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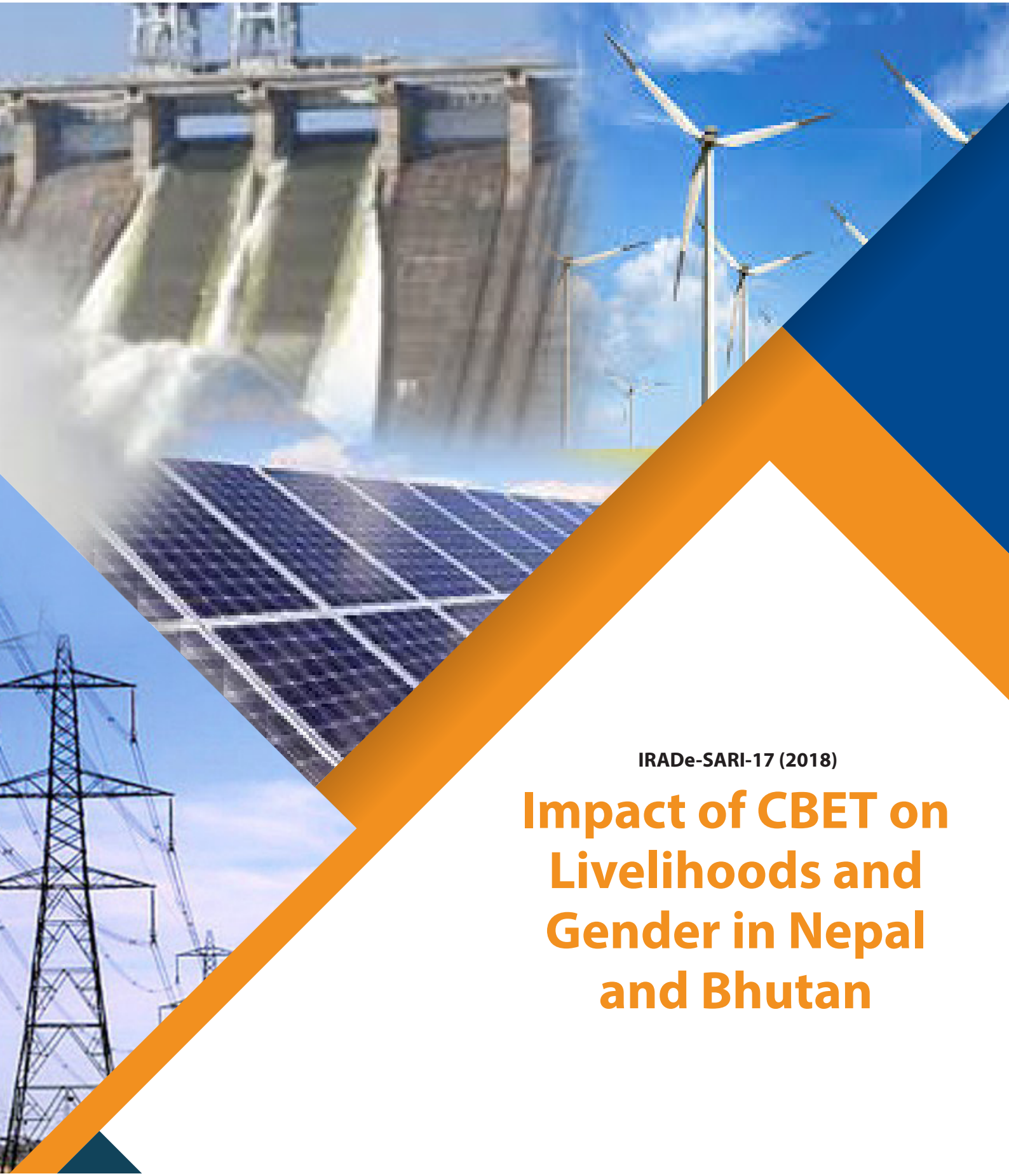

IRADe-SARI-17 (2018)

Impact of CBET on Livelihoods and Gender in Nepal and Bhutan

Prepared by
SARI/EI Secretariat

List of Contributions

Study and Research Team:
CUTS International
Mr. Udai S Mehta
Mr. Arpit Tiwari

Research Guidance &Technical Support
IRADe
Mr. Rohit Magotra
Ms. Asha Kaushik

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FOREWORD

The U.S. Agency for International Development (USAID) has been working since 2000 to enhance regional energy cooperation in South Asia through its South Asia Regional Initiative for Energy (SARI/E) program. The program covers eight countries: Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka and the Maldives. The first three phases of the program focused on awareness raising, building trust and assessing potential transmission interconnections. The fourth phase of the program, called South Asia Regional Initiative for Energy Integration (SARI/EI), which was launched in 2012, focuses on promoting regional energy integration through cross-border power trade.

Under the program, a Think Tank Forum (TTF) has been established comprised of leading civil society organizations from the participating South Asian countries. The role of the TTF is to initiate a discourse on the importance of cross-border electricity trade (CBET) in meeting the energy demands of each country. Local think tanks can be an important channel for positioning CBET in the national priorities of the respective South Asian country, and play a key role in engaging politicians, government institutions, media and civil society in shaping the country's priorities. The TTF has undertaken several studies, and organized events and campaigns to create consensus around the need for regional energy integration.

One such study, "Impact of Cross-Border Electricity Trade (CBET) on livelihoods and Gender in Nepal & Bhutan" examines the livelihood impact of the hydropower projects developed under energy cooperation between Nepal-India and Bhutan-India. It assesses the impacts at the household level in the area around the hydro projects, particularly the impacts on women. The hydropower projects that were assessed included Rahughat Hydropower Plant in Nepal and Tala Hydropower Plant in Bhutan. The study revealed that access to electricity has significantly improved the quality of lives of rural households including for students and women. Other services including health, transportation and communications also improved significantly.

I would like to take this opportunity to thank Integrated Research and Action for Development (IRADe) and Consumer Unity & Trust Society (CUTS) International for successfully carrying out the study. I am confident that this assessment will be useful to inform decision-making and create consensus around power trade among civil society in the region.

Thank you

Julia Kennedy
Director (A)
Clean Energy & Environemnt Office
USAID/India

Preface

The economic performance of the countries in the South Asia region has been impressive in the last decade or so. India has led the way with a 7–8 percent growth in the gross domestic product (GDP), followed by Bhutan with 6-7 percent and Pakistan, Bangladesh, and Sri Lanka each with approximately 6 percent. However, Nepal has experienced relatively slow growth.

Regional cooperation and integration is the key to ensure sustained development of the region. Often, it is regarded as a potent instrument of faster collective growth and shared prosperity. The potential benefits of engaging in trade cooperation are significant for South Asian countries.

Cross-Border Electricity Trade (CBET) in the region has brought in a sense of shared benefits and prosperity amongst the neighbouring nations. At present, CBET in the region is bilateral G2G in nature. Though, it is limited to between India-Nepal; India-Bangladesh and India-Bhutan on a case to case basis. It is envisaged by the experts that the region may experience a manifold increase in the quantum CBET in the years to come. This would result in the growth of infrastructure.

Several studies on the impact of energy cooperation and trade in other regions of the world suggest that CBET is likely to boost socio-economic development in the region. The development of infrastructure projects like power projects often creates employment opportunities for the local community.

Studies also suggest that access to electricity brings a positive change in the social status of women in the community. Increased access to electricity has opened doors for various economic and non- economic activities for women. With the reduced burden of the household chores, not only there is an increase in household income but also the improvement in the literacy rate among the women. Thus, it is reasonable to assume CBET gives an impetus to the local economy.

In the case of South Asia, there have been studies highlighting the overall socio-economic benefits to the local communities due to regional energy cooperation. However, little emphasis has been laid over the impact of CBET on livelihoods and gender roles.

Thus, to advocate the benefits of energy cooperation in the region, the United States Agency for International Development (USAID) formulated the South Asia Regional Initiative for Energy Integration (SARI/EI). This initiative is implemented by IRADe.

Under this initiative, CUTS International, one of the leading think tanks in SARI/EI think tank forum and the region, has undertaken the study to assess the impact of CBET on gender and livelihoods in the South Asian region. The objective of the study to assess the socio-economic benefits or costs accrued to the local community in general and impact on local livelihood and the role of gender in the community in particular.

The study comprises an in-depth analysis of available literature and impact assessment studies of other regions in the world and an intensive field survey in and around the project site, with support of the local partners. The key findings of the study suggest that in addition to creation of jobs due to increased energy access, various other job opportunities arise for both women and men in the project development and construction activities. Access to electricity amplifies the rural economic activities, such as growth in the hospitality business. Good road conditions, easy transport facilities and the availability of the health centers in close proximity have encouraged more patients to visit the health centers. The benefit comes in forms of employment opportunities for the locals and investment by the projects on education, health facilities, among others, in and around the project sites.

However, as the countries move towards sustainable development, the energy needs of their people will likely to increase exponentially. Ensuring energy security in the region thus become extremely important. CBET, not just bilateral level but also at a regional level, may help in achieving energy security. Even more so when countries such as Bhutan and Nepal in the region do not have sufficient resources to meet their energy needs. They had to rely on imports from other countries which take a toll on the economic growth of such countries.

The study has recommended that to facilitate CBET in the region, governments should promote bilateral/ regional agreements & treaties which promote equitable benefits. Moreover, such treaties must safeguard political interest not just at the national or regional level but also at the local level. Such policies backed by political interest will foster private investment which is essential for trade and development.

I hope this report on "**Impact of Cross-Border Electricity Trade (CBET) on livelihoods and Gender in Nepal & Bhutan**" will be useful for South Asian countries to foster CBET in the region.

Pradeep S Mehta
Secretary General
CUTS International

Acknowledgement

Efforts of several people have gone into making this report a reality. Involvement in various forms, such as direct inputs, thought-provoking discussions, timely reviews, incessant encouragement and guidance, has been crucial in the development of this report.

We gratefully acknowledge the key researchers of this report – Udai S Mehta, Deputy Executive Director, CUTS International and Arpit Tiwari, Assistant Policy Analyst, CUTS International

We are immensely grateful to Dikshya Singh and Rebecca Pradhan for undertaking field survey in the vicinity of Rahughat hydroelectric project, Nepal, and Tala hydroelectric project, Bhutan, respectively.

A special thanks to Kanika Balani, Senior Research Associate, CUTS International for her invaluable support in research and survey. We also appreciate the efforts of Garima Shrivastava for editing, Rajkumar Trivedi and Mukesh Tyagi for preparing the layout of this report. Vijay Singh, Akshay Sharma, and Nimra Khan deserve special mention for their contribution to the outreach of the report.

We sincerely thank Michael Satin, Regional Energy Director, Clean Energy & Environment Office, USAID, Monali Zeya Hazra, Regional Energy Manager, Clean Energy Specialist, Clean Energy & Environment Office, USAID, Jyoti Parikh, Executive Director, IRADe and the entire team of IRADe for supporting this research study.

Last but not the least, this report would not have seen the light of day without the skillful direction and guidance of Bipul Chatterjee, Executive Director, CUTS International.

Words alone cannot convey our sincere gratitude to each individual who has contributed in every small way toward this report. We express our sincere gratitude to all such individuals, whether or not named above, who have contributed toward the publication of this report.

Pradeep S Mehta

Secretary General

CUTS International

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Abbreviations

ADB	Asian Development Bank
BBIN	Bangladesh-Bhutan-India-Nepal
CBET	Cross Border Electricity Trade
CBS	Central Bureau of Statistics
DPR	Detailed Project Report
EIA	Environment Impact Assessment
EXIM	Export-Import
FGD	Focused Group Discussion
GDP	Gross Domestic Product
GHG	Green House Gas
GMS	Greater Mekong Sub-region
GoI	Government of India
GWH	Gigawatt Hour
HEP	Hydroelectricity Project
IEE	Initial Environmental Examination
INDC	Intended Nationally Determined Contributions
INPS	Integrated Nepal Power System
IRADe	Integrated Research and Action for Development
KII	Key Informant Interview
KV	Kilo-volt
KWH	Kilowatt Hour
LPG	Liquefied Petroleum Gas
LULUCF	Land Use, Land Use Change and Forestry
MHSP	Medium Hydropower Study Project
MoU	Memorandum of Understanding
MW	Megawatt
NEA	Nepal Electricity Authority
NPR	Nepalese Rupee
NRREP	National Rural Renewable Energy Programme
REDD	Reducing Emissions from Deforestation and Forest Degradation
SAARC	South Asian Association for Regional Cooperation
SAPP	Southern African Power Pool
SARI/EI	South Asia Regional Initiative for Energy Integration
SDG	Sustainable Development Goal
SUV	Sport Utility Vehicle
THPA	Tala Hydroelectric Project Authority
UNCITRAL	United Nations Commission on International Trade Law
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VDC	Village Development Council
WAPCOS	Water and Power Consultancy Services

Executive Summary

Cross Border Electricity Trade (CBET) in South Asia has brought in a sense of shared benefits and prosperity among the countries in the region. With growing interest among investors to tap the extensive resource potential for electricity generation in the Bangladesh-Bhutan-India-Nepal (BBIN) region, several large and small projects have been built or are in the process of being developed.

Research suggests that in addition to creation of jobs due to increased energy access, various other job opportunities arise in project development and construction for both women and men. Further, large infrastructure projects bring benefits to the local community, provided there are mitigation measures to manage the adverse impact on the environment. The direct benefit comes as employment opportunities for the local community and investment by the projects on education, health facilities, among others, in and around the project sites.

The socio-economic impact study of two hydropower projects, Rahughat hydropower plant in Nepal and Tala hydropower plant in Bhutan, has revealed that access to electricity has improved the quality of life of students, homemakers (women) and rural households mainly. Further, the quality of services of basic health units and other services such transport and communications also improved tremendously.

Access to electricity in rural areas results in intensification of economic activities. Consequently, productivity of individuals got amplified resulting in increase in income. For instance, in Chukha district, Bhutan, use of electric cookers and water boilers proved to be extremely beneficial for women. Since such appliances reduce cooking time, the time thus saved is being utilized in other economic and non-economic activities. Use of these electrical kitchen appliances also significantly reduced the exposure to smoke from fuelwood and led to better health status of women in particular. The quality of social life also improved with electricity because evenings were now lit up and enabled interaction.

CBET projects also generate employment. It has been observed that the men get involved in project construction work and consequently there is an increase in the participation of women in agriculture. Nevertheless, for equitable distribution of benefits, it is recommended that power projects too organize skill-based training for women as other projects in the region have done in the past.

In order to divert maximum benefits to the local community, there is a need to strengthen the contract design. For instance, disruptions in the construction of the Rahughat project (Nepal) may come in the way of the benefits promised to the local areas. The project developers of Rahughat HEP had assured the local community of better education, improved healthcare services, and potable drinking water, among others. Therefore, it is recommended that such contracts should include risk mitigating measures to avoid such disruptions.

Furthermore, positive impact of energy trade is not limited to swelling government coffers but also stimulating the local economy. Such projects contributed immensely in the development of remote places by increasing rural livelihood options.

Therefore, it is recommended that not just bilateral trade, but regional trade should also be promoted. Bhutan has so far used just 5 percent of its total hydropower potential. This potential can be harnessed to promote energy security in the entire region. There is immense potential for energy connectivity and trade in the South Asian region to ensure consumer and producer welfare.

At the same time there is a dire need of bilateral and regional treaties which promote equitable benefits. The treaties should highlight the contours of the contract which are beneficial to the parties involved. Further, in order to facilitate greater regional cooperation, it is imperative that both the parties in a treaty should get equitable benefits.

The Rahughat project is a case in point. It holds a lesson for policy-makers and project developers. It has raised concerns on the post-contractual opportunistic actions of project developers. There have been instances in the past where the rules of the game were changed post-bidding. As a result, project developers knowingly entered into unviable contracts with the hope that such contracts will be renegotiated in the future. Thus, it could be a cautionary tale for policy-makers to strengthen the design of contracts by inducing risk mitigating measures.

While CBET offers huge benefit as discussed above, there are various technical, political, and regulatory challenges that need to be addressed effectively and in a timely manner. In order to overcome technological challenges, it is essential that the power generation system within countries in the region be flexible enough to help them effectively use various complementarities emanating from seasonal variations, consumption pattern and time differences.

Further, to create political consensus it is essential to understand the costs and benefits of CBET at a granular level. There is also an urgent need to communicate the benefits of CBET among various categories of stakeholders to generate greater stakeholder buy-in.

Few Key Findings

- Good road conditions, better transport facilities (due to the establishment of the power projects) and the availability of the health centers in close proximity have encouraged more patients to seek medical assistance.
- There is improvement in the quality of education when students have access to electricity 24x7as it provides them with longer time for studies and other co-curricular activities.
- Access to electricity benefited women significantly by reducing the burden of household chores including cooking time. The use of electric rice cookers, curry cookers and other such kitchen appliances also minimizes exposure to smoke from traditional ovens and improves women's health.
- Setting up of power projects amplifies economic activities in rural areas leading to growth in hospitality and warehousing businesses – various contractors need godowns to store equipment and the influx of new people come to work for the power project need places to stay. Tea and snack shops, small eateries provide new business opportunities to community members.

This study is a pioneering attempt to assess the socio-economic benefits, so as to create an evidence-based narrative to advocate for strengthening cross-border energy trade within the South Asian region. The specific objective of this study is to examine the impact of a sustainable energy source, i.e. hydropower projects, established because of energy cooperation between Nepal-India and Bhutan-India, on the local livelihoods options and gender concerns of the communities situated around the power plants. The study facilitated in understanding the benefits of such projects to the local community resulting from better economic prospects and better access to health and education facilities.

1 Introduction

Background

South Asia is the fastest growing region in the world, with economic growth expected to increase from 7.1 percent in 2016 to 7.3 percent in 2017.[1] For the region to, however, sustain its economic growth the consequent increase in demand for electricity needs to be met.[2] Even now, South Asian countries are beset by electricity shortages and poor service quality.

In order to meet the rising energy demands, the governments of respective countries in the region had to increase their oil imports – all countries without exception rely on these supplies to meet more than a quarter of their commercial energy needs. With the exception of Bhutan, all countries in the region are net energy importers.

It is to be understood that while reliable energy supply and increasing access to energy (Sustainable Development Goal #7) are crucial for the overall socio-economic development of nations, the growing urgency in combating the global threat of climate change (SDG #13) also needs to be taken into account. This also gets reflected in the nationally determined contributions of countries toward mitigating the impact of climate change. For example, Bhutan aims to remain carbon neutral, building upon a commitment already made in 2010 (Royal Government of Bhutan, 2010). This means that Bhutan aims to maintain greenhouse gas (GHG) emissions below the country's total carbon sink from land use, land use change and forestry (LULUCF).

Nepal too has set itself ambitious targets by pledging[3] the following:

- achieve an 80% share of electricity from renewable sources in the energy mix by 2050
- reduce dependency on fossil fuels by 50%
- expand its energy mix focusing on renewables by 20% by 2020
- increase the share of electric vehicles to 20% by 2020
- decrease its dependency on fossils in transport sector to 50% by 2050
- maintain 40% of the total area of the country under forest cover
- reduce about 14 million tonnes of CO2e by 2020 with a sub-national project on REDD+
- deploy renewable systems under the National Rural Renewable Energy Program (NRREP)

South Asia, it is true, is well endowed with energy resources, but these are unevenly distributed. The countries also have seasonal complementarities in energy demand. Resources in the region therefore need to be optimized to address concerns related to energy security and sustainable growth. South Asian countries have come to realize that joining hands to leverage each other's resources is the only way forward. The declarations at various summits of South Asian Association for Regional Cooperation (SAARC), including the signing of the inter-governmental framework for energy cooperation,[4] point toward the political will and vision at highest levels to expedite cross-border energy trade.

Electricity trade between SAARC countries has certainly brought in a sense of shared benefits and prosperity among neighbors. With investors showing interest to tap the extensive resource potential for electricity generation in the

1 World Bank Report, http;//www.worldbank.org/en/news/press-release/2016/04/09/south-asia-fastest-growing-region-world-vigilant-fading-tailwinds, accessed on 28 February 2018
2 http://www.eldis.org/vfile/upload/1/document/0708/DOC21064.pdf
3 http://climateactiontracker.org/countries/nepal.html
4 http://www.moen.gov.np/pdf_files/SAARC-Framework-Agreement.pdf

closely knitted Bangladesh-Bhutan-India-Nepal (BBIN) region, several large and small projects have already been built while others are in the process of being built.

Studies carried out to assess the impact of energy cooperation in other regions suggest that in addition to creating new jobs[5] the increased energy access also opens up various other job opportunities for both women and men during the project development and construction phase. Studies also show that electrification also helps bridge the gender gap in communities. Literature suggests that dependable power supply to households reduces the burden of domestic chores for women leaving them with more time; this leads to an increase in their incomes[6]. Access to electricity also brings with it a wider variety of income generating activities. It also contributes to the education of girls and leads to greater safety for women in public places. Overall, electrification provides a major impetus to the local economy.

Relevance of the study

While there are only a few studies that showcase how local communities benefit socio-economically from regional energy cooperation in South Asia, there is very little emphasis on the impact of CBET on livelihoods and gender.

In addition to this, it is to be noted that the progress on CBET in the region is rather slow and currently limited to bilateral small-scale cross-border transmission interconnections and cross-border trading transactions between India-Bhutan, India-Nepal, India-Bangladesh and India-Myanmar.

There is therefore a need to effectively assess the socio-economic benefits accruing from cross-border energy trade in the region and create a strong narrative in its favor. This will help trigger greater advocacy on CBET at the political level.

With a view to address these gaps, CUTS International with support from SARI/EI Integrated Research and Action for Development (IRADe) and USAID, India undertook a study on **'Impact of CBET on livelihoods and Gender in Nepal and Bhutan'.**

Significance and potential of cross-border electricity trade in South Asia

The South Asian countries are endowed with diverse energy generation sources in the form of hydropower, natural gas and coal resources.[7] Yet the per capita electricity consumption in these countries is limited to 563 kWh on an average, which is significantly lower than the world average of 3126kWh.[8] In order to meet the ever increasing demand for electricity, South Asia needs to increase its total generation capacity by almost 750 GW, more than three times the current installed capacity.[9]

There is a strong consensus among SAARC nations that energy trading between the eight member countries will help optimize the existing potential for power generation and boost region-wide prosperity.[10]

5 https://www.adb.org/sites/default/files/institutional-document/33872/files/assessment-gms-subregion-energy-sector-development.pdf
6 http://www.undp.org/content/dam/undp/library/gender/Gender%20and%20Environment/TM4_AsiaPacific_Capacity.pdf
7 Wijayatunga, Priyantha, and P N Fernando. An Overview of Energy Cooperation in South Asia working Paper No 19. ADB South Asia Working Paper Series No 19, Mandaluyong City: Asian Development Bank, 2013.
8 The World Bank. Global Economic Prospects: A fragile recovery. Flagship Report, Washington DC: The World Bank, 2017
9 Timilsina, Govinda R., Michae l Toman, Jorge Karacsonyi, and Luca de Tena Diego. The Benefits of Expanding Cross-Border Electricity Cooperation and Trade in South Asia. Policy Research Working Paper 7341, Washington DC: The World Bank, 2016.
10 SAARC Secretariat. SAARC Regional Energy Trade Study (SRETS). Kathmandu: SAARC Secretariat, 2010.

Table I: Projected electricity demand in South Asia

	Demand (GWh)		CAGR
	Year 2010	Year 2020	
Afghanistan	2,600	6,750	10%
Bangladesh	28,470	67,400	9%
Bhutan	1,749	3,430	7%
India	938,000	1,845,000	7%
Maldives	800	1300	5%
Nepal	3,200	6,910	8%
Pakistan	95,000	246,000	10%
Sri Lanka	10,718	21,040	7%
Total	1,080,537	2,197,830	7.4%
Total in mtoe	267	544	

Source: Wijayatunga, Priyantha, and P N Fernando. An Overview of Energy Cooperation in South Asia working Paper No 19. ADB South Asia Working Paper Series No 19, Mandaluyong City: Asian Development Bank, 2013

Table II: Access to electricity in South Asia

Country	Installed Capacity (MW)*	Peak Deficit (%)*	Access (%)**	Per capita consumption of electricity (kWh)***
Afghanistan	1,341	NA	89.5	49
Bangladesh	11,088	6%	62.4	259
Bhutan	1,614	9%	100	977
India	2,76,783	3%	79.2	684
Maldives	NA	NA	100	521
Nepal	765	34%	84.9	106
Pakistan	23,663	NA	97.5	449
Sri Lanka	3,334	24%	92.2	490

*Source: *SARI/EI Project Secretariat, IRADe. "Cross-Border Electricity Trade in South Asia: Challenges and Investment Opportunities." New Delhi: IRADe, 2014. 6-12pg*

*** World Bank Database. 2017b*

http://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC (accessed 6 25, 2017)

**** Shrestha, Shyam Sundar. Study for Development of a Potential Regional Hydropower Plant in South Asia. Islamabad, Pakistan: SAARC Energy Centre, 2016*

The combined capacity of feasible hydropower generation of South Asian countries is estimated to be about 294,330 MW[11] of which, only 14 percent has been utilized thus far. In addition to this, transitioning from fossil fuel energy sources to hydropower can also help the countries in reducing greenhouse gases (GHG) emissions and achieving the Intended Nationally Determined Contributions (INDC) targets toward mitigating the impact of climate change.

Given the electricity shortages and the potential for hydropower generation in South Asia, trans-boundary exchange of hydroelectricity could help realize the objective of shared prosperity.[12] CBET facilitate the exchange via a harmonized network of power plants and transmission grid. Accepting the importance of CBET in achieving collective prosperity,

11 Supra Note 7

12 Gippner, Olivia. Energy Cooperation in South Asia: Prospects and Challenges. Discussion Paper, Kathmandu: South Asia Watch on Trade, Economics and Environment (SAWTEE), 2010

SAARC nations introduced a Framework Agreement for Energy Cooperation (Electricity) which was signed by member countries in November 2014.[13] The signatories agreed to establish a regional market for electricity market based pricing of electricity exchange, allow access to transmission network and also establish a body for coordinating regional power integration and trade.[14] The SAARC Energy Center based out of Islamabad, Pakistan has been involved in promoting intra-regional energy trade. However, as is case with the other aspects of South Asian regional cooperation, energy trade too has not gained much traction. Progress remains limited to bilateral energy trade between BBIN nations.

India has been leading the CBET agenda in the region and is currently engaged in buying power from Bhutan and selling net power to Bangladesh and Nepal. No other bilateral engagements exist between other SAARC members. The prospects are great though for scaling up electricity trade among these countries.

Bangladesh, India and Nepal suffer from acute electricity shortage leading to even 12 hours of power cut each day.[15] Nepal's peak demand deficit goes up to as much as 44 percent. In 2016 Nepal overhauled its distribution system and amplified the amount of electricity imports from India in order to address its crippling energy shortage.[16]

Bhutan has tapped less than seven per cent of its total estimated hydroelectricity potential of 24 GW. Yet hydropower generation and export have become key themes in Bhutan's economic success story. In 2015, hydropower contributed about 45 percent of the country's national revenue and constituted about 17.3 per cent of the country's GDP.[17] India supported Bhutan with the technical and financial assistance required also created a market for Bhutan's surplus hydropower during summers.[18] During the winter months, when the water bodies freeze and are incapable of generating hydropower, Bhutan meets its electricity requirement through imports from India.[19]

Such seasonal variance between potential energy generating countries such as Nepal and Bhutan and a potential energy importing country like India further creates an enabling environment for electricity trade in the region. The rivers in the two Himalayan countries are fed through precipitation as monsoon (roughly from April to September) contributes 60 to 90 percent of the total flow in the water bodies.[20] Such swell in the rivers makes possible optimum capacity utilization of the hydropower plants leading to excess power generation. This surplus energy can be exported to India which happens to face peak demand deficit during those very months.[21] Likewise, during winters when the rivers dry up, energy shortfall in Nepal and Bhutan can be mitigated by importing energy from India.

A better approach to regional cooperation would be if the countries went beyond electricity export-import and cooperated in mobilizing investments for building power projects and transmission infrastructure. The enhanced cooperation among nations can provide the advantage of economies of scale and make electricity generation cost-effective. [22]

13 SAARC Secretariat. SAARC Regional Energy Trade Study (SRETS). Kathmandu: SAARC Secretariat, 2010
14 Id
15 Singh, Anoop, Tanooj Jamsab, Rabindra Nepal, and Michael Toman. Cross-Border Electricity Cooperation in South Asia. Policy Research Working Paper 7328, Washington DC: The World Bank, 2016
16 NEA. A Year in Review: Fiscal YEar 2015/16. Annual Report, Kathmandu: Nepal Electricity Authority, 2016
17 Premkumar, Lakshmi. A Study of the India-Bhutan Energy Cooperation Agreements and the Implementation of Hydropower Projects in Bhutan. New Delhi: Vasudha Foundation, 2016.
18 Id
19 Wijayatunga, Priyantha, and P N Fernando. An Overview of Energy Cooperation in South Asia working Paper No 19. ADB South Asia Working Paper Series No 19, Mandaluyong City: Asian Development Bank, 2013.
20 Kunwar, Surendra B. "Complementarity of Wind, Solar and Hydro Resources for Combating Seasonal Power Shortage in Nepal." World Sustainability Forum 2014 – Conference Proceedings Paper. 2016
21 Central Electricity Authority of India. Load Generation Balance Report 2016-17. New Delhi: Central Electricity Authority of India, 2016.
22 Wijayatunga, Priyantha, D Chattopadhyay, and P.N. Fernando. Cross-border Power Trading in South Asia: A Techno Economic Rationale Working Paper 38. Working Paper, Mandaluyong City: Asian Develop Bank, 2015

According to a study by the Asian Development Bank, the quantifiable benefits in monetary terms arising from electricity trade in South Asia is estimated to range between US $105 million and US $1.84 billion.[23] Similarly, a study by the World Bank indicates that increased CBET could generate cost savings to the order of about US $9 billion per year on an average.[24] The study also states that CBET could reduce the total undiscounted electricity supply costs in the region by US $222 billion over the period of 2015-2040, compared to the baseline period when there was no electricity trade between countries. The gains would accrue mainly from savings in operational costs, which would be (in undiscounted terms) US $270 billion lower under regional cooperation.

The international experiences related to energy trade integration are also encouraging. The Southern African Power Pool (SAPP), established in 1995 and consisting of 12 South African Development Community member countries, led to rising investments in capacity building, and at best spurred trading activities between member states.[25] Similarly, the economic and environmental benefit of regional integration in the Greater Mekong Sub-region (GMS) is estimated as savings amounting to about 19% of total energy costs or about US $200 billion.[26] Likewise, the savings resulting from expanding the interconnection of GMS power systems alone are estimated at US $14.3 billion, mainly due to the substitution of fossil fuel generation with hydropower.[27]

Electricity trade and impact on livelihood

The United Nations points out that "without electricity women and girls have to spend hours fetching water, clinics cannot store vaccines for children, many schoolchildren cannot do homework at night, and people cannot run competitive businesses". Four million people die prematurely due to pollution caused by wood, charcoal and other traditional source of energy in households. There is a direct relationship between access to electricity and better livelihood options as the utility of electricity in terms of improving welfare, increasing productivity at work and generating income is huge.[28]

Studies done on the impact of electrification on employment generation show a correlation between job creation and electricity access.[29] A study in Sub-Saharan Africa showed that grid connection resulted in mean employment growth of two percent.[30] Likewise, a study conducted in post-apartheid South Africa also showed that rural electrification resulted in growth in job opportunities for women.[31] Electricity access helps in increasing income outputs by providing opportunities for other productive employment. In addition, use of electronic appliances for household chores frees up time for women allowing them to get involved in income generating enterprises; it also reduces school dropout among girl students.[32]

If electrical power can be used for cooking in rural areas, it could reduce the use of biomass and fuel wood. Electrification also has direct impact on education outcomes as better lighting allows students to study in the evenings. The impact of electricity may, however, vary from one cluster to another based on geographical, socio-cultural differences and differences in economic status.

23 Id
24 Supra, Note 6
25 Oseni, Musiliu O., and Michael G Pollitt. Institutional Arrangements for the Promotion of Regional Integration of Electricity Markets. Cambridge Working Paper in Economics 1428, Cambridge: Cambridge University, 2014.
26 ADB. Building a Sustainable Energy Furute: TheGreater Mekong Subregion. Mandaluyong City: Asian Development Bank, 2009.
27 ADB. Update of the GMS Regional Master Plan. Mandaluyong City: Asian Development Bank, 2010.
28 Attigah, Benjamin, and Lucius Mayer-Tasch. "The Impact of Electricity Access on Economic Development: A Literature Review." In Productive Use of Energy (PRODUSE): Measuring Impacts of Electrification on Micro-Enterprises in Sub-Saharan Africa, by L. and Mukherjee, M. and Reiche, K. (eds.) Mayer-Tasch. Eschborn: GIZ, 2013.
29 Id
30 Goedhuys, M. and Sleuwaegen, L. "High-Growth Entrepreneurial Firms in Africa: A Quantile Regression." Small Business Economics Vol. 34, 2010: 31-51.
31 Dinkelman, T. The Effects of Rural Electrification on Employment: New Evidence from South Africa. Mideo: University of Michigan, 2008.
32 UN DESA. Multi-Dimensional Issues in International Electric Power Grid Interconnections. New York: United Nations, 2006.

Electricity access also has associated auxiliary benefits. For instance, development of power projects results in extended road connections to interior habitats leading to increased market access; it helps in bringing down prices of commodities as well. Many a times, hydropower companies invest in community development by helping build local schools, healthcare and drinking water infrastructure, among others.[33]

A study conducted by UNDP in Baglung and Kavre districts of Nepal indicates that the total benefits attributable to electricity access amount to about US $150 per year for a rural household.[34] Not only does access to electricity help improve the quality of life and income opportunities but the project construction phase itself is responsible for stimulating the local economy. Besides, indirect benefits accruing from access to electricity supply, mainly owing to infrastructure development at the project sites, also increase job opportunities in the community.

Electricity trade and impact on gender

In most rural communities of South Asia, women and girls are largely responsible for gathering firewood or making dung cakes to be used as cooking fuel. This disproportionate distribution of responsibilities affects the prospects of girl children to access formal education. Many female students have to drop out of school in order to help with household chores. In these circumstances, improved access to affordable electricity, which can be used for lighting and cooking, creates significant scope for women to participate in income-generating activities.[35] Electricity improves the quality of life in general, and brings wellbeing among women and girls in particular by reducing their burden of domestic chores. It especially enables girls to attend school since now they are not needed to gather fuelwood and make dung cakes.

Health services are another area where electricity adds to the quality of life. It makes possible storage of medicines and vaccines that need to be refrigerated; and improves the quality of service in healthcare facilities. Improved healthcare services have a direct bearing on pregnant women and small children who need routine immunization. Hence, providing electricity to households for tasks which are mostly considered women's work and electrification of healthcare facilities promote gender equality, and create greater opportunities for women and girls to gain access to education, healthcare services, and employment.

Hydropower projects however can also increase women's burden of work. The direct benefits of such projects on the lives of women are limited.[36] If the development of a hydropower project creates employment opportunities for community members, it also on the other hand increases women's burden of work by destroying forests and grasslands – compelling women to walk longer distances to collect firewood and fodder.[37] Hydroelectricity projects also pollute the source of water during construction and, in many cases, this requires women to fetch clean water from a greater distance. Realizing how hydropower plants can add to the drudgery of women's lives, many project managers organize skill training workshops targeted at women.[38]

33 Shrestha, Shyam Sundar. Study for Development of a Potential Regional Hydropower Plant in South Asia. Islamabad, Pakistan: SAARC Energy Centre, 2016

34 Legros, Gwénaëlle, Kamal Rijal , and Bahareh Seyedi. Decentralized Energy Access and the Millennium Development Goals: An analysis of the development benefits of micro-hydropower in rural Nepal. Warwickshire, UK: Practical Action Publishing Ltd, 2011.

35 Ibid, Note 29

36 Supra, Note 30

37 Id

38 Id

2 Methodology

Objective:

The study aims to assess the overall socio-economic benefits energy co-operation brings to the local community. A more specific objective of this study is to examine the impact of a hydropower project, which is an example of energy co-operation between India and Nepal and India and Bhutan, on people's livelihoods and general concerns even before the project starts to generate electricity. It is hoped, this study will help find out to what extent such projects benefit the community. Do such projects help improve the local community's economic prospects and elevate living standards through better access to health and education?

To find the answer to the above questions the research work adopted the case study approach. Two case studies were chosen: one from Nepal (Rahughat hydroelectric project) and the other from Bhutan (Tala hydroelectric project). The case study approach allowed the research to investigate complex socio-economic dynamics to analyze the impact on gender equations and livelihoods.

Nepal's Rahughat Hydroelectricity Project (HEP) was selected for study because it is still under construction. It makes a good case for ex-ante study.

Tala HEP in Bhutan was selected because it was commissioned more than 10 years and was found appropriate for ex-post study. Bhutan has three other HEPs – Punatsangchu I (1200 MW), Punatsangchu II (1020 MW) and Mangdechu (720 MW), but these are scheduled to be commissioned in 2018-19.

Since investment is an important component of any infrastructure project, the role of Indian investors in a hydropower project located in Nepal and Bhutan could be seen as a major point of cooperation with India. It would have been ideal to study a hydropower project designed to export power to India with a dedicated feeder for the purpose as it makes for a stronger case on cross-border energy trade. There are two such projects in the pipeline in Nepal at present – Arun III and Upper Karnali – but both these projects are yet to begin work.

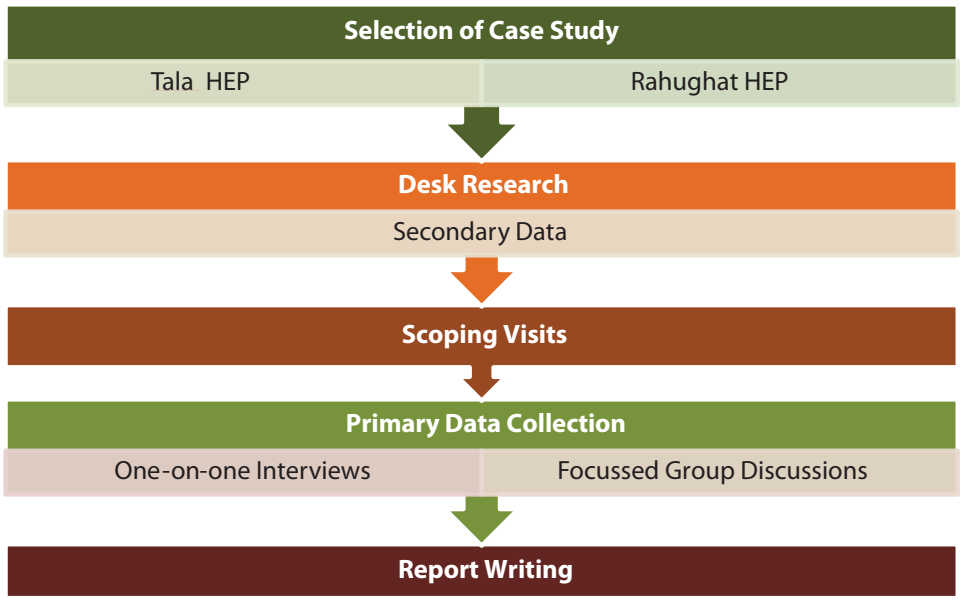

Figure I: Methodology

Field site

In Nepal, the study was undertaken in Dhaulagiri zone. The field visits were conducted in Beni, Mallaj Majhphant, Rakhu Piple and Mauwaphant villages. Field investigators also spoke with residents of Dagnam, one of the village affected by the project. It is to be noted that the inhabitants of these villages are predominantly engaged in agriculture for their livelihood. There was a stakeholder consultation involving government officials and others and this was held in Kathmandu.

In Bhutan, field visits were conducted in Dharla Gewog (sub-district) in Chhukha district; the study conducted interviews in seven villages: Lower Sorin, Middle Sorin, Rinchentse, Nimgang, Damdrangra, Shinchikha and Arikha. These villages are in the vicinity of the Tala power plant.

Method of Data Collection

Sampling Method: In case of Nepal, the respondents for household surveys were selected on the basis of convenience sampling technique due to limitations imposed by resources and geographical remoteness of the study area.

In case of Bhutan, purposive sampling technique was used for the selection of respondents for household surveys. Purposive sampling, also known as judgmental sampling, is based on the knowledge of a population and the purpose of the study. Purposive sampling is mostly useful in situations where there is a need to reach a targeted sample quickly and where sampling for proportionality is not the main concern.

Data Collection through household surveys, key informant interviews and focused group discussions: In Nepal, the key informant interviews (KIIs) entailed interviews with two managers of the Rahughat Hydro Electric Power plant, hydropower entrepreneurs, high level government officials related to energy authorities, elected officials of the local bodies, private sector representatives from the affected area and members of civil society. There were two focused group discussions as well which were conducted in different two locations covering participants from three villages impacted by the project.

Household surveys were also conducted, mostly among the women of these affected villages – Piple, Bagaicha, Mauwaphant and Dagnam.[39] A semi-structured questionnaire was prepared for the household survey covering questions related to the nature of the household, income, land-holding, nature of economic activities, consumption, fuel usage, impact on their health, say of women in decision-making, among others.

In Bhutan too data was collected using semi-structured questionnaires. Surveyors conducted key informant interviews with men and women of area, with local leaders of Dharla Gewog sub-district administration. Surveys were conducted in seven villages located in and around the Tala hydropower plant. Every 10th household was surveyed in Lower Sorin, Middle Sorin and Rinchentse villages. As Damdrangra village is located very close to Rinchentse, only one household was surveyed here. In Shinchikha and Arikha villages, every 5th household was surveyed. Based on the size of households in the villages, every 10th or 5th household was selected. A total of 31 households were surveyed; a majority of the respondents were farmers. The unit of analysis was households.

39 Note that these are names of the villages with the Village Development Committees. In some cases, the names of villages and their VDCs remain the same, while in others it may differ.

3 Nepal Case Study

Nepal and India have a long history of cooperation in energy-related projects financed by public and private investment. Rahughat Hydroelectricity Project is one such that is being financed through lines of credit (LOC) issued by the Indian government to Nepal. This chapter will explore the impact of the 40 MW hydropower project on gender and livelihood aspects on the local community living near the project site situated on the western hills of Nepal.

Rahughat Hydroelectricity Project[40]

The site of Rahughat HEP lies in the Lesser Himalayan Zone on the banks of Rahughat River, which is also known as Raghu Ganga. The snow-fed river is one of the major tributaries of the Kali Gandaki River. The project was conceived initially with an installed capacity of 27 MW, according to the environmental impact assessment (EIA) report prepared in 1998. The project's feasibility study in 2008 increased the installed capacity to 30 MW. Subsequently, a detailed project report was prepared in the 2008-09 by the Nepal Electricity Authority (NEA), which further increased the installed capacity to 32 MW. Subsequently, another study recommended the capacity be increased to 40 MW with some minor design changes. The works now pursued are being done to meet the need of 40 MW installed capacity. The project is being promoted by a subsidiary of the NEA –Rahughat Hydroelectric Project – under the financing from India's EXIM Bank.

The project area in Dhaulagiri zone is about 300 km (186.4 miles) from the capital, Kathmandu. The main access to the site is through Pokhara-Jomsom highway and the nearest airport is in Pokhara, about 100 km (62 miles) away. The impact site includes three former Village Development Councils (VDC) – Dagnam, Jhi and Rakhu Piple. These are now under Raghuganga Village Council. The other villages coming under the impact of the project are Patlekhet and Ghatan and Parbat district's Majhphant VDC, which is now under Jaljala Village Council. The project sites are located in a narrow valley, just 60 meters wide where the topographical relief varies between 850 and 1100 meters.

Table III: Salient feature of Rahughat HEP

Installed capacity	40 MW (2*20MW)
Transmission Line	LILO of 220KV transmission line from Dana substation to Kusma at PH gantry 600 m
Access road	12.5 km
Project cost	INR 5.5 billion
Total annual energy generation	247.89 GWH
Location	Myagdi district, 300 km from Kathmandu; 100 km from Pokhara Airport
Affected VDCs	Myagdi district: Dagnam, Jhi, Rakhu Piple, Patlekhet, Ghatan; Parbat district: Mallaj Majhphant
Affected settlements	Galeshwor, Mauwaphant, Dagnam, Bagaincha, Bukla, Goluk, Dharkharka, Jhi, Bhirkuna and Nepane villages
Land acquired	29.39 hectare

Source: SIEE 2016

40 Information under this heading has been obtained from EIA (1998), IEE (2010) and Supplementary IEE (2016) reports of the project and NEA's annual reports (2010-2016).

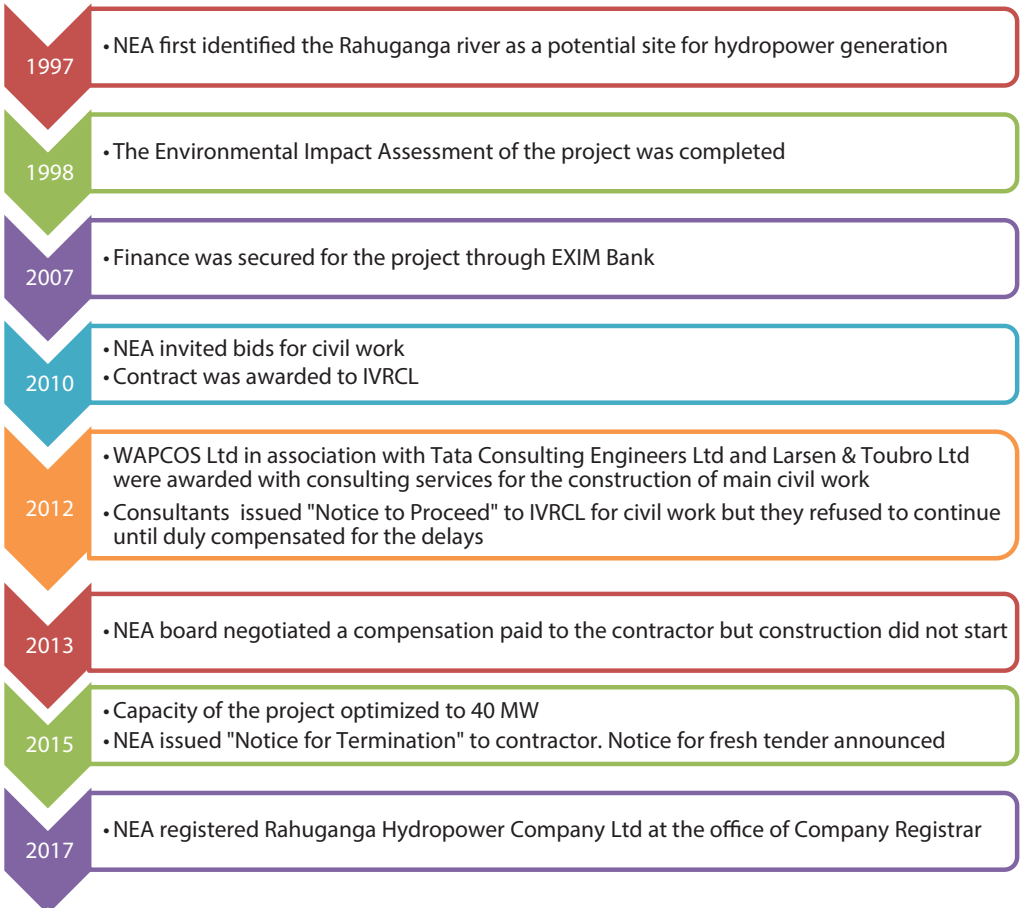

Figure II: Rahughat Hydroelectric Project timeline

NEA first identified the river as a potential site for hydropower generation in the 1990s under its Medium Hydropower Study Project (MHSP). Back then, Rahughat was one of the seven projects selected for a detailed EIA. Despite the early headwinds, the actual construction only started in 2010. The loan agreement with India's EXIM Bank to finance this project was finalized in 2007.

The project invited bids to begin construction of the main civil works in 2010. According to the loan contract between Nepal government and India's EXIM Bank, the contractor for the project could either be Indian companies or it could be a joint venture of Indian and Nepali construction companies with not less than 51 per cent share held by the Indian company.[41]

The contract was awarded to Indian construction company, IVRCL Ltd, and the contract agreement was signed in November 2010. By then, the NEA's subsidiary had already begun the acquisition of 30-hectare land needed for the camp facility, power house construction, among other requirements. The compensation distribution through the District Administration Office of Myagdi district was completed by 2012. Forest clearing, was completed in 2012 – it was one of the most contentious issues related to the infrastructure project around 1400 trees had to be felled.

In February 2012, the project awarded contract for consultancy services for the construction of Main Civil works to WAPCOS Ltd in association with Tata Consulting Engineers Ltd and Larsen & Toubro Ltd. All three are Indian consulting companies, responsible for electro-mechanical, hydro-mechanical works and erection of the transmission line under the project.

41 www.nea.org.np/pages/download.php?f=RGHEP_0001.pdf, accessed on 8 February 2018

After the selection of the consulting companies, they issued the civil works contractors 'Notice to Proceed' with the project work. In the absence of the 'Notice to Proceed', the contractor IVRCL Ltd was constructing the access road, bridge and camp facility. Between the award of the contract and the 'Notice to Proceed', two years had elapsed. When it was issued finally, the contractor refused to start the work on the ground that the delayed go-ahead had led to increased costs of construction and demanded price escalation and compensation of operational losses incurred by the company while waiting for the appointment of the consortium of consulting firms. Following negotiations, the NEA Board agreed in December 2013 to pay the contractor NPR 39.3 million as 'settlement against claim and delay'. Even then work did not start as the contractor's company was in poor financial condition.

After consultant WAPCOS Ltd issued a 'Notice to Correct' to force the contractor to carry out the obligation within the stipulated timeframe, IVRCL Ltd filed a case against NEA at a court in Nepal seeking stay orders to prevent the employer from terminating the contract and seizing the bank guarantees. Nepal's Lalitpur Appellate Court rejected the plea for stay orders. Finally, NEA issued 'Notice for Termination' to the contractor in June, 2015. As things stand now, the contractor IVRCL has initiated arbitration under UNCITRAL rules of Arbitration as per the Condition of Contract. In addition, sub-contractors responsible for construction of camp facilities – Gorkha Swachchanda JV and Lama Constructions – are also in arbitration.

Site of Adit III at Galeshwor

Meanwhile, NEA registered Raghuganga Hydropower Company Ltd at the Office of Company Registrar in July 2017. Following this Rahughat HEP will now be developed by a separate company with a majority stake of NEA. This also opened up the possibility for the company to seek funds from the public through initial public offerings and also to issue shares of the company to the affected locals.

Since the project came into existence in 2010 until now, only 10 km of the 12.5 km access road has been completed besides the preparatory excavation for the contractor's camp, army camp, a crusher plant and Adit III (underground mine).

Selected study area

Rahughat Hydroelectricity Project (Rahughat HEP) is one of the medium scale hydropower projects financed through debt financing to Nepal. This project could provide insight into the impact of such projects on livelihoods of the local community. Though the project is under construction, work is currently suspended due to the contractor's inability. Work is expected to resume soon (details in the subsequent chapter). This is an ex-ante analysis of the project where members of the local community would be able to share their perception and views on the impact of such projects on their lives.

Methodology

Since this research adopted the case study method, it combined both quantitative and qualitative approaches to examine how the local community is affected by the Rahughat HEP. The quantitative aspect of the study is used as an indicative of the project site while the qualitative part provides exploratory insight to form a perception regarding impact of the project on people's livelihoods.

Affected VDC of Rahughat Project

The study findings are based primarily on stakeholder consultation conducted at the project site and in Kathmandu. Interviews were held with two heads of the Rahughat HEP, hydropower entrepreneurs, high level government officials related to energy authorities, elected officials of local government bodies, private sector representatives from the affected area, civil society members, among others. Two focused group discussions were also conducted in two different locations and included participants from three villages affected by the project.

Surveyor fills the questionnaire during household survey

A household survey was also conducted, mostly among women of three affected villages – Piple, Bagaicha, Mauwaphant and Dagnam.[42] The respondents were selected based on convenience sampling technique due to limitations imposed by resources and geographical remoteness of the study area. For the purpose, a structured questionnaire was prepared that included questions related to the nature of the household, income, land-holding, nature of economic activities, consumption, fuel usage, impact on their health, say of women in decision-making, among others.

Field work was undertaken in Beni, Mallaj Majhphant, Rakhu Piple and Mauwaphant and included respondents from Dagnam village as well.

Limitation of the study

The suspended construction work of the Rahughat HEP may create some difficulty in assessing the project's impact on people's lives. The work remains suspended since 2014. The ambiguity surrounding the project's future has also negatively impacted the community's outlook toward benefits accruing from it. Since the affected area already has access to electricity, the project may not directly provide electricity to local households. Even when the project starts generation, the power will be evacuated to the national grid and not distributed in the area. However, increased supply to the grid will improve the quality of electricity supply in the whole region.

Another limitation of the study is related to the convenience sampling adopted for data collection for household surveys. This may have resulted in volunteer bias and undercoverage as information could be gathered only from those respondents who were willing to be engaged with the study. And since the information required for the case study is retrospective in nature and work at the project site has been suspended, at times respondents were unable to recall information such as the prevailing wage rate at the time, volume of business generated, and the like.

Demographic and social profile of the affected area

The affected area includes five village development committees in Myagdi district which are now part of Raghuganga Village Council[43] and one VDC in adjoining Parbat district which is now under Jaljala Village Council. This section will focus more on the four VDCs that are recognized as most affected by the project, namely, Rakhu Piple, Jhi, Dagnam

42 Note that these are names of the villages with the Village Development Committees, some names of villages and VDCs tend to be the same, while some are different.

43 Following the state restructuring as per the new federal regime, local authorities have also been restructured into Village Council, Municipalities, Sub-Metropolitan and Metropolitan cities. As a result, the VDCs have been regrouped and converted into Village Councils or Municipalities. This restructuring was undertaken in February 2017 only; so the database on Village Council level is yet to be brought up-to-date.Hence this research has focused on existing VDC level data for the sake of convenience.

and Mallaj Majhphant. According to Census 2011, the population of the project area is 20,323 considering the five VDCs of Myagdi district and one VDC of Parbat district.

The population density of the affected area is 309 persons per square km. The majority of the population in the area belongs to Chhetri, Bramhin, Thakuri and Magar [44]communities. The main settlements affected by the project include Galeshwor, Mauwaphant, Dagnam, Bagaincha, Bukla, Goluk, Dharkharka, Jhi, Bhirkuna and Nepane villages.

Site for project office and staff quarters in Rakhu Piple

The major occupation in the area is agriculture; farmers here cultivate three crops every year – rice, wheat and maize along with millets and seasonal vegetables. Many households have family members working abroad as migrant workers making remittances a supplementary income. Except for Galeshwor, which boasts of concrete houses, all the other settlements have traditional houses with corrugated iron or slate roofs.

There are 11 different units of community forests in the core affected area. Among them, six community forests are along the access road alignment while a section of the road passes through Rahughat Salleri Community Forest.

Table IV: Settlements affected by the project

Project Components	District and VDCs
Powerhouse	Myagdi, Rakhu Piple
Powerhouse trailrace	Parbat, Mallaj Majhphant
Surge Tank and Penstock	Myagdi, Rakhupiple
Tunnel	Myagdi, Rakhu Piple
Headworks	Myagdi, Jhi
Headworks	Myagdi, Dagnam
Access Road	Myagdi, Dagnam
Access Road	Myagdi, Rakhu Piple

Source: SIEE 2016

The project acquired 29.39 hectares and this affected 198 households in the VDCs nearby. The Supplementary Initial Environment Examination (IEE) undertaken to assess the impact of increasing the capacity of the hydropower project from 32 MW to 40 MW necessitated some changes. The realigned road – from Ghumaunetal to Piple – will be 355 m shorter than the previous one; as a result, less land would be required – affecting only 13 households instead of 17.

Demography of the affected area

Table V: Composition of population in the affected area

VDC	Total households	Population	Male	Female	Sex Ratio
Dagnam	289	1089	473	616	76.79
Jhin	288	1131	463	668	69.31
Piple	1015	3936	1719	2217	77.54
Majhphant Mallaj	2100	8087	3664	4423	82.84

Source: CBS 2011

44 Chhetri, Bramhin and Thakuri belong to so-called higher caste and Magarsare an indigenous community

Table V shows that Mallaj Majhphant is the most populated VDC among the affected villages. The male to female ratio shows that the villages have a higher female population. The women in the villages are mostly engaged in household chores and their income earning activities are limited to working on their own farm. The women grow vegetables and rear goats and chicken to supplement their income, which, according to them, is enough for them to buy few items of clothing for themselves and for their children. However, women in the villages pointed out that the younger generation of women there are engaged in salaried services in schools and local administrative bodies.

Health and education

In terms of health and education, the area is mostly dependent on government services. The closest hospital is in Beni, headquarters of Myagdi district; else VDCs have one sub-health post each that provides basic services. As for educational services there is only one higher secondary school among the affected villages. On an average, students have to walk about half an hour to reach primary schools, one-and-a-half hours for secondary school and two to three hours for the higher secondary school. Thus, the households that can afford to pay for a second accommodation send their older children to Beni town or Pokhara city for higher education.

Table VI: School in the affected area

VDCs	Total Schools	Primary	Lower Secondary	Secondary	Higher Secondary
Dagnam	2	1	1	0	0
Jhi	3	1	1	1	0
Rakhu Piple	5	3	0	0	0
Majhphant Mallaj	15	11	1	1	1

Source: CBS 2011

Literacy Rate in the affected area

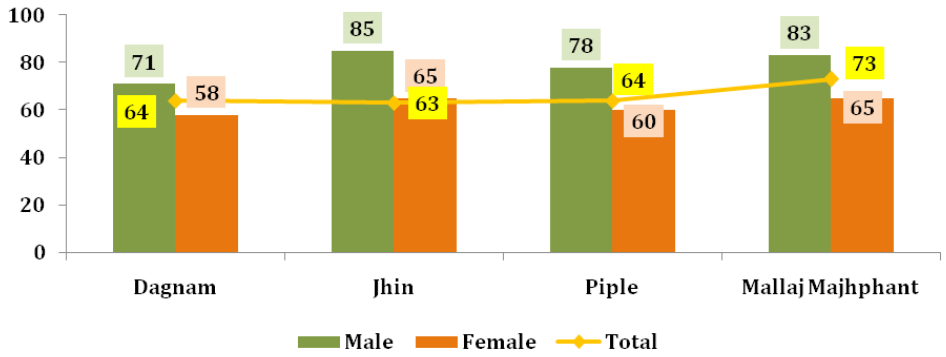

Figure III: Literacy rate in the project affected areas

Source: CBS 2011

Table VII: School attendance rate

VDC	Total male students	Male attendance	Total female students	Female attendance
Dagnam	177	138	231	156
Jhin	192	152	234	161
Piple	705	546	860	582
Majhphant Mallaj	1595	1269	1741	1206

Source: CBS 2011

State of Infrastructure

When the project was started, there was road access only up to Galeshwor, site for power project. Galeshwor is also a pilgrimage center, known for its shrine of Lord Shiva. After the project was launched the seasonal road connecting Galeshwor with Rakhu Piple was widened and made accessible for all seasons. The track opening was undertaken up to the dam site in Dagnam. At present, the dam site is not accessible as the road work was abandoned – the road is accessible only up to five km (3 miles) and reaches up to Mahuwaphant village. Public transport is available only up to Galeshwor. Beyond that people need to hire taxi-cabs (mostly Maruti 800, Maruti Suzuki Alto) for about NPR 300-500 depending on the length of the journey from Galeshwor. There are four-wheel-drive SUVs too that ply as taxi-cabs and more suited for difficult terrain, but these charge more than the usual taxis. Most households own motorcycles and use it for their regular transportation needs.

Site for project office and staff quarters in Rakhu Piple

Electricity accessibility

All the VDCs now have access to electricity, but not all houses have a connection. The area is being supplied with electricity generated at 2MW Tatopani and 14 MW Modi Khola Hydroelectric Centers which are connected to Integrated Nepal Power System (INPS). Jhi and Dagnam VDCs were not electrified. During the field visit respondents pointed out that there about 10 houses up on the hills in Rakhi Piple and Dagnam that still do not have electricity. However, the quality of the electricity supply is poor with frequent black-outs.

Socio-economic profile of the affected area

The local community had hoped the hydropower project would open up job opportunities right at their doorstep once the construction phase began, but that did not happen as repeated delays have prevented the project from taking off.

The survey of villages Bagaicha and Mahuwaphant revealed that the average annual income of respondents was NPR 345,000. The income reported by respondents ranged from less than NPR 300,000 to NPR 808,000. The average income reported by people of the affected area is 11 per cent less than the average household income of Nepal which is NPR 399,533 (Ministry of Finance 2017). The figure below shows that 48 percent of the respondents reported an annual income of less than NPR 300,000 while 12 percent said that their household income is more than NPR 600,000 (see Figure IV).

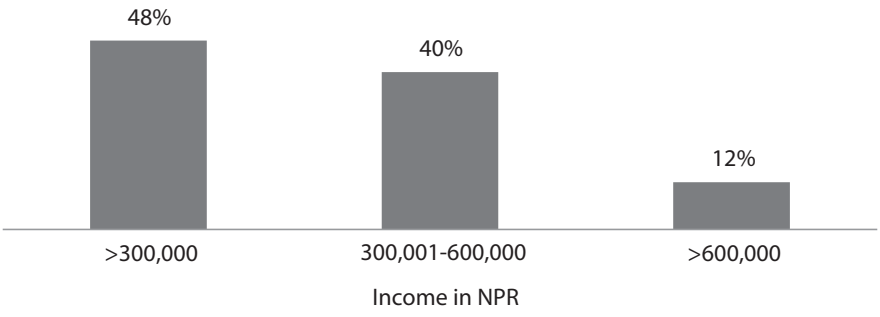

Figure IV: Income level of respondents

All the households surveyed reported agriculture as the primary economic activity while almost half of them said that they receive some form of income from abroad as remittance or pension for having served in the Indian Army. Households receiving remittances appeared to be better off. Although agriculture is the main economic activity of the households, the average land-holding is one acre only. Many households also rear cattle and goats for supplementary income. The affected area lacks industrial enterprises; there is not even a micro enterprise in the area. Hence, the source of income is limited to agriculture and few government sector jobs in schools and local authority offices.

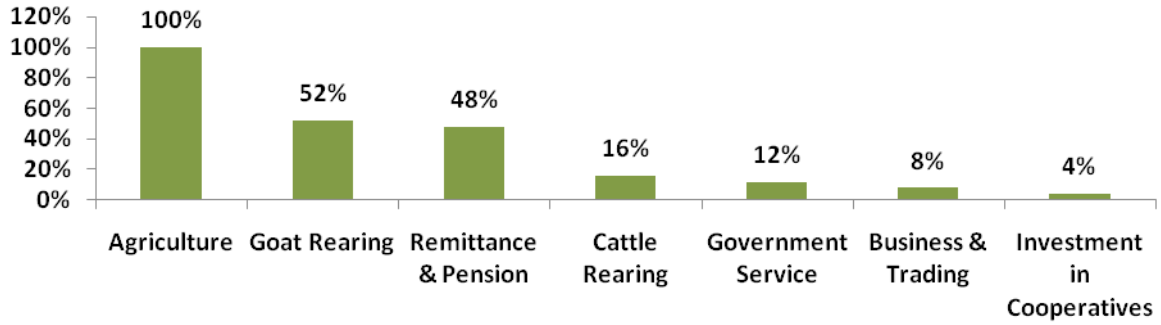

Figure V: Distribution of income sources among respondents

All of the respondents admitted agriculture as their income source (see Figure V). Approximately 48 percent of the households surveyed get additional income in the form of remittance; 52 percent said they rear goats for money while only four percent said they earn dividend from investments.

The average annual expense of the households surveyed was reported to be about NPR 220,000. This is less than the average annual expense of Nepal that is estimated to be about NPR 322,730 (CBS 2015).[45] It was observed that the households that receive remittances or pensions from abroad fall under the higher-income category. The families surveyed said they spend the most on buying food items. According to respondents, one-fourth of their expense is taken up by regular food and groceries while they spend an additional amount to buy protein rich foods such as poultry and milk. According to the respondents, their own farm produce is limited in quantity and variety so they need to buy other food items.

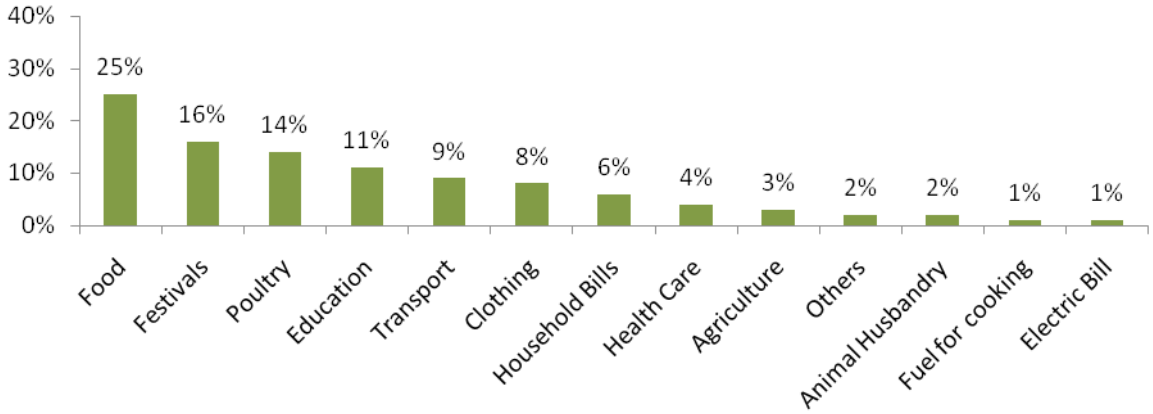

Figure VI: Average annual expenses of respondents

**Others includes house maintenance*

Likewise, another large expense recorded is related to festivals and social functions. Respondents said they sacrifice at least one goat during Dashain, the biggest festival for Nepal's Hindu population which falls in October. Likewise, other occasions, religious and social, also put pressure on their household budget. Education and transportation

45 http://cbs.gov.np/image/data/2016/Annual%20Household%20Survey%20Report%202014-15.pdf
ADB. Building a Sustainable Energy Furute: TheGreater Mekong Subregion. Mandaluyong City: Asian Development Bank, 2009.

were other two large expenses reported by respondents. Due to lack of proper road connectivity and public transportation, transport service is quite expensive. A one-way ride from the villages to the nearest town Beni costs about NPR 300 for one person.

As for household fuel, the largest source is firewood. Approximately 28 percent of the respondents said that they also used LP gas for cooking. The use of LP gas is limited to making tea or snacks, but meals are cooked only on clay ovens. The firewood is purchased once or twice in bulk while the community forests nearby allow people to collect branches and twigs from the forest floor for a fee. The burden of procuring and managing firewood is shared by both men and women of the household, according to the respondents. However, in households that are engaged in animal husbandry, fetching green fodder for the livestock is mostly women's responsibility with occasional help from men.

Nearly a third of the total respondents said they have a family member suffering from ailments related to eyes or breathing; a majority of those suffering are women. The reason could be the long hours of exposure to smoke from the traditional stoves as all of the households use firewood as the primary source of fuel for cooking.

As for concerns regarding gender balance, the respondents pointed out that men in the house consult with their wives and mothers while taking major decisions related to children's welfare, finances and purchase of assets. The households also stated that they do not discriminate between girls and boys on the question of education because they want their daughters to be educated.

Rahughat Hydroelectricity Project and livelihood concerns

The announcement of any large infrastructure project brings good cheer in local communities as it leads to a construction boom and employment opportunities in the project site in the initial phases, followed by more scope for trade and business. In the case of Rahughat HEP too, a similar boom was expected when the initial civil work started in 2010.

According to the EIA report, the project was supposed to create employment for 900 people during the construction phase. Similarly, the project would have contributed in the development of the affected local area. Half of the royalty paid by the project to the Government of Nepal is required to be spent on the development of the local region and of that amount 12 percent is to be spent on the affected areas, for example of every NPR 100 paid by the project to the government as royalty, NPR 50 would be spent in the Western Development region of which NPR 6 would be spent in the affected VDCs.

Economic impact

According to people the study team spoke to in affected areas, their gain from the project so far has been during land acquisition. Project developers bought land from them at about NPR 4 million per acre when market rates would have fetched NPR 2.5 million or less, the respondents said. According to the inhabitants of the affected villages, most of the land that was acquired by the project was barren shrub land, which had little use besides producing fodder for animals. Thus the loss in agriculture productivity caused by the project has been minimal.

Half-finished construction of a tunnel near Mauwaphant

Since the project acquired about 30 hectares of land from 198 households, the land purchase substantially improved their living standard. Many of them have invested that money either in buying heavy equipment or vehicles or on purchasing property in towns.

Even though the project is yet to take off, it has already benefited the local community by giving them increased accessibility following road construction. The construction of the road joining the power house at Galeshwor with the dam site at Dagnam via the project site (at Piple) has made the villages accessible by vehicles minimizing the journey time.

However, as the project work stalled, the road in Dagnam deteriorated and is not motorable at present. During the survey, the respondents mentioned that the project would have benefited them by way of maintenance of the road. As many households own two-wheelers, several community members said that the bad road condition resulted in frequent breakdown of their vehicles and higher maintenance cost. People also said that in the absence of reliable roads and transport system, they lack easy access to markets in Beni and the larger city Pokhara; access to these markets is important to sell fresh produces from their farms and livestock.

Abandoned equipment belonging to former contractor IVRCL at Galeshwor

It is true the announcement of the Rahughat project led the local community to expect employment during the period of construction, but their hopes were dashed. People said since the contractors did not hire locals they did not stand to gain from jobs as construction labor. The contractors and sub-contractors brought laborers from outside the district and even from India, who were willing to work for low wages. At the time (2012-2015), the prevailing wage rate in the villages for manual agriculture labor was approximately NPR 300 per day and the wage offered by the power project was less than that.

People said that they were hopeful even then because they believed that once the project work began in full swing more opportunities would be created. They were also planning to approach the project managers to provide employment to locals.

There was a clear sense of frustration in the community with the delays in starting the project. Some of the people who had received money from the sale of their land to the project had invested the money in buying heavy equipment such as earthmovers and trucks with the hope of renting them to project developers. But the constant disruptions and eventual halt of project work has left their equipment to remain idle unrented, leading to considerable loss, said a couple of respondents from Rakhu Piple. The project's own equipment (belonging to IVRCL) are left at the project site to rust due following the halt in the works. Respondents said they are trying to recuperate their investment by renting their equipment to projects in other places – for example, road construction work in nearby areas. But the problem here is that owners are not able to supervise the use of the machinery in these projects and this leads to frequent breakdowns.

The HEP project work was also supposed to stimulate the local economy as the influx of migrant workers would have increased business in local shops. The income from shops, house rental, sale of vegetables, meat, milk etc. was estimated to boost the local economy during construction phase. Community members reported that local businesses did not grow as they had expected. The flow of people and resultant growth in business was experienced more in the nearby town of Beni than in Rakhu Piple. Beni, the district headquarters of Myagdi, saw some business by renting out houses to officials of NEA, IVRCL and for godowns to store their equipment.

Even at the location site, laborers' petty purchases of tea and cigarettes also contributed little to the local economy. According to the people in Rakhu Piple, the laborers did not even buy groceries at the village shops as the contractors provided them with the necessary food items which were not procured from the markets nearby.

Despite their disappointment, people in the villages are optimistic. They believe they will benefit economically as soon as the project work restarts. They are hopeful that they will be able to rent out equipment to the project. And since the construction of the camp facility is almost over, officers and their families will be able to move in quickly. Once that happens, it will provide them with a better market closer home and increased opportunities for trade.

The people of the area were elated by the news that the project would be turned into a public limited company and shares would be issued to local residents. If that happens, it can be assumed it will have a noticeable impact on the livelihoods of the people of the area.

As for cheaper electricity due to the project, that seems unlikely. The electricity supply is routed through the national grid with uniform tariff for consumers. However, increased capacity in the region after the project is completed is expected to provide uninterrupted power supply in the area by improving overall supply to the national grid.

At present, there are frequent and power outages. On an average the villages get about 16 hours of electricity every day. The households pay tariff on a quarterly basis which comes around NPR 400 for a quarter. Although the price seems affordable, the cost of paying the electricity bill is phenomenal. Many respondents pointed out that they either have to walk almost three hours to reach Beni where the bills are to be paid at an NEA counter, or shell out NPR 600 for the journey.

Social impact

So far, there is hardly any discernible social impact on the local community that can be attributed to the project. As the project got entangled in the dispute between contractor and developer (Nepal Electricity Authority) even before the physical works started, the project developer did not take any initiative towards investing in the facilities promised. According to people of the area, the developer had assured local residents that the project will also financially support the villages in upgrading schools, facilitate the safe drinking water supply, donate ambulances to serve the villages, and other such benefits.

Locals from the affected area are hopeful that, as the process of awarding the new contract is near completion, the project will revive soon. Although, these commitments were not formalized in any written agreement, people are confident that the project will fulfill the promises made and will contribute in strengthening the education system and health services in the area.

They also believe once the project takes off it will also help resolve the two main problems people in the area face at present. These are: poor road condition and limited drinking water sources.

Gender concerns

Respondents were of the opinion that theirs was an equitable society in terms of gender relations. All of the women are engaged in agriculture and some women even run businesses (small shops), teach in the local school and work in the government sector. Respondents also said that they do not discriminate between their children based on gender.

However, many women admitted that they shoulder the larger burden of household chores. Also, use of traditional firewood ovens for cooking meant they suffer from frequent health hazards caused by smoke. As of now, there is not any visible impact on women as a result of the project. People are, however, optimistic that as the project resumes and the promises made with regard to community development are fulfilled a clearer gender impact is likely to emerge.

4 Bhutan Case Study

Background

Bhutan is a landlocked Himalayan kingdom with high rising mountains and rushing rivers, which bestow great potential for hydro-electricity. At present, only about six percent of the country's total hydro-electricity potential (24 gigawatt) is being harnessed with Chhukha, Kurichu, Tala, Basachu and Dagachu hydropower plants in operation. Since the Chhukha hydropower plant was commissioned in 1986, Bhutan has been exporting electricity to India. The Tala hydropower plant was commissioned in 2007 and the subject of this case study.

Of the several projects run jointly between Bhutan and India, the 1020 MW Tala hydropower plant[46] is the largest. It is located on Wangchu River in Chhukha District in Western Bhutan, downstream of Chhukha hydropower plant and is considered important to the country's economy, as it generates 4865 million kWh annually. The project was fully financed by the government of India (GoI) with a total cost of Nu. 41.26 billion (US $654.9 million), in the ratio of 60 percent grant and 40 percent loan at 9 percent interest per annum.[47]

Since the completion of Tala hydropower plant it has not only met the domestic power demand, it is also capable of generating surplus energy for export. The export tariff has been fixed at Nu. 1.80 per kWh in accordance with the Power Purchase Agreement signed between Bhutan and India.[48] The surplus power is being exported to India through cross-border electricity trading (CBET) interconnections.

CBET between India and Bhutan has benefited both countries in terms of the economy as well as the environment. While power export has provided Bhutan a stable source of revenue, it has helped India curb GHG emissions by replacing fossil-based power with cleaner hydropower. The commissioning of Tala hydropower plant in 2007 has contributed to the high growth rate of Bhutan's GDP, which stood at 7.5 percent in 2017 (Asian Development Bank). Besides bringing in revenue, the project also helped the country save infrastructure development costs when the Tala hydropower project headquarters and other facilities in Gedu town were handed over to the Royal University of Bhutan, Gedu Middle Secondary School, Gedu Hospital, Bhutan Telecom and the Royal Bhutan Police.[49]

This case study, however, intends to find out that besides revenue generation, what have been the other impacts of CBET, particularly on livelihoods and gender roles in Bhutan.

Tala hydropower project

The 1020 MW Tala hydropower plant generates 4865 GWh electricity annually. The project was commissioned in 2007, after eight years of rigorous work. Government of Bhutan had mandated that after meeting the domestic demand for electricity Tala hydropower project would sell the surplus power to India.

46 Jain, G. & Saini, V K. (2016), Impact of cross-border electricity trade on Bhutan (country series). South Asia regional initiative for energy integration (SARI/EI)

47 Project Finance (2017). Druk Green Power Corporation Ltd. Thimphu, Bhutan http://www.drukgreen.bt/index.php/thp-menu/pf-thp on 13/06/2017

48 Tala hydropower plant (2017). Druk Green Power Corporation Ltd. Thimphu, Bhutan; http://www.drukgreen.bt/index.php/thp-menu/about-thp on 13/06/2017.

49 Energy Benefits (2017). Druk Green Power Corporation Ltd. Thimphu, Bhutan. http://www.drukgreen.bt/index.php/thp-menu/energy-thp on 13/06/2017.

Table VIII: Salient features of Tala HEP

Location	Chhukha Dzongkhag, Western Bhutan
River	Wangchu River
Dam Height	92m
Output	1020 MW (6*170MW)
Annual Electricity Generation	4865 million kWh/yr
Project Commissioning	March 2007
Cost	INR 41.26 billion
Project Manager	Tala Hydroelectric Project Authority
Contractors	Hindustan Construction Company, Larsen & Toubro, Jaiprakash Industries
Land Acquired	855 acres
Transmission Line	3*440KV
Total Affected Settlement	Unknown

Source: Bhutan Dzongkhag Statistics, 2017

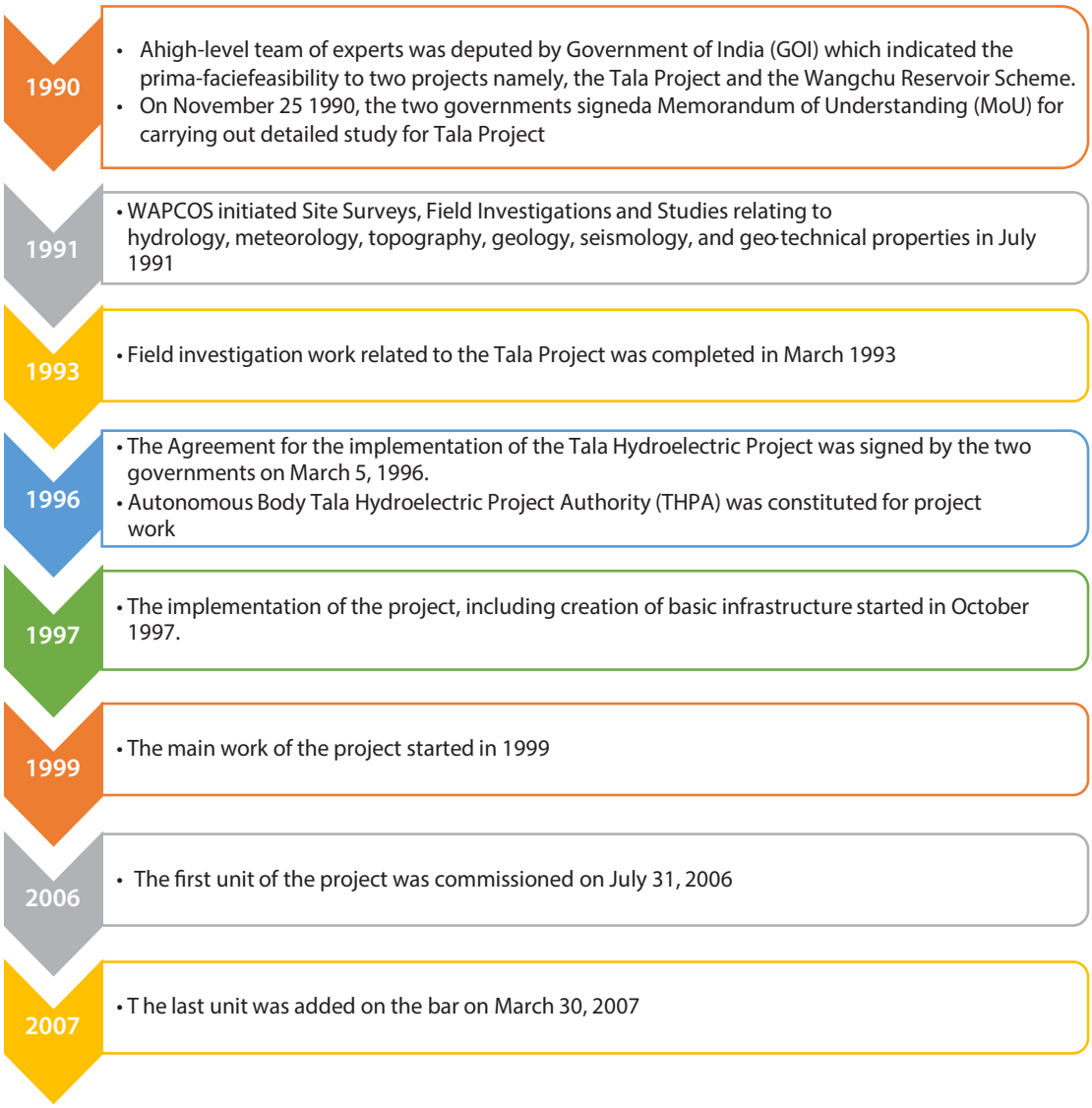

Figure VII: Tala hydroelectric project timeline

The success of the Chhukha hydropower plant and its socio-economic bearings on the people of Bhutan and India, led to discussions between His Majesty, the Fourth King of Bhutan and the then Union Minister for Energy, GoI, in January 1990.[50] A high-level team of experts was then deputed by GoI to undertake feasibility study for potential hydropower projects. The team indicated the prima-facie feasibility of two projects, the Tala Project and the Wangchu Reservoir Scheme, and recommended that detailed studies be taken up.

Subsequently, the two governments entered into an MoU on November 25, 1990 to carry out detailed investigations and studies. GoI appointed Water and Power Consultancy Services (WAPCOS), an undertaking of the ministry of water resources of the government of India, through an agreement on February 18, 1991. In July 1991, WAPCOS initiated site surveys and field investigations to study the hydrology, meteorology, topography, geology, seismology, geophysical and geo-technical properties, quarries for construction materials and the environmental aspects. The field investigation was completed in March 1993 and a draft detailed project report (DPR) was prepared by August 1993.

Subsequently, the agreement was signed by the two governments on March 5, 1996, and an autonomous body, the Tala Hydroelectric Project Authority (THPA), was constituted for construction, operation and maintenance of the project.

The construction of basic infrastructure started in October 1997, and the main works started in early 1999. The first unit of the project was commissioned on July 31, 2006, and the last unit was added on the bar on March 30, 2007. The project components stretch for approximately 100 km (62 miles) from the dam at Wangkha to TRT Outfall at Tabji.

Selected study area

Tala HEP his located on the Wangchu river and at 860m, and is the region's largest high-head project.

The affected area includes Tabji, Rinchhentse, Dangreyboog, Gengu, Khamaedthapang, Nimgang, Tashilakha, Bongo and Tsimalakha in Chukha district. However, the study was focused primarily on seven villages most affected by the project. These are: Shinchikha, Arikha, Lower Sorin, Middle Sorin, Rinchhentse, Nimgang and Damdrangra.

Damdrangra village in Tala HEP

Methodology

The research has used the mixed-method approach wherein both quantitative and qualitative studies were undertaken to examine the impact of Tala HEP. The quantitative study is used as an indicative of the project site while the qualitative study provides exploratory insight to form a perception regarding impact of the project on the livelihoods of the people in the affected region.

Key informant interviews were conducted with women and men of the community, and with local leaders of Dharla Gewog (sub-district) administration.

Rinchentse village at the Tala project site

50 https://www.drukgreen.bt/index.php/thp-menu/about-thp, accessed on December 17, 2017

Semi-structured questionnaires were used as the tool for gathering the information. The investigators also interviewed respondents from seven villages which are located in and around the Tala hydropower plant site.

Every 10th household was sampled in Lower Sorin, Middle Sorin and Rinchentse villages. As Damdrangra village was very near Rinchentse, only one household was surveyed here. The study team selected every 5th household as sample in Shinchikha and Arikha. A total of 31 households were surveyed and the majority of the respondents were farmers.

Table IX: Sampled households in the vicinity of Tala hydropower project site

Area	Category of settlement	Female	Male	No. of households responded	Total Households in the village
Shinchikha	Rural	3	0	3	14 (21%)
Arikha	Rural	1	1	2	7 (14.28%)
Lower Sorin	Rural	2	3	5	53 (9.5%)
Middle Sorin	Semi-urban	2	3	5	60 (8.33%)
Rinchentse	Semi-urban	4	3	7	51(13.7%)
Nimgang	Semi-urban	3	5	8	140 (6%)
Damdrangra	Semi-urban	1	0	1	60 (1.66%)
Total no. of respondents				31	385 (8 %)

Limitations of the study

Rudimentary information such as the exact number and names of villages affected by each component of the project, the number of households affected, wetlands and drylands affected, the number of households that lost homestead land is not available in the public domain. Therefore, researchers of this study did not have much secondary data to start with. Information relating to ground realities presented in this section is based on key informant interviews.

Survey at Rinchentse village

Data collection for household surveys may have resulted in volunteer bias and undercoverage as information could be gathered only from those respondents who were willing to be engaged with the study. And since the information required for the case study is retrospective in nature and work at the project site was completed over a decade ago, at times, respondents were unable to recall information such as volume of business generated, number of patients visiting health centers, among others.

Demographic and social profile of the affected area

According to the Annual District Statistics 2016, the population of the affected Gewog (sub-district) is 8566. The population density of the affected area is calculated as approximately 47 persons per square km. The major occupation in the area is animal husbandry and farming of cash crops such as cardamom, oranges, potatoes and ginger.

Approximately 96 percent of the rural population in the district has access to safe drinking water. Approximately 35

percent of the population is involved in agriculture and related activities. Women are employed in agriculture related activities and as laborers. The unemployment rate in the district is 5 percent.[51]

Women play an active role in the family and are involved in financial and non-financial decision-making. However, their literacy rate is extremely low; literacy among young women is considerably higher though, approximately 82 percent while among adult women it is 45 percent.[52]

Situation before the Tala hydropower project

The situation was very different before electrification of the area. All the respondents reported that earlier cooking was always done using firewood, collected from the forest. They also added that cooking with firewood was not only time consuming and tiresome, but it also entailed problems like difficulty in maintaining cleanliness, proper health and sanitation, and it was resource intensive as well. Resinous pinewood (ocote) and kerosene were used as the main source of lighting which hindered people from doing other work after dusk. Road connectivity, schools, health, electricity and other facilities were not in place then.

Table X: Demography of Chhukha district

Segment	Parameters	2008	2017
Education	No. Higher Secondary School	2	3
	Student to Teacher Ratio	21	17
Health Infrastructure	No. of hospitals	3	3
	No. of doctors	10	17
Rural Sanitation	Access to safe drinking water (%)	-	96
	Access to improved sanitation	-	96
Livelihood/ Employment	Labor force participation rate	43	62
	Employed in agriculture related activities	19	36
Access to Roads	Farms Roads (km)	25	355
	Urban Roads (km)	-	58

Tala hydropower project and its impact (socio-economy)

The respondents reported that there were no roads, health and education facilities in and around their community. More than 70 percent respondents reported road connectivity as a direct benefit of the Tala project, followed by the schools and health facilities. Arikha School and Arikha Basic Health Unit were established as more people migrated to Arikha for the construction of the hydropower project. And the local communities gained from it.

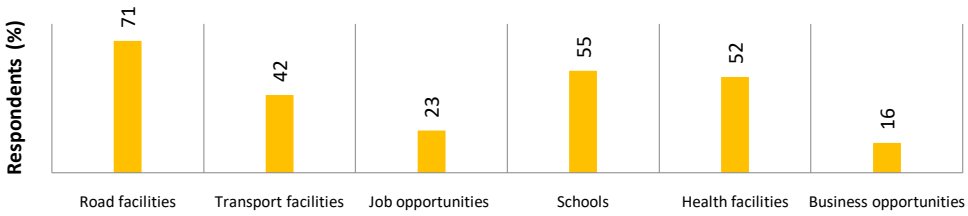

Figure IX: Infrastructure development in the community due to Tala project

51 http://www.nsb.gov.bt/xl/?dir=SUBJECTS/ANNUAL%20DZONGKHAG%20STATISTICS/2017/ADS%20-%20Chhukha%202017, accessed on 17 December 2017

52 Id at 48

According to 23 percent of the respondents, the construction of the Tala hydropower project has also helped the communities by creating job opportunities including in the construction work. Local leaders and government officials added that the creation of business opportunities in the communities is the biggest fallout of the Tala hydropower project. This is corroborated by the several retailers, restaurants and grocery shops that can be along the highway toward the Tala hydropower project.

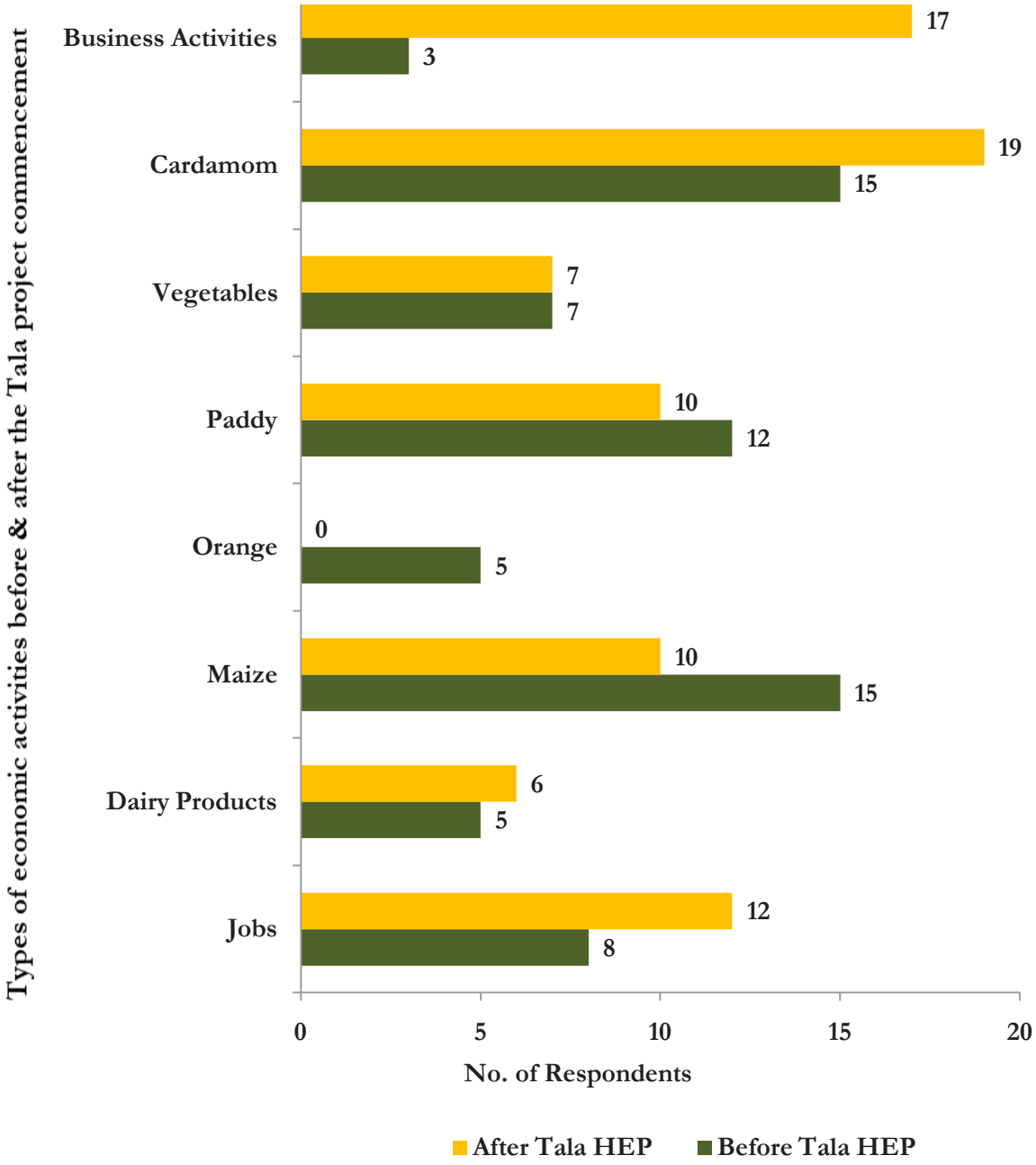

Figure X: Changes in economic activities after Tala project began

A majority of the respondents have reported a shift in agricultural practices. While maize cultivation declined, cardamom production has shown significant increase.

Electricity and its impact on the lives of local community and women

All the households in the local communities are 100 percent electrified with 24-hour power supply. Even the schools and the Basic Health Units have 24-hour power supply. Almost all respondents said they use electricity for cooking and home lighting. However, only one electric grinding machine is reported to be operating in the community.

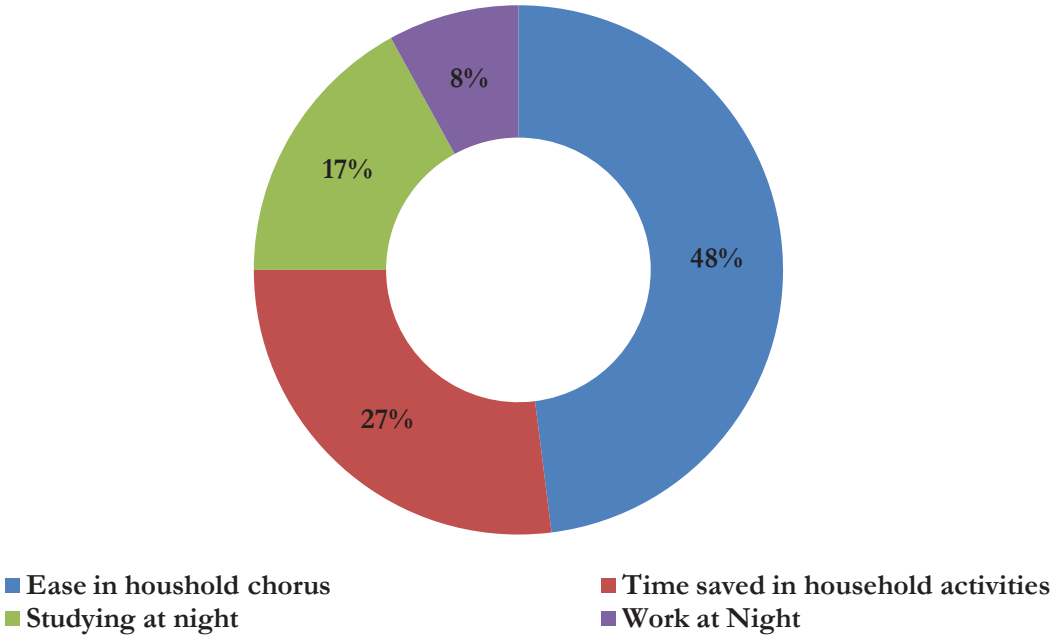

Figure XI: Direct benefits of electricity to households

Electrification has benefited women in a significant way as 48 percent reported that it has eased their household chores, especially cooking, and it saves time. Most of the households use electric rice cookers, curry cookers and other such appliances. Two households at Shinchikha used electric fencing to guard their crops against wildlife. Electric fencing too saves guarding time. People use the time saved from cooking and guarding in gainful employment such as running a business, socializing with the community, cardamom and other cultivations, reported 48 percent of the respondents; 8 percent said they worked even at night as there is electric light now and 17 percent reported that their children study comfortably now and for longer hours. Before electrification, children studied in the light of a kerosene lamp.

Figure XII: Direct benefits of electricity to households

Impact of electrification on education and health

All the respondents reported that schools and health centers have 24-hour power supply. However, the rise in school enrollment of girls may not be due to electrification, because more than 50 percent respondents reported that it is due to the fact that the schools are now located in their community. A majority of the respondents (Figure XIII) reported there has been improvement in the quality of education as 24x7 power supply allows students longer study hours. Not all respondents agreed as 5 percent argued that the education quality has not improved post electrification.

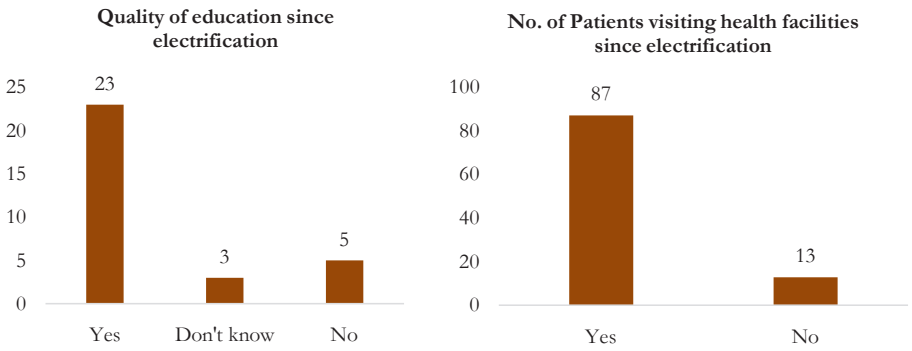

Figure XIII: Impact of electricity on education quality and health facilities

Approximately 87 percent agreed that more patients visit the health centers even for small illnesses. However, the increased number of patients visiting the health centers is not directly credited to electrification but regarded as an indirect benefit of Tala HEP project. Good roads, transport facilities and a health facility in close proximity to the community have encouraged more patients to visit the health centers. According to 13 percent of respondents, the health facilities are still in a poor condition and staffed by inexperienced health personnel.

Impact of Tala HEP

Tala HEP has spurred the economy of Bhutan. The per capita income of Bhutan was US $2,805 in 2017, much higher than that of India's US $1,715. Hydropower plants in Bhutan generate more than 60 percent of the government's entire revenue.

Tala HEP has been mandated by the government of Bhutan to meet the local energy demand, which was earlier met by Chukha hydropower projects. The surplus power is exported to India. Thus it is prudent to say that Tala hydropower project has benefitted the local community and also played a crucial role in the economic growth of the country. It also led to development of infrastructure such as roads, hospitals, etc. By harnessing only 5 percent of the potential hydropower capacity Bhutan has been able to provide electricity to 100 percent of its population.

Hydropower plants have played a key role in the socio-economic development of both Bhutan and Nepal. They not only provided safe, reliable, sufficient and affordable electricity to meet domestic and industrial demands, but also spurred cross-border energy trade. The revenue generated from the hydroelectricity was used to finance other social projects in both countries.

While the primary focus of these hydropower projects were to meet the electricity demand in schools, hospitals, and district administration, the government had also aimed to promote 100 percent access to electricity in rural areas. The present socio-economic impact study has shown that access to electricity has particularly improved the quality of life of students, women and the rural households. Further, it improved quality of services of basic health units. In addition, it facilitated transportation and communication services. Approximately, 61 percent of households in the districts surveyed have access to mobile phones.[53]

The study focuses on some of the socio-economic parameters as discussed below.

Improved access to health and sanitation

While the major hospital is in the district headquarters, each of village has a sub-health post that provides basic services. Approximately 90 percent of respondents said patients visit health centers even for small illnesses. The increased patient

53 National Population and Housing Census 2011, reported on March 2014. Central Bureau Statistics 2016, Bhutan

load at the health centers is not due to electrification though. Good roads, transport facilities and a health center in close proximity have encouraged more patients to seek medical advice. A small percentage of respondents however believe that the services available in the public health centers were poor owing to inexperienced personnel.

Improved health in the community is also attributed to better sanitation. Approximately 95 percent households in the villages of Chukha district have access to improved sanitation. Though the village data for Bhutan is not available, 96 percent of the rural population of Chukha district has access to safe drinking water supply.

Improvement in literacy rate

The literacy rate[54] of Chukha district is approximately 63 percent. There are 5 higher secondary schools, 12 secondary schools and 26 primary schools in Chukha[55] district.

All the schools have 24-hour power supply. The study also found that the number of girls enrolled in local community schools is higher than the number of boys. While the overall female literacy rate is extremely poor in villages of both Nepal[56] and Bhutan[57], the literacy rate among young girls is high. A majority of the respondents reported there has been tremendous improvement in the quality of education as students have access to 24-hour power supply, which gives them longer study hours. A UN study suggests that "without electricity, women and girls have to spend hours fetching water". The higher school enrolment of girls in the village community could therefore be attributed to the access to electricity.

Access of clean fuel for cooking

Most of the households in Chukha district use electric rice cookers, curry cookers and other such appliances for cooking. A few households in Shinchikha also use electric fencing to guard their crops from wild animals. People use the time thus saved from cooking and guarding in gainful employment such as running a small business as an additional source of income or cardamom and other cultivations. Consequently, household incomes have increased substantially.

Access to road and transport

Unlike Nepal's Rahughat HEP, Tala HEP was commissioned (in 2007) and the infrastructure in the vicinity of the plant is well developed. Tala HEP is the fourth hydropower plant in the area. The building of roads has facilitated the overall development of the local economy.

Development of local market

Due to unavailability of data, the change in annual income of villagers of affected villages in Bhutan could not be assessed; however, the shift in the agriculture pattern from conventional crops to cash crops was observed which suggest that there might be positive change in the income of villagers. While maize cultivation has declined in the region, cardamom cultivation and dairy products show significant increase. And since people prefer rice over maize as the staple, that too led to reduction in the cultivation of maize.

The increase in cultivation of cardamom, a cash crop, may be attributed to the development of road and transport facilities which significantly improved accessibility to the market. Any increase in people's income generally increases accessibility to communication and recreational facilities. Here too we find evidence of this pattern.

54 https://knoema.com/atlas/Bhutan/Chhukha, accessed on 24 Nov 2017
55 http://www.chhukha.gov.bt/?page_id=18
56 Id
57 Id

5 Way Forward And Recommendations

Bhutan has been successfully using its hydropower potential as a springboard to economic and social wellbeing. Despite the shortage and seasonal variance in demand-and-supply of electricity, hydropower provides opportunities for cross-border energy trade. That is the reason hydropower projects attract foreign direct investment. According to the Investment Board of Nepal, the energy sector comprises 46 percent of the total foreign investment pledged in the country. Bhutan too received investment from India and Austria. However, the two countries need to develop state-of-the-art institutions and physical infrastructure to ensure continual growth in energy connectivity and trade.

The importance of cross-border energy trade in ushering collective advantage has been well-established. India had been extensively engaged with both Nepal and Bhutan in promoting hydropower plants as clean energy sources. These plants not only meet the energy demand in their respective countries, but also improve the socio-economic condition of society at large.

The direct benefit of these projects comes in the form of employment opportunities for local communities and in the setting up of educational and health facilities. The socio-economic impact study has revealed that the access to electricity has improved the quality of life of students, homemakers (women) and rural households mainly. The quality of services of basic health units and other services such as transport and communications also improved tremendously when the project started.

Furthermore, such projects contributed immensely in the development of remote places by stirring the rural economy and creating livelihoods. The optimum energy supply and development brought in by the hydropower projects had been possible due to sufficient flow of investment and timely execution. Therefore, it is recommended that not just bilateral trade, but regional trade should also be promoted.

It must be said though there are some people who also lose from these projects. This is mainly because policy-makers and project developers failed to recognize the asymmetry of cost incurred and benefits reaped by the local people. As there would be some local groups such as incumbents providing electricity access to the local people through diesel generator sets would lose their business, amongst others.

Expert believes that for a trade cooperation to be successful at the regional level, policies and investment initiatives should be in cohesion with what people need. The local communities must be able to connect with the initiatives undertaken under these projects. CBET would stand to gain if the benefits became visible at the granular level. Therefore, it is recommended that projects in the future should develop a mechanism to identify people who would lose their livelihood because of the project and compensate them fairly and equitably.

Scope for CBET

Significant seasonal complementarities exist in electricity demand among countries in the Bay of Bengal.[58] While India is majorly dependent on coal for generating power, Bhutan and Nepal depend on hydropower. For example, during winter when the run of rivers become dry, Bhutan and Nepal import electricity from India and India imports electricity from Bhutan during summer and monsoon seasons.[59]

58 The Benefits of Expanding Cross-Border Electricity Cooperation and Trade in South Asia, World Bank Project Number P143029, March 2016.
59 Ibid

Owing to dependence on hydroelectricity generated from the run of rivers which in turn are seasonal in Bhutan and Nepal, the two Himalayan countries suffer from severe power shortages during winter when the rivers dry up. Bangladesh also suffers from severe power interruptions leading to significant economic losses to the tune of 0.5% of GDP. India also suffers from power deficits and consequent outages during summer and monsoon when the demand for electricity is high.

These shortages affect economic activities in the region. To deal with the situation, industries, commercial units and households depend on inverters or generators which trigger increase in the use of fossil fuel and hence add to the problem of carbon emission. Therefore, it is recommended that such complementarities and economic opportunities in the region should be tapped and taken advantage of for mutual benefit. Effective use of these complementarities has the potential to create both social and economic value for local people through energy trade. Consequently, it would attract investment in the sector, subject to successful negotiations between neighbors.

The benefits of CBET need not stay limited to electricity exchange, but should also be extended to the people affected by such projects. It has been observed that energy treaties are not always balanced between bigger and smaller countries. In case of Rahughat hydroelectric project in Nepal, the labor force for the project was imported from India. Only one-third of the total labor force used in the project was hired from the local community.

It is recommended therefore that there is a dire need for bilateral and regional treaties which promotes equitable benefits. The treaties should highlight the contours of the contract which are beneficial to the parties involved. Further, in order to facilitate greater regional cooperation, it is imperative that both the parties in a treaty should get equitable benefits.

The case of Rahughat project could be a lesson for policy-makers and project developers. It has raised concerns on the post contractual opportunistic actions of project developers. There have been instances in the past where the rules of the game were changed post bidding. As a result, project developers knowingly entered into unviable contracts with the hope that such contracts will be renegotiated later. There is a lesson here for the policy-maker to strengthen contracts by inducing risk mitigating measures.

While CBET offers huge benefits as discussed above, there are various technical, political, and regulatory challenges that need to be addressed effectively and in a timely manner. In order to overcome technological challenges, it is essential that the power generation system within countries in the region be flexible enough to help them effectively use various complementarities emanating out of seasonal variations, consumption pattern and time differences.

Further, to create a political consensus it is essential to understand the costs and benefits of CBET at a granular level. Lastly, there is an urgent need to communicate the benefits accruing from CBET among various categories of stakeholders to generate greater stakeholder buy-in.

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40. Information under this heading has been obtained from EIA (1998), IEE (2010) and Supplementary IEE (2016) reports of the project and NEA's annual reports (2010-2016).

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42. Note that these are names of the villages with the Village Development Committees, some names of villages and VDCs tend to be while some are different

43. Following the state restructuring as per the new federal regime, local authorities have also been restructured into Village Council, Municipalities, Sub-Metropolitan and Metropolitan cities. As a result, the VDC have been regrouped and converted into Village Councils or Municipalities. This restructuring was undertaken in February 2017 only so database on Village Council level is yet to be up-to-date, hence, this research has focused on existing VDC level data for the convenience.

44. Chhetri, Bramhin and Thakuri belong to so-called higher caste and Magar is considered indegeneous community

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Annexure 1

Key Informant Interviews in Nepal

Name: Jeevan Bishwokarma (Date: 13 June 2017, Beni)
Designation: President
Department/Organization: Myagdi Chamber of Commerce and Industry

Name: Jeevan Malla (Date: 12 June 2017, Rakhu Piple)
Designation: Chairperson
Department/Organization: Ward No 3, Raghuganga Village Council, Myagdi
Village and/or District: Myagdi

Name: Pramod Shrestha (Date: 9 June 2017, Kathmandu)
Designation: Executive Member, Federation of Nepalese Chambers of Commerce and Industry and Immediate Past President, Myagdi Chamber of Commerce
Village and/or District: Myagdi

Name: Mani Kumar Kafle (Date: 21 May 2017)
Designation: Project Head, Rahughat Hydroelectricity Project

Name: Shreeram Raj Pandey (Date: 11 July 2017)
Designation: Project Head, Rahughat Hydroelectricity Project

Name: Kumar Pandey (Date: 25 June 2017)
Designation: Vice president, Independent Power Purchasers' Association of Nepal

Name: Keshab Dhoj Adhikari (Date: 25 June 2017)
Designation: Joint Secretary, Water and Energy Commission Secretariat

Focused group discussion participants (Nepal)

The FGDs were undertaken at two locations: Rakhu Piple and Mahuwaphant

Rakhu Piple (12 June 2017)

1. Jeevan Malla, President, Raghuganga Village Council, Ward No 3
2. Muktinath Sharma, Secretary, Raghuganga Village Council, Ward No 3
3. Arjun Shahi, Chairperson, Nawa Santosh Sewa Club
4. Dev Kumari Shahi, Member, Raghuganga Village Council, Ward No 3
5. Laxman Shahi, grocery shop owner
6. Dev Subedi, Project Site Coordinator hired by Gorkha Constructions

Mahuwaphant (14 June 2017)

1. Dandapani Subedi, Former Ward Chairman
2. Bishnu Malla, Member, Disctrict Committee, Nepali Congress party
3. Harihar Khatri, owns a shop in Mahuwaphant
4. Sabitra Malla, Member, Raghuganga Village Council, Ward No 4
5. Rama Khatri, Dagnam resident

About SARI/EI

Over the past decade, USAID's South Asia Regional Initiative/Energy (SARI/E) has been advocating energy cooperation in South Asia via regional energy integration and cross-border electricity trade in eight South Asian countries (Afghanistan, Bangladesh, Bhutan, India, Pakistan, Nepal, Sri Lanka and the Maldives). This fourth and the final phase, titled South Asia Regional Initiative for Energy Integration (SARI/EI), was launched in 2012 and is implemented in partnership with Integrated Research and Action for Development (IRADe) through a cooperative agreement with USAID. SARI/EI addresses policy, legal and regulatory issues related to cross-border electricity trade in the region, promote transmission interconnections and works toward establishing a regional market exchange for electricity.

About USAID

The United States Agency for International Development (USAID) is an independent government agency that provides economic, development, and humanitarian assistance around the world in support of the foreign policy goals of the United States. USAID's mission is to advance broad-based economic growth, democracy, and human progress in developing countries and emerging economies. To do so, it is partnering with governments and other actors, making innovative use of science, technology, and human capital to bring the most profound results to a greatest number of people.

About IRADe

IRADe is a fully autonomous advanced research institute, which aims to conduct research and policy analysis and connect various stakeholders including government, non-governmental organizations (NGOs), corporations, and academic and financial institutions. Its research covers many areas such as energy and power systems, urban development, climate change and environment, poverty alleviation and gender, food security and agriculture, as well as the policies that affect these areas.

For more information on the South Asia Regional Initiative for Energy Integration (SARI/EI) program, please visit the project website:

www.sari-energy.org