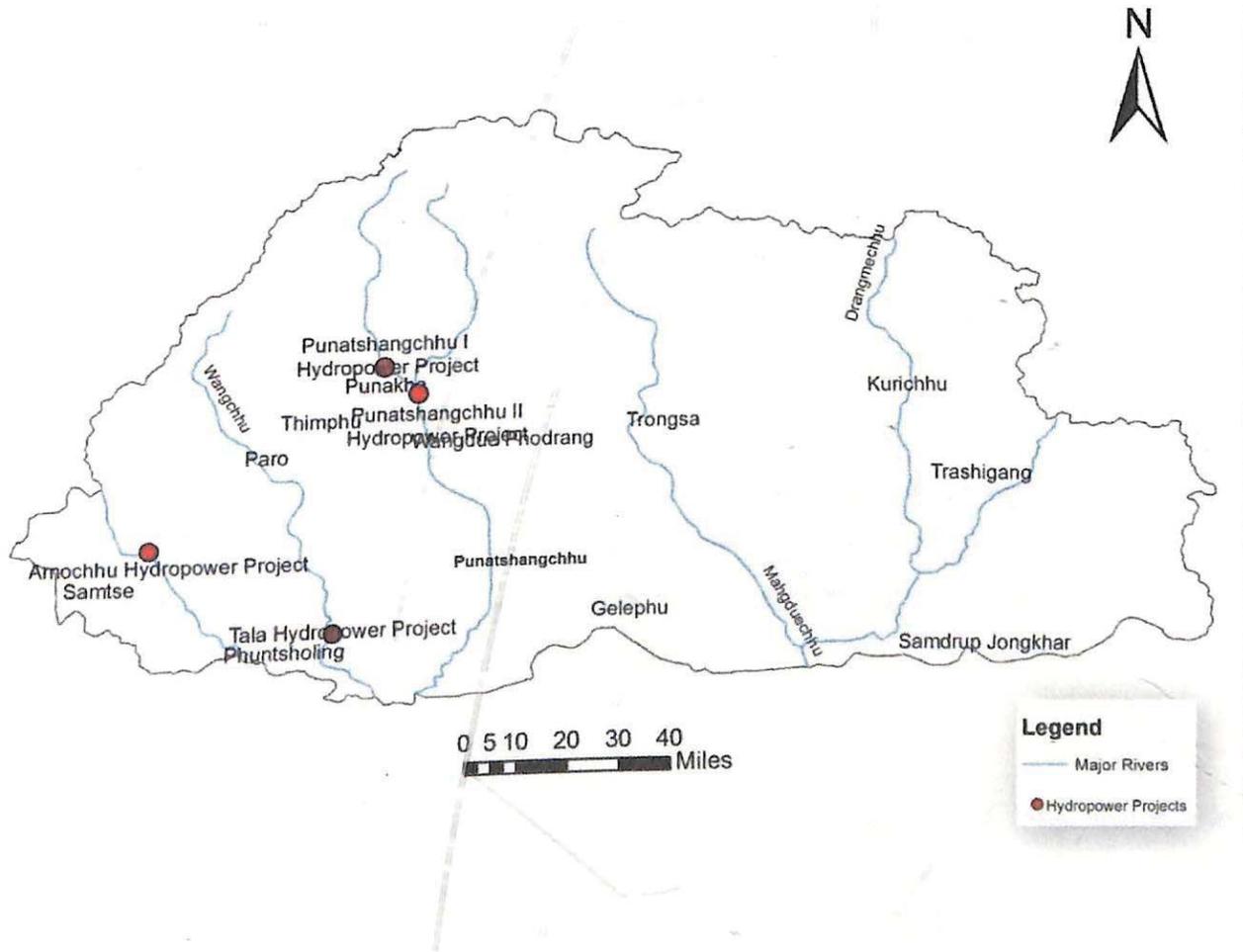
The study area is taken in three important hydropower project sites in Bhutan, the upcoming Punatshangchhu hydropower plant in central west which is under construction phase. Amochhu hydropower project site which is expected to begin its construction very soon in South and have been taken up due to their strategic location and the phase of functioning of these projects. Tala hydropower project in southern Bhutan is fully functional and caters to the domestic need and most of the export to India. The three hydropower project sites become the best representation as samples of the process involved in building up of hydropower projects in Bhutan. The study sites are also taken because of their strategic location.

The 1020 MW Tala hydropower project is a run-of-river scheme in river Wangchhu in Chuckha Dzongkhag in western Bhutan. The project falls in the foot of southern mountain range of Himalaya in steep river gradients. This project is 60 km up from Phuntsholing the nearest main town and the power house is in Arikha and Sintshikha village in Tala. Tala hydropower plant has been taken into the study as it is the first major project >1000Mw run of the river scheme in Bhutan. The project is a major energy supplier domestically and outside dominantly India. The evaluation of the major project is of importance to see its effects in the ecology, society and economy. As a completed and fully operational hydropower plant it can give the history of the constructional phase and the operational one. Second area is the Punatshangchhu I and II as discussed above are in constructional phase since 2009. The Punatshangchhu hydropower I and II plants jointly is expected to an annual energy of 2200Mw. The project is located in Punatshangchhu in Wangdue Phodrang in western Bhutan the project is exactly located in the right bank in Wangdue Tsirang highway. The project would be completed in seven years including establishment of access roads and other infrastructure facilities. It is included in the study as it is in the constructional phase can represent a true scenario of happenings around the hydropower development environment.

Lastly the imminent Amochhu reservoir hydropower project is going to be the first of its kind in Bhutan. The Amochhu or popularly known as the Torsa chhu is the shortest river system in

Bhutan and flows through two Dzongkhag called Chuckha and Samtse. It becomes very important to discuss with the hydropower development of such big project what could be the possible effect and what do the communities look forward. The figure 4.1 shows the location of the three identified sites of the study area.

Fig. 3.1 Location of Hydropower Projects Considered for the Study



3.3.1 Physical Features

In the Tala hydropower plant, hydrology of the river in the area with a catchment area of 4028 sq. km and the high river discharge a mean annual run off of 3107 million cu.m and an average flow at the dam site being 99 cu.m/sec highly favourable for the hydropower generation (DGPC 2013). The place receives highest rain falls mainly from the summer monsoon. Precipitation is generally higher than in the Central and eastern part of the country as the area is close to the head of the Bay of Bengal. The middle and upper slopes are considerably more moist than the valley floors. The highest flows in July and August, suggesting that hydrological pathways are mostly short and direct. The project area is

dominated by Higher Himalayan Crystalline Complex. Metamorphic, Gneiss, granite quartzite, schists and marble are commonly found (Agrawal 2005).

The 1,200 MW Punatshangchhu I a run-of-the-river scheme hydropower plant is situated on the Punatshangchhu river 18.5 km downstream of Wangduephodrang bridge. The project under the implementation by the Punatshangchhu-I Hydroelectric Project Authority (PHPA), an autonomous body of the Royal Government of Bhutan and the Government of India (DPR Punatshangchhu I 2006).

The Punatshangchhu II hydropower project is 38km below Wangdue bridge and the dam site is about 22.50 km from Wangdue bridge and connected by highway. The power house is near village Uma. The river has a catchment area of 6836 sq. km. The Punatshangchhu II area is located in the lower Himalayas. The area is of meta sedimentary rocks and granite gneiss and different types of schist. The river flows in an anticlinal fold. No major tectonic movements are observed. Meteorological data suggest that the area receives an annual rainfall of 57.48 m in December to 269.92m in July, from south west monsoon from mid may till September (DPR Punatshangchhu II 2009).

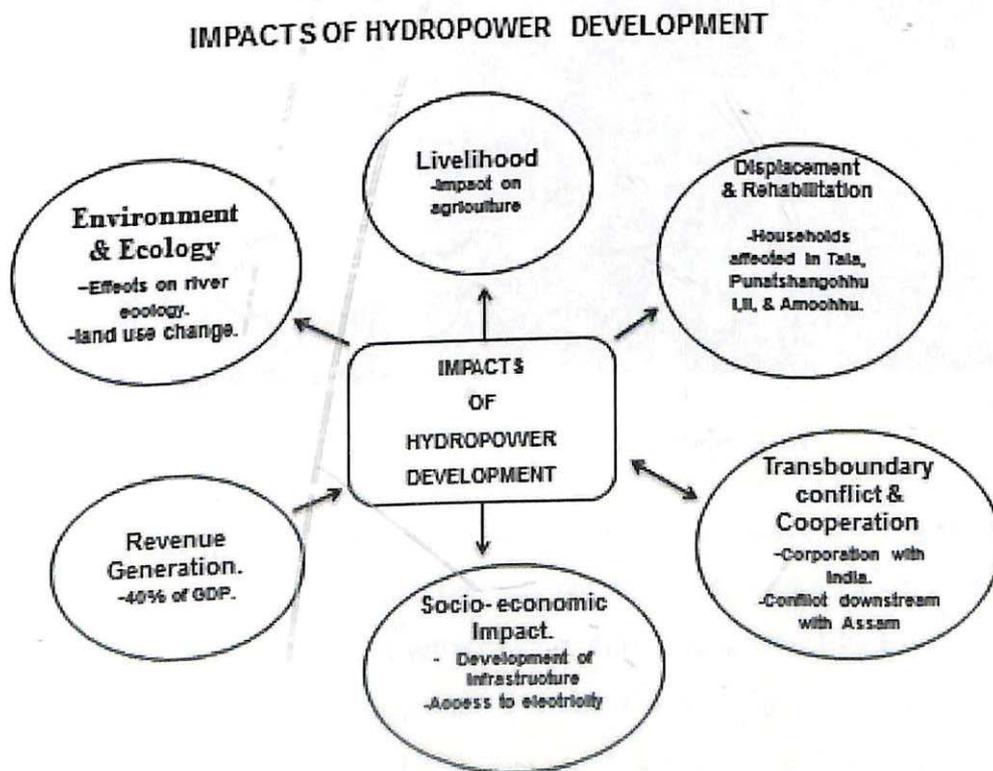
The reservoir scheme Amochhu hydropower plant is to be located in the shortest river system in Bhutan the Amochhu/ Torsa chhu which flows through two Dzongkhag called Chuckha and Samtse. The location of the project starts from Tading village which is 8km away from the main town Phuntsholing till Samtse Dzongkhag.

3.4 Implementation Impact

Based on the physical aspects of the hydropower development sites three hydropower projects taken for the study are run of the river scheme hydropower plant Tala, Punatshangchhu I and II while the Amochhu hydropower plant which is to be constructed in a year's time is of reservoir type. The implementation impact of the hydropower plants are manifested in many fold. The large scale hydropower projects construction has impeded various rivers and the obstruction is likely to disturb the river ecology and its surrounding environments to a huge extent. The construction of hydropower plants involved displacement and relocation of various communities and the case of Punatshangchhu I, II, Tala and Amochu displays a similar nature which is being. Thus the displacement relocation has brought various livelihood challenges to the riparian communities. While other than the effects hydropower development in an area brings huge socio and economic transformation.

The hydropower energy generated and exported brings huge economic return. The process of a hydropower plant development involves various actors and stakeholders which would encourage multiple country engagement fostering transboundary corporation, and otherwise conflict due to water sharing or downstream impact of the upstream hydropower development like flooding, water scarcity etc. The details of these impacts of hydropower generation have become import focus of our discussion below. The figure 4.2 shows a comprehensive sketch of the various impacts of hydropower development in Bhutan, and the preceding discussions are in the line of the major impacts.

Fig 3.2 Impacts of Hydropower Development

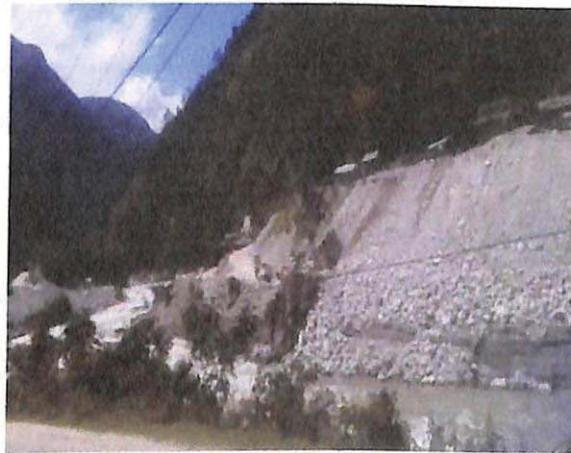


3.4. 1 Effects on Environment and Ecology

The constructional phase of a hydropower development brings a great alteration in the physical landscape of an area. The land carving for access roads, Dam, the power house and the working station, different offices and residential complexes for the employees. The submergence of land for dam construction takes 530 per hectare forested area in Punatshangchhu hydropower plant, similarly 172 per hectare forest area in Tala hydropower Plant and 1500 acre of land is expected to be submerged in the upcoming Amochhu hydropower project. The following figures show the soil deposition in the road and river bank in the Punatshangchhu area.

Fig.3. 3 Road Carving in Punatshangchhu Project

Fig.3.4 Muck Deposition in Punatshangchhu Bank



Source: Field 2014

Source: Field 2014

The EIA study could be proved weak with issues coming up like, the Punatshangchhu hydropower plant dam was relocated from the original site which was 1.5km downstream. Other incident comes to question the EIA where in the Punatshangchhu I hydropower project site the hill on the right bank of the project site started to sink in July 2013. *The loose rock face has been gradually moving down to the base of the dam site that is being excavated to go more than 70m below the riverbed until it touches hard rock. As of now, 37m have been excavated below the riverbed. The sinking area stretches 200m above the Wangdue-Tsirang highway* (Namgyel <http://www.kuenselonline.com/2013>).

The construction of the plant brings modification to the land use and land cover of a place greatly. Chuckha Dzongkhag where Tala hydropower plant is located covers 4.90% of the total land area of Bhutan, chiefly forest dominates the land cover with 4.20 percent under forest cover of which 172 hectare forest cover was lost to the Tala hydropower plant. The

land cover in the Punatshangchhu area is mainly dense forest and broad leaved forest cover to dry shrubs covered hill slopes. Similarly dense forest cover was observed in the Amochhu river areas.

Around the Punatshangchhu area 372 hectare of land is seen to be mainly Agricultural land, few built up areas like roads and the town area like the Messina, Bajo and Wangdue town. The agricultural land use pattern is such that the residents grow paddy, maize, Millet and buckwheat in the area. The next major land cover and land use in Tala is agricultural area 0.24 percent of the total 4.90 percent. The agricultural pattern is such that maize sown once a year in the month of February/March which after ripping in August/September, paddy is sown in the monsoon season. Other crops like millet, buckwheat were grown. The lower valleys were said to have cardamom and betel nut trees earlier but it did not seem visible during the field study. Kitchen gardens with few vegetable like Sag Radish, Beans items were reported. The residents also reared domestic livestock like cattle, goats and hen. Similarly residents around Amochhu river practice agriculture for sustenance. The land is put into use to mainly grow paddy, maize, millet and buckwheat in some areas. Main cash crops were Betel nut trees, orange trees, cardamom and main cash earning crop being ginger. The pictures below show the land use patterns in some of the villages.

Fig 3.5 Cardamom & Betel Nut Cultivation



Source: Field Survey May 2014

Fig 3.6 Paddy Field



Source: Field Survey May 2014

The agriculture in these areas has largely suffered because of the hydropower development. The dust generated during the construction of the hydropower plants because of road carving digging tunnel etc. have destroyed the crops of the farmers in the Uma village which is near

the project power house area. The Arikha and Sintshikha village in Tala also recollect of the dust generation and it covering the agriculture crops and declining the productivity. App³⁰ Doji³¹ a middle aged farmer goes furious telling how his agriculture land and crops are covered with dust and the frequently felt tremors have destroyed his crops. He complains of the local stream used for irrigation and drinking purpose has dried and water in the area is drying speedily. Mr. Bir Badhur³² 70 years old man and has practiced agriculture and reared livestock for his survival his whole life. He said he had 1 acre of cardamom cultivation and 8000 saplings of trees, near the project area the land got submerged and his agriculture land was lost forever. He received the compensation from the government and he is more than happy with the compensation but he fears his other paddy field land near the project site may be submerged in times to come.

The residents near the Amochhu area bear similar fears in mind. In Serina³³ 17 households are affected people have lost huge tracts of land. All the seventeen households derive their livelihood from practicing agricultural. With no good educational qualification they do not expect to get good job when the project comes. As asked them by the authorities to identify supplementary land of their own choice, they are disappointed not to find any good land like the present one they have. Sana Bir Limbu³⁴ has identified a land in the upper hill tract where the project has not affected the area but he says the land productivity is not as good as the one that they presently have near the river bed. The place a decade back had very good orange production according to Bal sing Limbu³⁵, he had an acre of land under orange cultivation. The orange trees subsequently in the recent years dried and now oranges are not grown any more. With the coming of the hydropower plant agriculture produce could be decreased like the case of Uma village in Wangdue due to the Punatshangchhu project.

The project constructional phase has brought a vital issue which needs to be addressed soon. The blasting of underground for the construction of tunnels and excavation of land for constructing or expanding roads have created vibration effect in the nearby villages. Of the severely affected villages are Uma and Rubisa villages in Punatshangchhu II hydropower plant area. The houses of the area are severely cracked and the residents complain of not being able to sleep at night due to the vibration and shaking of the land. To top the ill effect

³⁰ A way of addressing a man like calling Mr.

³¹ Respondent male, 39 years Tala Bhutan, for the secrecy of informers identity name has been changed.

³² Respondent 70 years male Tala Bhutan, for the secrecy of informers identity name has been changed.

³³ It is one of the effected villages by upcoming Amochhu hydropower Plant.

³⁴ Respondent 32 years Serina Bhutan, for the secrecy of informers identity name has been changed.

³⁵ Respondent 43 years Pachu dara Bhutan, for the secrecy of informers identity name has been changed.

noise pollution is another issue that the residents are troubled with. Similar consequence was bearded by the residents near the Tala hydropower plant. Mani lal³⁶ a middle aged farmer tells his house located near the project site the land became very unstable as the house developed many cracks and even after several repairs the house could not stand and thus him and his other neighbour had to leave the house and buy and built in a new area.

Near the Punatshangchhu hydropower plant construction two parks Jigme Dorji National Park and Jigme Senge Wangchuk National Park. Due to the infrastructure development and human interference about 2-3km of wildlife habitat has been affected in both flanks of the road. Barking Deer, gray langoors, monkey and mouse chripping birds, Jackels, wild boars, leopards, sambhar, Himalayan black bear and wild dogs. Among the reptiles python, cobra, king cobra are found. The most important wild life animal in the area is the White Bellied heron rarest and endangered species and is found in Bhutan, NE India to hills of Bangladesh, Mayanmar, China and Tibet and is extinct in Nepal. A total of 36 herons in Bhutan were seen in Punakha. Wangduephodrang, Tsirang, Dagadzung, Zhemgang Mongar, Tashigang, Tashiyangtshe, Sarpang, Samtse, Chuckha and lower Haa in 2007 and of the total 26 were spotted in Punatshangchhu river it's a fish eater and lives in chirpine forests. Globally only 200 in 2008 32 herons were counted in Bhutan and 28 herons in Punatshangchhu area (DPR Punatshangchhu II 2009).

Fish population in Bhutan has not yet been documented well yet with the available data it is suggested that there are around 41 indigenous species of fish species in the Bhutan's rivers (Peter 2002). The Punatshangchhu river is also known for the rarest fish in the region the golden Mahasheer. The course of the river in Punakha to the study site has a cold temperate climate to tropical cold climate. Only nine species of fish are found in the Punatshangchhu according to the DPR 2007. Commercial fishing is prohibited in Bhutan as per the fishing rules amendment act in 1993. No use of fire arms, nets, hooks with live baits etc. for fishing sport fishing is permissible in specified location on payment Nu 25 daily to nu 500 yearly. In the studies done by WAPCOS only 5 species were found in the project area the snow trout, Golden Mahasheer, Mahasheer, Catla and asala and in the dam site only three species were reported snow trout, Golden Mahasheer and Mahasheer. The Mahasheer and the golden Mahasheer are migratory species and they journey south to the warmer waters during the month of September to march. Then they journey back to the

³⁶ Respondent 38 years Tala Bhutan, for the secrecy of informers identity name has been changed.

upstream. During their upstream movement in May and June they breed in several tributaries. They are found in kamechu and Dikchu area. Calculated number of fish population in the Wangchu river is not yet the Wangchu river has the brown trout and Asala fish. The brown trout which is an endangered species needs to be conserved. The upstream Chuckha project and downstream Tala both do not have a fish ladder which makes the fish crossing the river very difficult from a 90m high dam. While in the Amochhu river the residents reported of not doing fishing thus only reported fish during the field was katla fish.

3.5 Nature of Displacement and Rehabilitation

Development of hydropower involves large tract of land and the land accusation from the local residents of the project area. Punatshangchhu hydropower plant I and II effect 142 households and the Amochhu hydropower plant is expected to affect 297 households the exact figures of numbers of family effected is not clear but the field study reports 14 households being removed from their land at the time of Tala hydropower project construction (DPR Punatshangchhu I, II 2009, DPR Amochhu 2014).

3.5.1. Tala

The land accusation for the hydropower project development not only brings the problem of compensation and proper resettlement but also brings transformation in the land use and land cover. The agricultural fields in Arikha and Sintshikha in Tala hydropower project site are now converted to build up areas with road settlements and buildings. Similarly in the Punatshangchhu area agricultural fields, forest covered lands are turning to build up area.

35kms down from Gedu³⁷ is Arikha and Sinchikha the site of Tala Hydropower project. JoJo³⁸ Dao³⁹ 85 year old man had 12 acers of land before the hydropower development about 25years ago and he practiced agriculture where he grew maize, wheat, buckwheat and millet there and reared cattle for daily survival. JoJo Dao was asked to give his land to the government by the government officials and was promised of better housing, employment and other facilities. 14 such houses were moved from their land and moved near the project staff colony which is now the main market in the area. He got 4lakhs for his land in total and

³⁷ Is a town in south-western Bhutan in Chuckha District.

³⁸ Grandfather in Bhutanese local dialect.

³⁹ Respondent 85 years Tala Bhutan, for the secrecy of informers identity name has been changed.

extra 3lakhs for the construction of his house but has yet not got the Tharm⁴⁰ of the land which he is afraid he'll be asked to leave soon. His two sons got employment in the Hydropower Project.

Fig. 3.7 The Rebuilt Houses of the Displaced



Source : Field work February 2014

For the land he approached many higher government officials but of no use. JoJo Dao is sad that he had to give away all his land and says is not happy with the compensation where he cannot practice agriculture and has to buy all the cereals and food items from Phuntsholing Town. The business is also not good as the project is over and there are not many customers. With another acre of land near his present house he rare 10 cattle and does some cultivation of maize and other vegetables. The Wangchhu river which flows through their village had no other purpose but flowed freely on its path. They fetched some vegetables from forests ferns, Damru,⁴¹ Nam Nam⁴² and mushroom but they all seems to have vanished and they buy all vegetables from market for consumption.

After coming of the hydropower project he acknowledges the fact of the roads and in fracture facilities that has come up like the school and the BHU where they do not have to walk long to reach the nearest market and travel in local transport and can educate their children. With the coming of the project the land price has escalated tremendously high where a decimal of land here today cost 5000 thousand ngultrum. Figure 4.8 represents the map of the affected

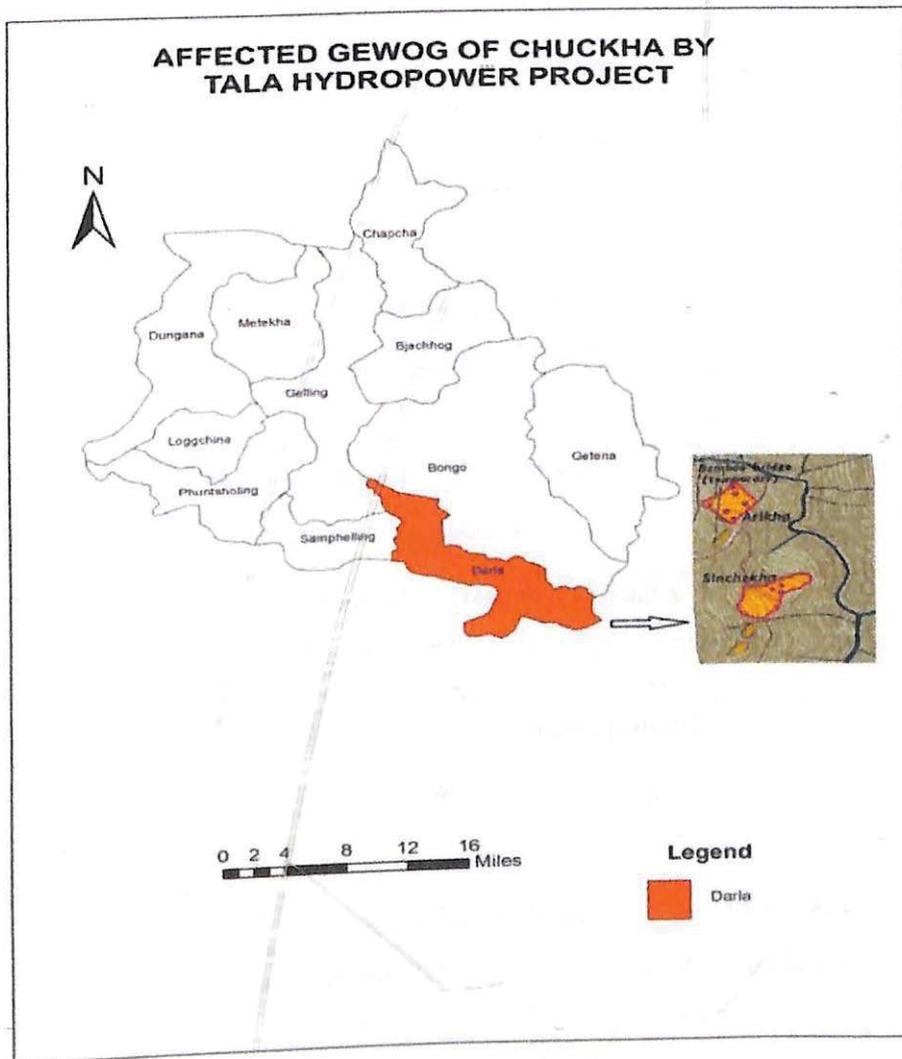
⁴⁰Registration of land.

⁴¹A kind of wild vegetable.

⁴² A leafy wild green vegetable

areas by the Tala hydropower project in Chuckha Dzongkhag were two villages of Arikha and Sincikha in Tala gewog were severely affected.

Fig. 3.8. Map of the Affected Area by Tala Hydropower Project



3.5.2 Punatshangchhu I and II

The construction of the Punatshangchhu I and II project on its completion will submerge a total forest area of 356.29 ha and affect 142 households. The Punatshangchhu I dam is located about 6.5 km of downstream of Wangde bridge while the main area of construction for the Punatshangchhu II falls 22.3km south from Wangdue bridge to 39.1km to Pinsa village. The Punatshangchhu project I affect 92 families mainly from Tshogom gewog and Thedtsho gewog. The Punatshangchhu II project mainly affects four villages and which fall in Daga gewog and only one house hold fall in the Ruepisa village. The details of the project affected families are listed in the tables below.

Table 3.1 Punatshangchhu I Hydropower Project Affected Families

SL. No	District	Village Name		No. of Project Affected Families/Organization
1.	Wangdue	Tshogom Geog	Khempajichu	19
			Toewogma	24
2.	Wangdue	Thedtsho (Gewog)		27
3.	Wangdue	Rubesa (Geog)		8
4.	Punakha	Goleykha, Zingkona, Thang Gongma, and Tsokona		4
5.	Wangdue	Khempajichu (PWD), Hesothangkha (CDCL,BPC)		3
6.	Wangdue	Gyewathang (Tshowom Geog)-1		4
		Ruchekha (Rubesa)- 3		
7.	Wangdue	Jimthangkha, Zhigonang, Nyasitar		3
TOTAL				92

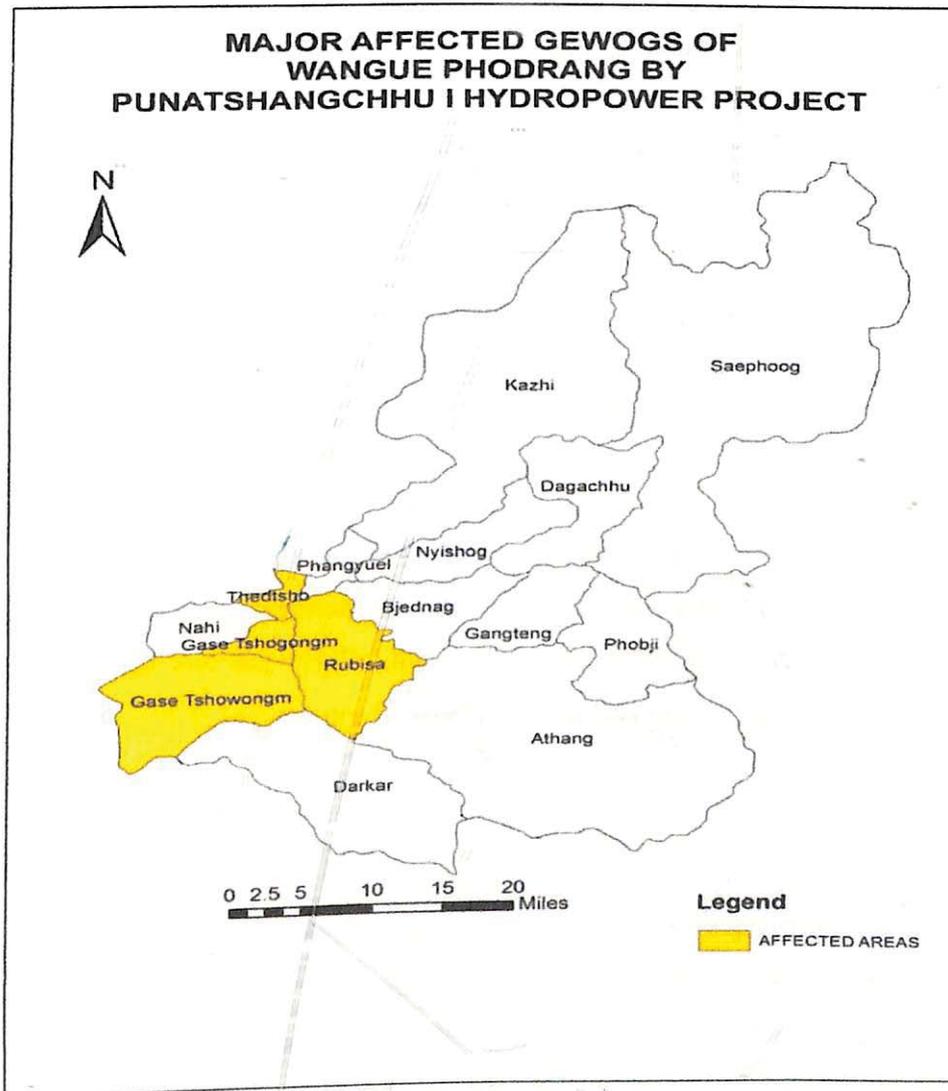
Source: DPR Punatshangchhu I

Table 3.2 Punatshangchhu II Project Affected Families

Sl.no	Name of the Villages	Total affected families
1	Kerabari(Pinsa)	21
2	Besokha	3
3	Gyechhu	2
4	Khuma(Rupepisa)	1
5	Kamechu	23
	Total	50

Source: DPR Punatshangchhu II

Fig. 3.9 Map of the Affected Area by Punatshangchhu I



From the figure 4.9 it can be understood that Punatshangchhu I has majorly affected four gewogs Rubiisa, Gase Tshowongm, Gase Tshogongm and Thedisho in Wangdue Phodrang Dzongkhag. While Punatshangchhu II Hydropower plant in the downstream of Punatshangchhu I has affected Kamechhu area and Pinsa area. Accessing the data three categories of affected areas were taken for study displaced and partially effected households from Hetsokha, Ruebisa and Uma. The affected residents from the villages of the Punatshangchhu hydropower projects. Sonam, Sangay, Dema, Dawa and Dorji lived in the same locality before they moved from Hentsokha. All had small piece of land not more than an acre. Sangay works at the Punatshangchhu hydropower project I as a computer operator had 56 decimal of land and lived with her seven other family members practicing agriculture.

After the project came to the area they were asked to shift to a new area with land to land or money compensation.

The land Sangay and her family owned was wet land near the river where they grew Paddy, maize and vegetables. The land irrigation was mainly monsoon rains supplemented by local stream, Naike stream is commonly used by people in that locality for irrigation. The river was not used for irrigation nor for drinking water or for fishing. They grew vegetables and did not fetch any vegetables from the river either. The land they got now she says is a dry land and they can only cultivate few crops like maize and millet. They have land in another area from where they get the supply of rice. Their house was demolished and has constructed a new one in the new land. The land registration has not come yet but they are expecting it will come soon. As promised by the project authorities a member from the family is employed and they get 100 units of electricity for free.

The coming of the project they say is good for the development of the country's as told by the authorities like earning revenue for the country, generating employment, infrastructure facilities like roads and the hospital that is going to come up in future. The only displeasure they feel is they had to leave a productive land to a less productive land, but also forgo their ancestral property.

3.5.3 Amochhu

The reservoir induced hydropower project will take an area for construction double the times of an run off the river scheme as reservoir needs to be built for water storage. Around 1500 acres of land will be required for the project installation. The details of the land acquired from different villages are explained in the table 4.3.

The project site which begins at Tading village is about 8kms away from the nearest main town Phuntsholing. The people of the area fear of losing their land and an unexpected turn in their environment. In Serina 17 households are affected people have lost huge tracts of land. Santa Bir rai and Palden Rai, Seris Limbu is from Serina and they have lost a vast tract of land 16 acres of dry land and 15 acres wet land and 7 acres of dry land respectively to the project. In the dry land Maize, millet, pulses, betal nut trees, oranges and ginger is grown. The wet land is mainly used for paddy cultivation and the dry land for maize and ginger. Ginger is the main cash earning crop. The Chandmia kholsa is used for irrigation in combination with the government made canal.

Table 3.3 Details of Major Households Displaced in the Amochhu Basin

Sl. No	Village	No. Household Displaced	Sl. No	Village	No. Household Displaced	Sl. No	Village	No. Household Displaced
1	Samdur	32	12	Phakhay	3	23	Demji	2
2	Pachu Tar	27	13	Tursatar	7	24	Khempagaw	8
3	Lumina	1	14	Malabasay	16	25	Bumakha	5
4	Doban	9	15	Lingden	12	26	Lhajab	1
5	Chelawnay	6	16	Sukhaygaw	1	27	Rumtey	16
6	Dam Bari	1	17	Balden dara	8	28	Tapagaw	13
7	Pachu Dara	24	18	Gongkhola	1	29	Singey	11
8	Serina	17	19	Dopham	1	30	Jime	14
9	Magwa	8	20	Amalat	1	31	Wangchu	5
10	Mechey kola	1	21	Zedokha	7	32	Sanglung	2
11	Tashidenkha	9	22	Ranitar Tading	6	33	Lapchagaw	4
								Total =
								279

Source: DPR Amochhu II

The Pachu Dara and Pachu Tar are not fully submerged by the upcoming Amochhu hydropower Project. Badhi Badhur Limbu lost 50 decimal dry land close to the river to the project, where he previously cultivated oranges but recently all his orange trees died. He is not unhappy to give away the land as it was barren and of not much use except to grow some maize. Similarly a senior women popularly known as Dedi in the area lost 44 decimals to the project where she had orange trees, maize field and cultivated ginger. Other residents have also lost small sections of their lands to the project. The Amochhu river was never used by the residents of the area for irrigation nor drinking purposes or in any other use. Mostly the irrigation is rain fed otherwise for irrigation and drinking water local streams popularly known as kholsa in local term are used like the ranighang kholsa is used by the Pachu gewog people. The project is expected to affected two 279 households in two Dzogkhags Chuckha and Samtse the details of which is shown in the figure 4.10 and 4.11.

Fig 3.10. Map of the Affected Families in Samtse Dzongkhag of the Upcoming Amochhu Hydropower Project

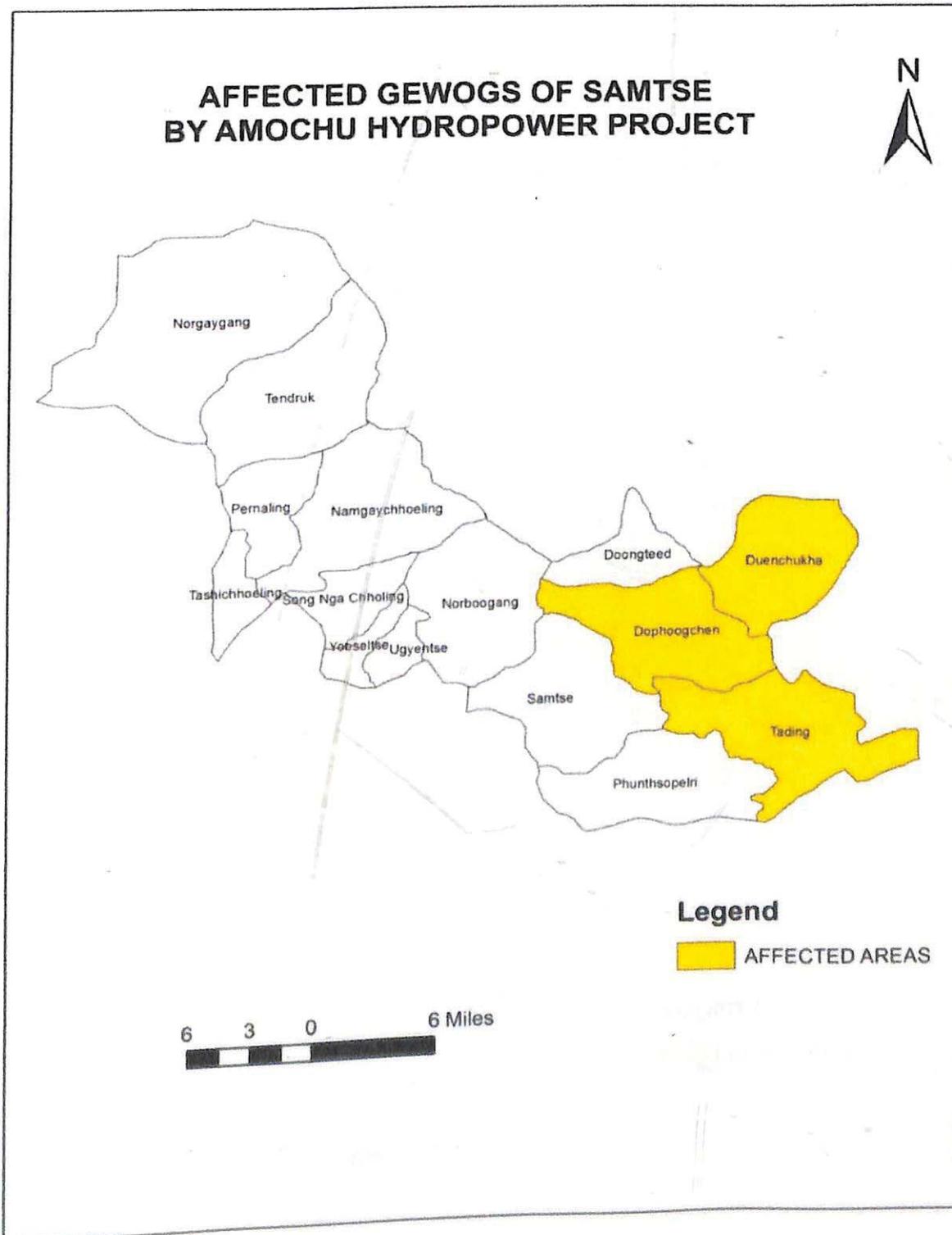
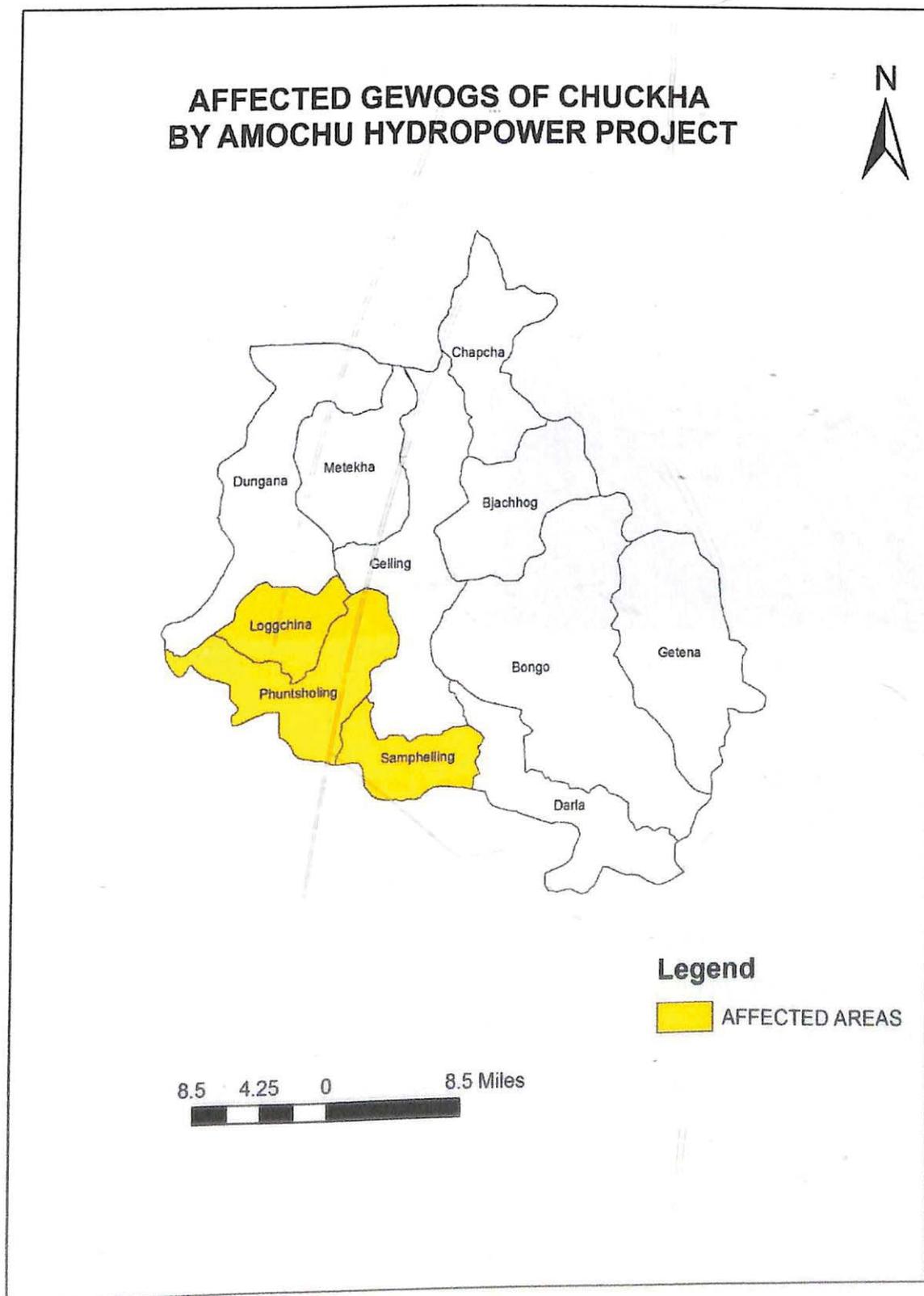


Fig. 3.11. Map of the Affected Families in Chuckha Dzongkhag of the Upcoming Amochhu Hydropower Project



The people of the area have lost their whole land and property and they do not wish to leave their ancestral property. The land replacement is to be searched within the gewog or the Dzongkhag which is very difficult as huge tract of land is not available at a place and the area they have identified are in the upper slopes of the mountain in the forest area. The new lands are not as fertile as their present one and productivity would not be like the present land which is fertile and plain land near the river. The hill tracts do not have enough water which is also a major concern. They also fear of less business prospect as they have to move away from the place after coming of the project.

Fig 3.12 Construction of Concrete Bridge



Source: Field work May 2014

Fig 3.13 View of Amochhu River from Tading



Source: Field work May 2014

The figure represents the construction of a new concrete bridge which is the beginning of the construction of the hydropower plant. In figure the river Amochhu is shown to be flowing. The ridge seen in the figure is to be submerged with the construction of the project.

Displacement in Bhutan has been in various pockets in smaller scale in Bhutan but the project affected household have increased over years. With the coming up of Amochhu hydropower project which is effecting 279 households the toll is rising even higher. The concealed nature of displacement in Bhutan can become pronounced soon if higher number of households are displaced and affected by eight major hydropower plants coming up in various parts of the kingdom by 2020.

3.6 Effects on the Socio Economic Impact

Major alteration of the socio economic environment of an area is visible after the coming of hydropower plant in an area. In the constructional phase of hydropower development mass

labour force is required, thus the generation of employment is the most advantageous outcome of the project for the local people in and around the project area. The source of earning income is raised with business prospects for the business community with the large influx of project employees come to the area.

Bajo town is a planned town located in Wangdue Phodrang Dzongkhag in the opposite of the Wangdue bridge. The town is a central hub of business activity due to the Punatshangchhu hydropower project location in the area. The town houses many office units of the Punatshangchhu project and is residence of the project employees. The town holds a very good business prospect and a number of business men were interviewed to know the present state of business there.

Since the project started in 2009 in the area the project has brought huge influx of people and the business has boomed. The exact profit amount was not disclosed but the business community say they have benefited greatly. They bring the supply of the materials from Phuntsholing and some from Thimphu. The most benefited business was observed to be vegetable vending, garments shops, hardware shops and restaurants. The house owners were advantaged from the house rent in the area which was known to be very high ranging from Nu 7000 to Nu 20000. The project is building project colonies for the employee's residential purpose in kerabari. The business men and the house owner fear of losing their consumers and the high paid houses disserted. While the owners of shops in Bajo Town and Messina⁴³ benefit from the influx of employees for the Punatshangchhu I and II hydropower plant, Uma town which is just 30 minute walk from the Bajo town, the business prospect of the farm produce is reported to be declining. App Karma⁴⁴ who sold his farm produces earlier along the roadway near Wangdue road and earns profit. Now he says *his produce is too small from the huge lot of vegetables imported from India*. While livelihood option for the riparian communities seem to be deprived. The development of new infrastructure is of another important contribution of a project construction like roads School, hospitals, housing, educational intuitions etc. The Tala hydroelectric power project has established 35km long road connecting the main Thimphu Phuntsholing highway from Gedu till Arikha.

⁴³ A town

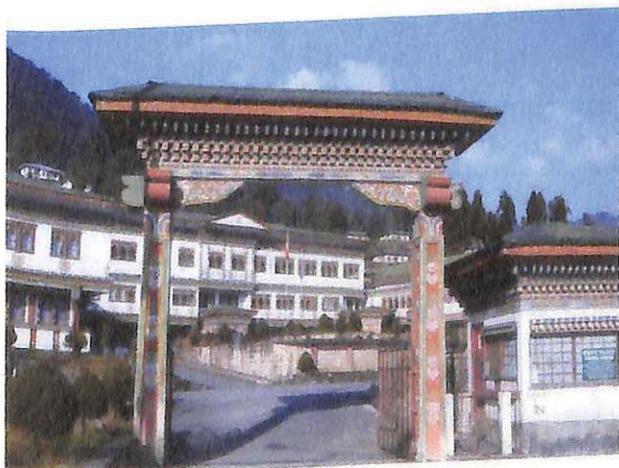
⁴⁴ Respondent 45 years Uma Bhutan, for the secrecy of informers identity name has been changed.

Similarly Punatshangchhu hydropower plant has also built several access roads in the Wangduephodrang area. The upcoming Amochhu hydropower project is also expected to connect the isolated villages near Amochhu river to the main land after the project begins.

Setting up of new schools and hospitals and other educational instruction is another advantage. The Tala hydropower project has built a Basic Health Unit (BHU) in the Arikha region where the project has employed the BHU staffs to cater to the people. The place before coming of the project he said had no much access to the outside world with no road connection nor any other jobs to do rather than their farming activities. Where they were they had to walk down to the Phuntsholing town and it took days to return home, With the coming of the project he said the roads have made their travel easier and less time consuming. The opening of new schools and BHU has also helped them access to a better medical facility and education for their siblings. The project provided the residents there with jobs and earned good money. The vegetation over the year was reported to rise the reason being the government encouraging the plantation of new saplings.

The Punatshangchhu project has also established a health clinic in Lobesa. The head office of the Tala Hydroelectric Power Authority which was located in Gedu, after the commencement of the project the infrastructure was handed over to the Royal University of Bhutan for setting up of the Gedu College of Business Studies based on the decision taken by the RGoB in the 85th Session of the National Assembly. The figure below shows the Gedu business college and the Punatshangchhu clinic.

Fig 3.14 Gedu Business College



Source: Choden 2014

Fig 3.15 PHPA health Clinic



Source: Field work February 2014

The residential complexes established by the hydropower project has provided concrete pacca houses to the employees with safe drinking and sewerage facilities including reliable supply of electricity. Most of the houses 100% households in Arikha and Sintshikha the Tala project site area have access to safe drinking water and sewerage facility. Similarly the residents of Bajo the project employees about 92% have safe drinking water and sewerage facility and with the establishment of the project residential complex in Kera bari, the employees getting better facilities is expected to rise. Same is expected after the commencement of Amochhu hydropower plant. Most of the people in the study area of Tala and Punatshangchhu use electricity in combination of LPG 96% and 94% respectively for cooking and 100% of the people surveyed in the Amochhu hydropower project area use electricity, LPG gas and fire wood for cooking.

The Amochhu project site which begins at Tading village is about 8kms away from the nearest main town Phuntsholing. The main town is joined to the villages near Amochhu river area by a rough feeder road where after the Tading area small vehicles do not travel and in the other villages only pickup vans and load trucks can ride the steep rough road. The residents of Pachu Tar and Pachu Dara recollect how they walked to Phuntsholing town carrying loads of food items on their back or the horse back until the village got connected by a rough road which was made 8 years ago made for talc carrying from the Sadu Madu Damchen talc mine near the village. The village got electrified only four years back in 2010. Other infrastructure like school and hospital is not too promising with just a primary school and an ORC medical unit.

The meals are mostly cooked in fire in most of the houses with a limited use of electric appliances and LPG gas. Most of the villagers practice sedentary agriculture and rare livestock like cattle, pigs and hen. The main crops are maize, millet, mustard, pulses and paddy with some vegetables. Main Cash crops are oranges and ginger. The produce is mostly consumed but some items like ginger and oranges are mainly marketed to Phuntsholing. One private service Jeep runs in the area once every day.

As mentioned earlier, in the Pachu Dara and Pachu Tar where partial land submerged exist the upcoming Amochhu hydropower Project where each household lost lands not more than an acre. The Amochhu river was never used by the residents of any economic value as it was not used for irrigation nor drinking purposes or in any other use. The residents of these villages anticipated better tomorrow with the coming of the project. The people of the Pachu

gewog expect development with the upcoming Amochhu hydropower project. Better roads and transportation where accesses to the nearest major market are easier and less time consuming. Better health facilities in the locality. Good higher level educational facilities for their children as Dedi says she is blinded not knowing how to read and write and hopes better future for her grandchildren.

The people also aspire to enjoy better business possibilities like restaurant, grocery shops, vegetable vending of their own produce in a good price, with the upcoming of new project where population in the area will rise and their needs too. The greatest hope they have is of good employment facility as promised by the project for a better living and a permanent source of income.

From the extended discussion above give a view of hydropower over the world mainly have evolved issues of conflict and contestations between nations for sharing of transboundary rivers like the Sava, Bosna, Morača, Vjosa and Devoll in South-Eastern Europe. Naryn, Tejen and Vakhsh the Syr Darya river in Central Asia. While it has also led to cooperation among nations like the major hydropower projects like Itaipu built over La Plata River basin even after long lasted initial military conflict. Hydropower development has also brought issues related to effect on the environment and ecology where fish population in western Himalayas of India and Colombo has seen a major decline. Additionally hydropower led hazards like landslide, flood has not only hampered agriculture but deprived indigenous residents around the hydropower development sites marginalizing them.

From the political ecology lenses Bhutan's hydropower development and its concomitant ecological effect cannot be seen merely as an environmental issue. The nexus of power relation between Bhutan's Bureaucracy and big capital of India is one clear aspect of hydropower development in Bhutan which needs to be understood critically. Responses from the primary survey reveal that the negative effect of the construction of hydropower plant has major environmental, ecological, social economic impact in the constructional phase. The road excavation, tunnel digging and blasting have submerged huge tracts of land. While it's important to note that the run of the river scheme submerges less land and forest area compared to the planned reservoir scheme. 530 per hectare forested area is submerged in Punatshangchhu hydropower plant, 172 per hectare forest area in Tala hydropower Plant and while the reservoir scheme Amochhu 1500 acre. With the dust generated from the excavation work the agriculture produce have been severely affected reducing the productivity or by

submergence in Tala and Amochhu area. While same can be expected in the villages near the Amochhu hydropower plant especially Pachu Tar, Pachu Dara and Tading area as they fall very close to the power plant. The operational phase seems to have minimal impact where the disserted towns of Gedu and Arikha suffer from loss of business after the project was completed in Tala. After years of the completion of the project vegetation around the project was reported to rise with the compulsory replantation forest policy of the royal government of Bhutan.

Wildlife and marine ecology is being affected in the Punatshangchhu river especially endangered species like golden masheere and white black heron. The EIA studies conducted in Bhutan seem to be faulty with the major project of the scale above 1000 Tala, Punatshangchhu I and II no provision for fish ladder is been kept. EIA can be claimed faulty in another instance where the original dam site had to be shifted after the construction started and the sinking of the ridge in the construction site also represents weak geological study during the EIA study.

Bhutan's hydropower development is characterised of a concealed nature of displacement and rehabilitation. The land replacements have not been equal to equate the previous land while many have yet not got the Tharm of their new land. The project affected families are more than the displaced. The project has not really helped the development of economy and livelihood of the riparian communities with business and employment opportunities being temporary while barring them from their everyday means livelihood options like agriculture which is being degraded by the plant generated dust and blasting tremor caused disruption to the irrigation and land productivity further marginalizing the indigenous community. The voice of the marginalized group of people goes unheard in Bhutan because till date the scale of displacement and effected citizens are not in major number as the country is sparsely populated. Though with the coming up of the eight more major hydropower project the toll of displacement and effected people are going to see a rise which would voice against the ills of the hydropower project.

The project has been beneficial to the communities around the project with infrastructure facilities like road, coming up of schools and hospital units in the project areas. The project provides 100units electricity free to the affected people and employment to one member from the affected family. While in the case of the upcoming Amochhu hydropower project, the residents except having free 100 unit electricity will not have any major benefit as that

almost all households in the area are already grid-connected, and the fact that even after being electrified, households still burned fuel wood for cooking and heating, with minimal use of electricity only for cooking. Further the inhabitants near the Amochhu not having got any economic benefit from the free flowing river the using the river for power generation can disrupted local water use by drying up of the streams that they presently use for drinking and irrigation as happened in the other hydropower sites.

Chapter - IV

Conclusion

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Conclusion

The geopolitically strained and historically isolated nation of Bhutan stepping into the modernized and liberalized era of global change after 1960's saw a wholesome transformation in its polity, economy and societal structure. The transformation of the country from an isolated theocratic government to a liberalized modernized nation state becomes abiding interest of a political ecologist. State led power laden environmental management and development of resources was crucial against the least developed economy and adverse social conditions to start with as understood in various discussion in different context, the struggle for control over management of resources became an important site. Such struggle over the control of natural resources like water facilitated towards the introduction and expansion of market in Bhutan. State power guided and influenced the way common property resources to be managed. The peculiarity of Bhutan's political, economic and social condition facilitated in the emergence of resource management as a contested field with multiple vested interests of various actors and agencies. It is interesting to note here that Bhutan's economic background of being an agrarian economy characterized by longstanding monarchic rule proud to promote very fertile ground for the emergence of hydropower and its concomitant market led economy with the assistance from India.

The emergence of Bhutan's hydropower is an offshoot of the development process sponsored by India. The economy becomes centralized to hydropower as the driver of the economy without any diversification. In this process India became the nodal financial agency and the only major trade partner. Bhutan's economic development and the utilization of the resource became a subject largely between the power nexus at different strata between Indian big capital and bureaucrats and technocrats of Bhutan. Geopolitically speaking Bhutan's hydropower development can be seen through the lens of India's rise as a hegemon in the region surrounded by smaller powers. India's Big Capital has been the driving force to generate surplus energy by exploiting natural resource of the country, with a promise to modernize the Bhutanese economy on the lines of capitalist development.

The development of hydropower in Bhutan is projected as an example of ideal collaboration between India and Bhutan. Popularly articulated as "win-win" equation in international forum, the term captures the happy-go-situation where it benefits a section of society where

as Bhutan still staggers with critical issues like development of human capacity building, generating employment, agriculture sector development etc. While Bhutan is much celebrated for conceptualizing an alternative perspective of human development under the banner of Gross National Happiness, the development of hydropower seems to point towards “well-being” to be connected with a materialist orientation. These contradictory approaches towards development on the part of the Bhutan are deeply embedded in the political ecology of hydropower. The process of Hydropower development between India and Bhutan to critically analyse is beneficial for big capital enterprise of India and Bhutan’s some section of the society as hydropower development investments has mainly led to infrastructure development with minimal human resource development.

The power relation between Bhutan’s bureaucracy and India’s Big Capital enterprise needs to be understood critically. The fantasies and romantic conceptual landscapes of Bhutan has given currency to the representation of hydropower as “green –energy” and “environment friendly” such romanticization of Bhutan as pristine Eden obfuscates the actual ecological processes at the ground. In contrast to the romantic representation of hydropower, response from the primary survey while talking to the local bureaucrats reveals that the ecological issues are represented in a manner to show that there has not been any significant impact. However the narratives of the respondents from the villages points otherwise. Observations made during the survey revealed wider impacts on the local ecology. While in the absence of primary data to capture the ecological impacts remain a theory issue. Observations made during the survey and collective reflection of the respondents from the village visited reveal that the ecological impact are more pronounced during the initial constructional phase of hydropower development itself then the operational phase. The excavation works to build access roads and dig tunnels have caused tremors which has not only formed cracks over land and houses of the nearby villages but also affected the source of water for drinking and irrigation. The stream though the main river is not been used for any economic nor personal purposes. In the case of agriculture, the impacts are visible hampering agricultural practices. Dusts generated during the construction of hydropower infrastructure has significantly reduced yield in crops. The effect on the river ecology especially on the number of endangered species like golden masher, snow trout and other wild life ecology like the white billed heron is a major issue of concern.

Environmental degradation is often associated with the marginalization of poor subsistence communities. The sustainability of nearby villages and their livelihood is affected by the

hydropower development which has disturbed the community's environment. Coupled with the environmental problems the issues of resettlement, rehabilitation which is of a concealed nature is coming out to be a major. Local residents associate the ecological degradation due to development of hydropower as loss of ancestral resources. As observed during the fieldwork the disgruntlement of right of community over resources which they have been associated with for centuries together are quite intense. Though the numbers of displaced and rehabilitated people have been not very significant in Bhutan, the major concern as of today remains with the compensation modalities. The compensation amount and scheme have not been satisfactory to equate the actual loss according to the displaced and rehabilitated people.

In contrast the perception of the bureaucrats and technocrats of Bhutan, the ecological crisis does not surmount to a serious level. While the superiority of the technology of hydropower development is highlighted. It is a widely cited fact that most of the hydropower development in Bhutan is run of the river scheme which is expected to have minimal impacts on the immediate ecology and nor does it submerge large tracts of land and forest. The best example is sighted of the major 1020Mw run of the river scheme Tala hydropower project which submerged only 172 hectare of forest land and the increase in forest cover after years of its completion due to afforestation policy carried out during the project construction. The hydropower led effects to the fish population especially in the Punatshangchhu river where golden masher snow trout are nested, is to be mitigated by introducing artificial fish hatchery and releasing the fishes in the river.

Similarly artificial incubation of while billed heron is reported to be hatched with the help of Royal society for protection of Nature and to be released to the wild. Such ideas about resource conservation are deeply influenced by the ideology of the policy makers. Policy makers have formulated 15 different acts and policies concerning forest and wildlife conservation, fish conservation, for hydropower development and management in the context of crucial issues such as rehabilitation and conservation.

Apart from the contested nature of conservation ideas, another important area related to hydropower development and management is of monitoring and evaluation. Feasibility studies and impact assessment studies point out the "managerial approach " which tries to provide legitimate ground for hydropower development on the basis of popular managerial perspective of best practices and technical procedures of assessing the fact whether hydropower plants can be initiated or not. Additionally, the feasibility studies conducted like

EIA or DPR preparation by WAPCOS with experts from Austria, Japan is convinced to be a major effort to minimize various social, economic and environmental repercussions of the hydropower project development which is furthermore supplemented by SEIA conducted by the country's highest authority the national environmental commission who is the nodal agency concerning environmental issues. The above discussed issues largely focus and emphasize the fact that the ecological crisis cannot be seen in an apolitical manner. Power and ecological crises are invariably interrelated in the context of Bhutan. All the developmental activities are State directed in Bhutan and under the increasing competitive global trade regimes and liberalized markets, the profit making and increasingly capitalist driven model of hydropower development leads to amplified extraction from ecological resources then raising the vulnerability of ecological crisis related to hydropower development.

As realised during the course of conversation with various higher authorities in Bhutan, the benefits from hydropower development are revealed to be enormous. Hydropower development in Bhutan has raised the annual revenue. The hydropower generation contributes about 40 percent of the national budget simultaneously boosting other industries like construction, transport and service sector, generating employment and training manpower. The concomitant linkage of hydropower development offer wider scope for capital accumulation. The hydropower generation today has grid electrified the whole country and the revenue return from hydropower export has the propensity to make the country economically self-reliant.

According to the advocates of hydropower development, the environmental displaced population created due to displacement for the hydropower development are very minimal and are well compensated with various options for compensation like land/property to cash compensation, land to land compensation. Around 100 units of electricity free per effected family and permanent employment of one person from the family of the displaced. The effected households can still benefit from prospects of business and access to better infrastructure and socio economic amenities generated due to the upcoming of the hydropower plant in an area.

While the understandings of hydropower development in Bhutan by the people are context specific. The benefits from hydropower are viewed in terms of infrastructure facilities like access roads, health units and education institutions. Similar to the Tala hydropower

projected related infrastructure like the 35km road to Arikha and Sinchikha, better housing, health unit which caters to all the local people, school and the Gedu College, the residents in the valley of Amochhu hope for similar development in their area. Hydropower development in the context of employment is seen to be beneficial but is of temporary nature. Business prospects are great for the people who can install business units near the hydropower development area. The hydropower is believed to bring better socio-economic conditions in the areas where grid electricity has reached in terms of cooking and lighting purposes and better sanitation. But conversely these benefits do not reach displaced people who are shifted to a different location where these facilities cannot be availed.

Looking through the lens of political ecology, the study is appalled by the fact that hydropower development in Bhutan is totally uncontested. The depoliticization of this can be gauged from the larger salience maintained about the issue and the controversies surrounded in public space. Hydropower development led ramifications in Bhutan which have led to ruinous conditions in some parts of the country, still the hydropower development remains depoliticized in nature. The depoliticized state of the hydropower development in Bhutan owes to the long political and economic history of the country's development process. In the State which has dominated especially about deeming strategies of development process. The emergence of private sector in the Bhutanese development process is an offshoot of the domination of the Bhutanese state. Moreover the role of the state is enhanced with all foreign aids on which Bhutan has great reliance to finance all developmental Plans and programs, is channelled through the government. Thus opposition to the state decisions can be predictably impossible at present.

Another notable feature of hydropower development and its impact on environment and people is its concealed nature of displacement and resettlement. Bhutan with about 700000 populations, the rate of displacement and resettlement and effect of hydropower in population has not been enormous owing to which opposition to the political rule by small number of effected population is least probable. Coinciding with the sparse settlement in Bhutan the favourable mountainous topography and the careful choice of the run of the river scheme project in rivers which have very minimal or no economic and social attributes to the local residents has been the strong point of the Bhutanese hydropower development planners.

With the unprecedented rapidity of the step towards building large scale reservoir and run of the river scheme hydropower projects development planned in the next seven years to

produce 10000Mw energy to be supplied to India, Bhutan could face emblematic case of environmental change and degradation. The state authorities and actors who are in to control of the country's resources, to fulfil the ambitious target of 10000 Mw energy may extract too much from the environment and marginalize numerous indigenous communities.

The political ecology argument of environmental subjects and identities assert that, *institutionalized and power laden environmental regimes have led to emergence of new kinds of people, with their own emerging self-definitions, understandings of the world, and ecological ideologies and behaviours. More firmly: people's benefits and attitudes do not lead to new environmental actions, behaviours, or rules systems: instead new environmental actions, behaviours, or rules systems lead to new kinds of people. Correlatively new environmental regimes and conditions have created opportunities or imperatives for local groups to secure and represent themselves politically* (Robins 2012).

In the light of this emerging political ecology perspective, Bhutan's hydropower development to critically read has the potential to substantially drive the affected population to margins. As evident from the study the crisis may not have assumed catastrophic scale leading to injustice and conflict, talking about the other side of the coin, the study highlights how certain political economic factors facilitated in the development of hydropower and its representation in official discourse. In this context it is understood that nature's capital is expropriated driven by class intersects where capitalist firms engaged in hydropower development have squeezed surplus from Bhutan's rich ecological landscape. This has serious environmental implications some of which is captured during the course of field study. Such ongoing pillage of environment is expected ultimately result in a political response from. The local community because of deeper monarchical roots in Bhutan's contemporary governance, Till now it has not witnessed any environmental movement unlike India where wide spread resistance against the government exist. However, with deepening of democratic practices in the country such movements in Bhutan may not be a distant dream as it is undergoing immense economic and social transformation. As understood the hydropower development process has the potential to sharpen the existing social, economic and spatial disparities. Such rise in disparities will definitely have a hearing in the struggle over resources. Once resource utility and management became contested it is highly probable that it will lead to conflictual situation. Once the social economic disparities become more prominent and it's further sharpened by the development process led by hydropower generation, the possibility of a conflictual situation is unmistakably high unleashing long standing struggle over resources.

The study concludes that from a political ecology perspective the triple factors “Dependency, Accumulation and Degradation” are found to be instrumental towards understanding the ecological crisis unleashed by the development of hydropower in Bhutan. Bhutan’s economic and political dependence on India. The concomitant accumulation out of hydropower by the bureaucratic, technocratic and business elites in the both sides has led to degradation and erosion of ecological sustenance of Bhutan threatening to open a new regime of environmental crisis. The contemporary ideas of accelerated hydropower development in Bhutan not only have the possibility to drive the traditional indigenous communities to the margins but also could produce unsustainable results leading to injustice and conflict across regions. Such regional changes may unite communities who have got new collective identities that have traditionally been divided and give rise to social movements pertaining to environmental issues.

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Appendix I

Environment clearance rules followed for Hydropower Project Construction

1. National environment protection Act Royal. Govt. of Bhutan 2007
2. Environment clearance guidelines for Hydropower National Environment Commission 2004
3. Environment clearance guidelines for Transmission and Distribution time National Environment Commission 2004
4. Environment clearance guidelines for Highway and Road National Environment Commission 2004
5. Environment clearance guidelines for Hydropower National Environment Commission 2004
6. Environment clearance guidelines for Forebay National Environment Commission 2004
7. Environmental discharge standards National Environment Commission 2004
8. Regulation on strategic environmental assessment National Environment Commission 2002
9. Environmental Assessment Act Royal Govt. of Bhutan 2000
10. Regulation for environment clearance of projects National Environment Commission 2002
11. Environment Assessment Process Manual 1999
12. Biodiversity action plan for Bhutan, Ministry of Agriculture 1998
13. Forest and Nature conservation Act Royal Govt. of Bhutan 1995
14. Mines and minerals management act and its regulation Royal Govt. of Bhutan 1995
15. Bhutan fishing rules Royal Government of Bhutan 1992
16. Land Act Volume K ARoyal Government of Bhutan 1991.

Appendix II

SEMI STRUCTURE QUESTIONER

Government Officials

1. Name:
2. Designation:
3. What is the history of hydropower development in Bhutan?
4. What is the importance of hydropower development in Bhutan?
5. What is the importance of Hydropower development in Bhutan?
6. What is the nature and characteristics of the MoU signed between the government of Bhutan and the various financing countries?
7. What are the future plans and policies of Hydropower development in Bhutan?
8. What do you feel are the other alternatives sources of energy production in Bhutan?
9. Do you feel that the issue of sustainable development with regards to hydropower projects has been adequately dealt with?
10. Are Hydropower Projects a part of the larger scheme and goal of achieving Gross National Happiness that Bhutan Carters to?

Effected People

1. Name:
2. Age:
3. Occupation:
4. Name of the Village:
5. Type of land you had:
6. What are the kinds of compensation received?
7. Are you satisfied with the compensation?

8. What are the changes you have seen in the locality after the development of hydropower project?...
9. Did you use the river for any purpose before the hydropower construction?
10. How has the forest cover changed after the hydropower production?
11. What are the benefits you get from the development of hydropower project being built in the area?

WAPCOS Officials

1. Name:
2. Occupation
3. when did WAPCOS start?
4. What are the mission of WAPCOS?
5. Which are the countries it operates in?
6. How do the operate their work in Bhutan?
7. What are the MoU of understanding with the government of Bhutan?
8. How are the DPR being prepared?
9. How many more projects are in pipeline in Bhutan.

Engineers

1. Name:
2. What type of geology is required for hydropower construction?
3. How is the hydropower project constructed?
4. What are the main problems face while the construction?
5. How resistant are the hydropower projects o earthquake?
6. What are the hazard preparedness schemes available?