WATER AND HYDROPOWER IN A FEDERAL NEPAL:

DEVELOPMENT AND DECISION-MAKING

FROM A COMPARATIVE PERSPECTIVE

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Development and Decision-Making from a Comparative Perspective

Contents

LIST OF ACRONYMS

DoED	Department of Electricity Development
EIA	Environmental impact assessment
FITTA	Foreign Investment and Technology Transfer Act
GW/h	Gigawatt-hour
GoB	Government of Bihar
IEE	Initial environmental examination
IPP	Independent power producer
INPS	Integrated National Power System
ILO	International Labor Organization
kW	Kilowatt
MW	Megawatt
MoU	Memorandum of Understanding
NWP	National Water Plan
NEA	Nepal Electricity Authority
NWPP	Nepal Workers and Peasants Party
PRoR	Peak-in run of river
PPA	Power purchase agreement
RoR	Run of river
UNDP	United Nations Development Program
WCD	World Commission on Dams
WECS	Water and Energy Commission Secretariat

Preface

Nepal declared its status as a federal republic in late 2007, through an amendment to the Interim Constitution of 2007, and is now called the Federal Democratic Republic of Nepal.

With this historic decision, the small Himalayan country opted for a fundamental shift from a unitary system of government to a decentralized one. Typically, federations include: at least two, and more often three, orders of government, with each level having a certain degree of self-rule; a rather complex distribution of jurisdictions and fiscal powers; and mechanisms and institutions at the centre that ensure the unity of the country, to mention only a few important features.

While there has been ample discussion within the constitution drafting process about how to translate this decision in principle into an institutional set-up, important issues still need to be negotiated and settled. On May 28, 2011, the deadline for the approval and enactment of a new constitution was therefore postponed for a second time.

The decision to become a federation will not only have an impact on the institutional and fiscal structure of the country, it will also affect, with a few notable exceptions, almost all sectoral policies and related public services to be delivered to the people of a federal Nepal.

In this paper, one vital sectoral issue is more closely examined: Water and its use. The central focus of this study is the production of hydropower. These two closely related topics are of crucial importance to the overall development of the country and to the livelihood of the Nepalese people.

More concretely, this study explores the implications of Nepal's decision to become a federal country for the water and hydropower sector, in terms of the governance structure for decision-making in this area. Its purpose is to identify and draw attention to key issues in the management of water and hydropower resources at all levels of governance in a future federal Nepal.

In methodological terms, this study provides a comparative analysis of the current challenges facing Nepal in this sector and relevant experiences from another federal country, Switzerland. With this approach the study aims to provide additional perspectives and views on governance issues for the Nepalese water and hydropower discussion and agenda.

The challenges related to the topic and this methodology are considerable: Governance issues related to water and hydropower production in Nepal have thus far received limited attention in specialized literature and in mainstream news media, and have never, to our knowledge, been analyzed from a federal perspective. Moreover, discussion of the subject requires multidisciplinary analysis involving various aspects of economics, the environment, law and engineering, as well as other disciplines. It would eventually be desirable to have a broader comparative reference base than one country can provide (aside

from the inherent shortcomings of comparative approaches). Therefore, the study does not pretend to be comprehensive by providing complete answers to all the new questions. Rather, it aims initially to raise the relevant questions and contribute to a discussion which is barely underway.

For the Forum of Federations, this comparative approach has been a very inspiring exercise, and we sincerely thank all of its contributors. The study owes a great deal to Ratna Sansar Shrestha, a Kathmandu-based Nepali water resource analyst, who provided valuable data and a critical analysis of Nepal's water and hydropower sector. Special thanks go to the following Swiss resource persons: Bernard Dafflon, Professor of Public Finance of the University of Fribourg in Switzerland, and Hugo Aschwanden, PhD, Head of the River Basin Management Section of the Swiss Federal Office for the Environment. We also wish to thank other individuals, specifically: Blanche Villard of the Swiss Foundation for Sustainable Development of Mountain Regions (based in Sion), for facilitating the consultation process in Switzerland; Roderick Macdonell and Robert Winters for copy-editing the text; and Rita Champagne for proofreading and graphic design of this document. Rachel Higgins and Irina Shmakova (Ottawa), and Vickal Deep Khadka (Kathmandu) of the Forum also assisted in the publication process.

With this publication, the Forum hopes to contribute to the Nepalese debate on constitution-drafting and the subsequent sectoral legislation work by providing access to key comparative information. This book is intended for Constituent Assembly members, political parties, representatives of professional organizations and other stakeholder organizations engaged in or interested in issues of water and hydropower production.

The project is part of the Forum's Nepal Program 2008-2011, entitled *Federalism in Nepal: Supporting Nepal's Constitutional Transition*, which aims to: (a) strengthen the capacity of the Constituent Assembly members to draft a federal constitution, (b) enhance knowledge of federal systems among political party leaders and civil servants, and (c) increase public understanding of federalism. This project has been mainly funded by the Swiss Agency for Development and Cooperation (SDC).

The Forum of Federations is an international governance organization founded by the Government of Canada in 1999. It is concerned with the contribution that federal and devolved forms of governance make to the maintenance and construction of democratic societies and governments. The Forum seeks to strengthen democratic federal governance through learning among practitioners and experts.

It pursues this goal by:

- Enhancing mutual learning and understanding of federalism among practitioners.
- Building international networks and fostering the exchange of experience on federalism and multi-level governance.

- Disseminating knowledge and technical advice of interest to existing federations and of benefit to countries considering devolved and decentralized governance options.

Today, the Forum is supported by nine partner governments: Australia, Brazil, Canada, Ethiopia, Germany, India, Mexico, Nigeria and Switzerland. It currently has development assistance programs in Ethiopia, Nepal, Pakistan, and Sudan; and has managed programs in Iraq, Nigeria and Sri Lanka.

Introduction

Nepal's richest natural resource is almost certainly its water. The country's potential for hydropower generation has been estimated at up to 80,000 megawatts (half of India's current total electricity capacity), but fewer than 1,000 megawatts (MW) have been developed and most Nepalese live in a pre-industrial energy economy with little to no access to electricity. The development of even a portion of this hydroelectric potential could have a transformational impact on Nepal's economy and society over time.

Apart from its use for hydropower generation, water has many other human uses and ecological functions that compete as alternative prioritizations for its deployment. Water management necessarily involves multiple objectives and thus conflict arises among various proponents with interests in agriculture, hydropower, the environment and other domestic uses of water. Nepal's Water Resource Act of 1992 set hydropower as the country's fourth highest priority, according greater weight to issues of water and food security. Any decision related to the use of water for energy production must take into account the multitude of uses for water resources.

In 2007, an amendment to the Interim Constitution declared Nepal to be a federal republic. The deadline for the promulgation of the new constitution, originally set for May 28, 2010, was extended for a year, and then another three months. Another three-month extension was recently adopted, thus moving back the deadline for the constitution to November 28, 2011.

It is expected that Nepal's new federal arrangement will have a fundamental impact on water resources. In particular, the new federal system is likely to result in the empowerment of provincial governments and grassroots-level agencies, and lead to the enhancement of local involvement in decision-making and environmental protection. Moreover, a federal system will necessarily raise the question of sharing the economic benefits associated with, and flowing from, the development of this resource.

Nepal is committed to the principle of becoming a federation and has elected a Constituent Assembly charged with drafting a new, federal constitution. To date, there has been little focus on how water will be managed in federal Nepal. The constitution will set out the number of provinces and their boundaries, and it will establish the political and institutional framework within which water issues are to be addressed. Therefore, the drafting and implementation of the constitution represents a crucial opportunity to develop a framework to promote the sustainable exploitation of Nepal's water resources, one that will satisfy current needs while preserving the environment so these needs can be met for generations to come.

Scope, purpose and content of the study

The purpose of this publication is twofold: (a) to provide an overview of some of the key issues of water use for hydropower production related to Nepal becoming a federal state, and (b) to facilitate dialogue among various key stakeholders, and thus assist Nepalese authorities to make informed decisions on the country's constitutional design and on issues involved in legislation dealing with the use of water resources for hydropower production.

More specifically, this study highlights key factors to consider in designing a political and legal regime for hydropower production in Nepal, taking into consideration equity, efficiency and environmental sustainability. A key factor in successfully exploiting Nepal's water resources is governance, and how this will be reconciled in terms of constitutional, legal and administrative norms, as well as structures and processes.

In PART I, the study will examine water availability and the use of water in Nepal as well as the related topic of energy production. This section also considers the political and legal framework of hydropower production, as well as the policies, plans and strategies related to water and hydropower in Nepal. PART II offers a description of the strategic sector of hydropower and the milestones in its development in Nepal, leading to a review of the country's governance framework for hydroelectricity combined with the economic and environmental aspects of hydroelectric production. In PART III, as Nepal is on the verge of adopting a new constitution reflecting its new federal structure, the study discusses challenges and action-related issues, then closes with a short section of conclusions and recommendations.

This is a discussion paper, not an empirical technical document. The paper is based in part on somewhat scattered publicly accessible information as well as on interviews with officials and individuals possessing thorough knowledge and insights available only to insiders.[1] It assembles a selection of technical and legal information in a manner that brings governance issues and their implications to the forefront.

The target audience of this study includes government officials, political parties, researchers, academics, students, journalists, and members of non-governmental and international organizations.

Water and concepts of water governance

While some consider water a common good, it is mostly treated as a social and economic good. The 1992 Dublin Statement on Water and Sustainable Development asserted the principle that: "Water has an economic value in all its competing uses and should be recognized as an economic good." The statement goes on to say that "within this principle, it is vital to recognize first the basic right of all human beings to have access to clean water and sanitation at an

1. The list of people interviewed for this study is in Appendix III.

affordable price. Past failure to recognize the economic value of water has led to wasteful and environmentally damaging uses of the resource. Managing water as an economic good is an important way of achieving efficient and equitable use, and of encouraging conservation and protection of water resources."

The United Nations Development Program (UNDP) and International Fund for Agricultural Development have identified four dimensions of water governance: social, economic, political and environmental.2 The social dimension calls for an equitable use of water resources. The economic dimension of water governance speaks to the efficient use of water resources and the role of water in overall economic growth. The political dimension involves granting water stakeholders and citizens at large equal democratic opportunities to influence and monitor political processes and outcomes. The last dimension is one of environmental sustainability which shows that improved governance allows for enhanced sustainable use of water resources and ecosystem integrity.

More specifically, the UNDP defines governance as: "The exercise of economic, political and administrative authority to manage a country's affairs at all levels. It comprises the mechanisms, processes and institutions, through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences." [3]

Several studies have illustrated that per capita income and the quality of governance are strongly positively correlated across countries. Better governance exerts a powerful influence on per capita incomes. How water quality, quantity and related services are allocated and distributed has a direct impact on people's health as well as on their livelihood opportunities.

It is for these reasons that this study presents information on the availability, use and governance aspects of water and, in particular, hydropower production in Nepal.

2. *Water for People — Water for Life: The United Nations World Water Development Report, 2003.*
3. United Nations Development Program, *Governance for Sustainable Human Development*, UNDP policy document, New York, 1997.

PART I: Availability and use of water in Nepal

"Water, water everywhere but not a drop to drink"

At first glance, Nepal is blessed with an abundance of water. According to Food and Agriculture Organization data,[4] water availability per person per year in Nepal was 9,122 m^3 in 2002. It was significantly lower in the neighbouring countries of: Pakistan, where there were 2,961 m^3; Sri Lanka, 2,642 m^3; China, 2,259 m^3; and India, only 1,880 m^3.

Nepal's water availability of 9,122 m^3 per person per year is quite high compared with that of other, more affluent Asian countries. Those range from 3,383 m^3 in Japan to 149 m^3 in Singapore. Against a backdrop of depleting forests and a lack of minerals, except for good-quality limestone, water is the main natural resource with the potential to drive Nepal's future prosperity.

The paradox of Nepal being known as rich in water resources while its people are water-poor is climate-related: About 80 per cent of the country's annual rainfall occurs during the monsoon season, generally from June to September, while the rest of the year is quite dry. In other words, Nepal is hit with flooding during the four months of the wet season and suffers from drought the rest of the year. Even during the wet season, water is not available where it is needed, and too much of it is located where it is *not* needed.

As in other countries, a multitude of users compete for their share of the available water. Section 7 (1) of Nepal's Water Resources Act of 1992 sets out the following "priority order" for the utilization of water resources:

1. Drinking water & sanitation
2. Irrigation
3. Agricultural uses including animal husbandry and fisheries
4. Hydropower
5. Cottage industry, industrial enterprise and mining uses
6. Navigation (water transportation)
7. Recreational uses
8. Others

While water availability per person per year is high, Nepal nevertheless suffers from rampant water scarcity. 5 Only a fortunate few have access to piped water. The taps are dry much of the time. Most people are dependent upon the conventional sources of water, including from often-unsafe wells, lakes, rivers and springs. In most places in Asia, piped water is generally deemed safe and

4. Source: http://www.unesco.org/bpi/wwdr/WWDR_chart1_eng.pdf.
5. Australia's average per person water consumption was 493 liters per day in 2008 while in the U.S. it was 575 liters daily in 2008 and China's daily per capita consumption in 2006 was 86 liters. (http://www.greenlivingtips.com/articles/185/1/Consumption-statistics.html). The daily water use per inhabitant in urban Katmandu is estimated at 73 liters (Joshi et al 2003). Using this estimate of Nepali urban water consumption, it could reasonably be considered that daily water use per inhabitant in rural areas is much lower.

clean, compared to water obtained from conventional sources. However, this is not the case in Nepal and, consequently, deaths due to water and sanitation-related diseases are widespread. As a result, advertisements urging people to drink only boiled water have become a dependable source of revenue for the electronic and print media. This is reminiscent of a common saying, adapted from the *Rhyme of the Ancient Mariner*, by Samuel Taylor Coleridge: "Water, water everywhere but not a drop to drink."

The situation for irrigation is similar to that of water and sanitation described above. There are 3.97 million hectares of cultivated land in Nepal, of which about 0.5 million hectares receive some irrigation, mostly during the wet season. This is similar to other agricultural uses of water, including animal husbandry and fish hatcheries.

Industrial use of water is also limited. The only waterway for transportation is the reservoir of the Kali Gandaki River. As well, there are some recreational uses of Nepal's water resources, such as for rafting and canoeing.[6]

In Nepal as well as abroad, the feature of water resource exploitation that has drawn the greatest attention is the generation of hydropower. The capability to generate hydropower comes from the country's terrain and topography, with water falling from high elevations providing a "head" for electricity generation along with the "flow" which is formed by the narrow gorges. These features provide ideal and cost-effective venues for reservoirs to store water in the wet season and have it available in the dry season, thereby diminishing the impact of supply peaks and troughs. Reservoirs also provide a flood control facility. In contrast, large quantities of water in Nepal drain into the Ganges river in India, in the states of Uttar Pradesh, Bihar and West Bengal. But these states cannot capitalize on the water resources as their topography does not offer the necessary elevations and gorges to generate electricity cost-effectively, nor to control flooding.

Nepal's Himalayan range is considered South Asia's water reservoir. But the receding of snow lines in the mountains, attributed to climate change, is a source of concern. This phenomenon is contributing to the formation of glacial lakes and creating the real danger of severe flooding from those lakes in the floodplain of nearby rivers. This represents a serious threat to people's lives, endangers land and properties in the path of the flooding, and poses a threat to the hydropower projects on the affected rivers. Some fear the melting snow in the Himalayas will lead to reduced quantities of water in the

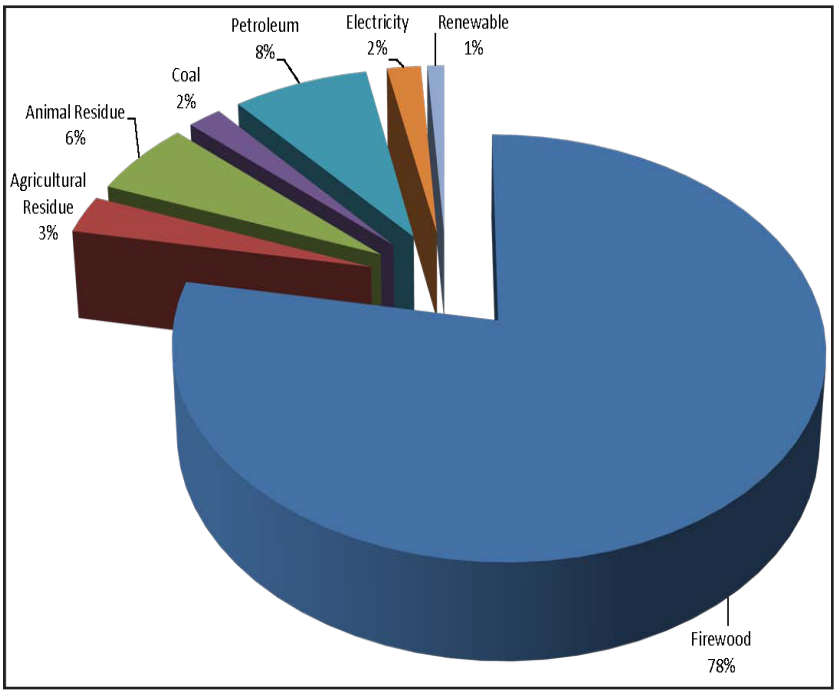
6. The category referred to as "Others" includes customary, cultural and spiritual uses. In Nepal, custom and culture, including festivals, of all ethno-cultural-religious-linguistic groups, is woven around a body of water such as a river, well, spring, lake, pond, fountain or waterfall. Even traditional fairs are held in or around bodies of water. Rivers and their water were needed for rituals ranging from enthronement and coronation of kings before abolition of the monarchy to cremation of indigents. So important are these bodies of water that examples of famous ancient architecture can be seen in abundance on the embankments of rivers, ponds, lakes and terraced structures. Stone spouts can be observed as well as carvings and carved idols in stone and metal.

region's rivers, causing an adverse impact on Nepal's water resources, while other experts disagree.[7]

Water and energy production

Currently, 87 per cent of Nepal's energy comes from traditional sources such as firewood and animal and agricultural residue. Of Nepal's modern energy sources, coal and petroleum products account for 1.95 per cent and 7.87 per cent of energy production, respectively. Only 2.14 per cent of the country's energy supply comes from electricity and 0.72 per cent from renewable energy sources. This is because more than 60 per cent of the population does not have access to electricity, while most of those who do have such access use it for lighting purposes only. This is reflected in the chart below:

Table 1: Estimated energy mix in Nepal



Data compiled by Ratna Sansar Shrestha, December 2010

7. A study conducted by Dr. Donald Alford, titled *Annual Runoff from Glaciers of the Nepal Himalaya*, seems to rebut this concern. Alford states that runoff from the glacier portions of the three catchments (Karnali, Narayani and Sapta Kosi) was slightly less than 5,200 million cubic meters annually, representing about four per cent of the estimated 145,000 million cubic meters that flow on average into the Ganges River from Nepal each year.

Clearly, Nepal has developed only a small portion of its hydropower potential. Of the estimated potential of 83,000 megawatts (MW) of hydropower, only about 644 MW have been developed, according to the Nepal Electricity Authority (NEA 2010).

Nepal's Western Development Region produces about 330 MW, the most in the country, while it consumes about half that amount. The Eastern Region produces 14 MW and uses 20 times that amount. The Central Development Region consumes a little more than the 277 MW it produces. This is due to a higher population density, the concentration of industrial belts (such as the *Sunsari-Morang*, the *Bara-Parsa* and the *Rupandehi-Nawalparasi* belts) and the need to extract ground water used for irrigation purposes and to increase the water supply. Hydropower project sites are mainly concentrated in the mid-hills areas, which are sparsely populated and do not have many industries.

Electricity consumption per capita is low in Nepal; in 2006 it was only 70.865 kW/h[8] compared with about 1,460 in the U.S., 700 in the European Union, 868 in Japan and 785 in Russia.

Political and legal framework of hydropower production

Legal provisions of water and hydropower

There are provisions that address the area of water and hydropower in various Nepalese laws ranging from the Constitution to a variety of acts and regulations. Similarly, there is also international law relevant to Nepal, such as Convention C169 of the International Labor Organization (ILO), which contains dispositions on natural resources and their linkage to indigenous and tribal peoples.

Interim Constitution

Nepal's 2007 Interim Constitution assigns to the state the responsibility to "use existing natural resources including water resources of the country for the interest of the nation," under Article 33 (o). Similarly, Article 35 (4) stipulates that "the state shall, while mobilizing the natural resources and heritage of the country that might be useful and beneficial to the interest of the nation, pursue a policy of giving priority to the local community."

Moreover, Article 156 (2) of the Constitution requires that when division of natural resources is contemplated, any treaty or agreement must be approved "by a two-thirds majority of the total number of members of the Legislature-Parliament." The provision specifies that if the treaty or agreement referred to "is of (an) ordinary nature which does not affect the nation extensively, seriously or in the long-term," the approval by a simple majority of present members of the Legislature-Parliament is sufficient. One school of thought considers that the export of power constitutes a division of the use of natural

8. Source: http://www.nationmaster.com/graph/ene_ele_con_percap-energy-electricity-consumption-per-capita.

resources and is subject to two-thirds approval, while others argue that such a power export would simply be an act of international trade.

Electricity Act of 1992

The Government of Nepal enacted the Electricity Act of 1992, along with the Water Resources Act of 1992, which ushered in the advent of economic liberalization in the power sector, as had been envisaged in the Electricity Development Policy of 1992. The Electricity Act was adopted "to develop electric power by regulating the survey, generation, transmission and distribution of electricity and to standardize and safeguard the electricity services." The aim of the legislation was "to make arrangements for the rational utilization, conservation, management and development of the water resources and to make timely legal arrangements for determining beneficial uses of water resources, preventing environmental and other hazardous effects thereof and also for keeping water resources free from pollution."

Electricity Bill of 2009

The Government of Nepal tabled the 2009 Electricity Bill to improve upon previous legislation, based on lessons learned from the implementation of the previous act. The bill was also meant to implement provisions of the Hydropower Development Policy of 2001. The government also tabled the Nepal Electricity Regulation Commission Bill in parliament in 2009. However, as of April 2011 when this study was completed, these had yet to be passed as 142 amendments to the bills had been proposed. The most important proposed amendments relate to energy security and reducing the country's dependence on imported fossil fuel, ensuring optimum exploitation of resources, setting up a state-owned firm whose purpose would be to sell power internationally, facilitating investment by locals in hydropower projects, as well as ensuring there is effective integrated water resource management.

ILO Convention C169

The International Labor Organization calls this convention the "Indigenous and Tribal Peoples Convention" of 1989. It is a legally binding international instrument which deals specifically with the rights of indigenous and tribal peoples, and has been ratified by Nepal. Article 15 of the convention states that rights of the peoples who have an interest in the natural resources shall be specially protected: "These rights include the right of these peoples to participate in the use, management and conservation of these resources." It does not address the issue of investment in hydropower projects by the indigenous and tribal peoples.

Policies, plans and strategies of water and hydropower

Nepal's first written policy on water and hydropower, which came in 1992, was a confirmation of the economic liberalization of this sector. A new policy came into effect in 2001. Although hydropower is a subsector of water resources, Nepal still lacks a policy for its water resources, which is referred to only in passing in this policy. The government's Water and Energy Commission Secretariat unveiled a draft water resource policy in April 2010. The government has also approved a water resources strategy and a national water plan.

Hydropower Development Policy of 1992

The Hydropower Development Policy was formulated in 1992 to bring about economic liberalization in the hydropower subsector in particular, and the water resource sector in general, as alternative arrangements were needed to provide for the country's pending completion of several projects to come on-stream within seven to 12 years. It was necessary to construct small hydroelectric projects to meet the demand of those living in the hilly and remote Himalayan regions where the national electrical system has not been extended. Distribution of power must also be extended to the rural areas where electrification has not been completed. As well, hydropower for the entire country should be increased by encouraging foreign and local investors to invest in the electricity sector. The Electricity Act and Water Resources Act were enacted to realize those goals.

Hydropower Development Policy of 2001

The country's new hydroelectric policy was formulated in October 2001. The policy was meant to refine and update the existing policy and bring it in line with new concepts in the international market, and their impact on technological developments and the export of power, as well as the possibility of promoting foreign investment and environmental conservation. However, as of the completion of this paper in April 2011, the new policy had not yet been enacted.

Water Resources Strategy of 2002

The government formulated the Water Resource Strategy in 2002. Its purpose was "to identify effective, scientific, sustainable and consensus-based mechanisms to facilitate the implementation of action-oriented (water resource) initiatives and programs." The strategy states that living conditions of the Nepali people are to be significantly improved in a sustainable manner. The strategy includes short-, medium- and long-term goals, and identifies 10 strategic priorities. The following indicators were set out for the hydropower subsector:

By 2007: 820 MW of hydropower capacity were to be developed to meet projected demand, including 70 MW for export.

By 2007: laws were to have been enacted making mandatory the participation of national contractors and consultants in all types of projects.

By 2007: 25 per cent of the country's households were to be supplied with electricity.

By 2017: 2,230 MW of hydropower is to be developed to meet the projected demand, including 400 MW for export.

By 2017: 38 per cent of households are to be supplied with electricity.

By 2027: 60 per cent of households are to have access to electricity.

By 2027: Nepal is to export substantial amounts of electricity, thereby earning revenue for the state.

In mid-July 2010, almost 645 MW of power were being generated.

National Water Plan (NWP) of 2005

The Government of Nepal developed its National Water Plan (NWP) in 2005, with the goal of ensuring that tangible benefits are delivered to all the people in line with their basic needs. Specifically, the NWP was developed to realize the output objectives of the Water Resource Strategy described above. The notion of Integrated Water Resources Management was adopted as one of its principal themes. The following targets were set for the hydropower subsector:

By 2007:

- Hydropower generating capacity was to be increased to 700 MW to meet the projected domestic demand.
- Legislation was to have been enacted making participation of national contractors and consultants mandatory for all types of projects.
- Thirty-five per cent of the country's households were to have been supplied with electricity, eight per cent of the population was to have been served by micro and small hydro-generating systems and two per cent were to be served by alternative energy sources.
- Per capita electricity consumption of 100 kW/h was to be achieved.

By 2017:

- 2,100 MW of electricity from hydropower are to be generated to meet projected domestic demand.
- Fifty per cent of households are to be supplied with electricity, 12 per cent of those living in isolated areas are to be served by micro and small hydro-generating systems, and three per cent of the population is to be served by alternative energy.
- Per capita electricity consumption of 160 kW/h is to be achieved.
- The Nepal Electricity Authority (NEA) is to become a corporation.

By 2027:

- About 4,000 MW of hydropower are to be developed to meet projected domestic demand.
- Seventy-five per cent of households are to be supplied with electricity, 20 per cent of those living in isolated areas are to be served by micro and small hydro-generating systems, and five per cent of the population is to be served by alternative energy.
- Per capita electricity consumption of more than 400 kW/h is achieved.
- Nepal is to be exporting substantial amounts of electricity, thereby earning important revenue.
- The Nepal Electricity Authority (NEA) is to be privatized.

It should be noted that the target for 2007 electricity generation was set at 700 MW, which is lower than the indicator of 820 MW set by the water strategy.

Periodic Plans

In the context of Nepal's planned development, 10 periodic plans have been implemented and an 11th is under way. All of the plans up to the 10th were for five-year periods, except for the second which was only for three years (1962-65). The planning process began in 1956 and the last plan, the 10th five-year plan, ended in July 2007, after which a three-year Interim Plan was implemented through July 2010. It aimed to increase the country's installed hydropower capacity from 560 MW to 704 MW. The National Planning Commission has yet to make public whether this goal was achieved.

PART II: Hydropower: governance of a strategic sector

The online Encyclopedia Britannica defines **hydroelectric power** as: "Electricity produced from generators driven by water turbines that convert the potential energy in falling or fast-flowing water to mechanical energy. In the generation of hydroelectric power, water is collected or stored at a higher elevation and led downward through large pipes or tunnels (penstocks) to a lower elevation; the difference in these two elevations is known as the head. At the end of its passage down the pipes, the falling water causes turbines to rotate. The turbines in turn drive generators, which convert the turbines' mechanical energy into electricity."

The following are the main methods of hydropower generation:

- Run of river project (RoR).
- Daily pondage (also known as Peak-in RoR project (PRoR).
- Storage project.
- Multipurpose project.
- Pumped storage.

Table 2: Sites, forms and installed capacity of power generation in Nepal

Method of hydropower generation	Facilities in operation	Total installed capacity
Run of river project	More than 20 facilities	231 MW, of which 167 MW were developed or owned by investors from the private sector, called independent power producers (IPPs). The IPPs sell electricity in bulk to the Nepal Electricity Authority through power purchase agreements (PPAs).
Daily pondage or Peak-in RoR project (PRoR)	Devighat (14.1 MW) Marshyangdi (69 MW) Trishuli (24 MW) Kali Gandaki A (144 MW) and Middle Marshyangdi (70 MW) projects have daily pondage facilities and represent a total installed capacity of 321.1 MW.	321.1 MW

Storage project	Kulekhani I and II (60 MW and 32 MW) are storage projects	92 MW
Multipurpose project	Pancheshwar and Koshi High Dam project conceived but not operational.	0
Pumped storage	N/A (no pumped storage project under construction).	0
Total		644 MW

For a comprehensive list of hydropower projects as of 2009/10, see Appendix I, p. 52.

Milestones and achievements in hydropower development

A major change began in Nepal's the hydropower sector in 1992, when the ownership of generating facilities started shifting to majority private hands after being a government monopoly for 80 years.

This was triggered by three key measures in 1992: the formulation of the Hydropower Development Policy and the enactment of the Electricity Act and the Water Resources Act. At the same time, almost 405 MW were added to the Integrated National Power System (INPS) grid, bringing Nepal's megawatt total to almost 698 (including 53.41 MW of thermal power). The 1992 measures were meant to bring about compliance with Nepal's hydropower development policy.

Until then, hydropower had been owned and operated by the public sector in Nepal. At that point, the total installed hydropower capacity in the INPS was only 240 MW, the sum total of all projects built there in the 80 years since 1911.

Compared to those first 80 years, Nepal has performed remarkably well in less than two decades since 1992. However, this period was also a turbulent one, marked by a number of milestones, not all perceived as positive.

Nepal became a net exporter of power with the commissioning of the Kali Gandaki, a hydroelectric project at the beginning of the millennium. However, it became a net importer by the middle of the 2000-10 decade because of increased demand for power in the country. Nepal exported 74.48 GW/h until mid-July 2010 while it imported 612.58 GW/h (NEA 2010).

Nepal's neighbours have enormous energy needs. For example India, with its 2010 installed power generation capacity of about 167,278 MW[9], had a shortfall of 20,000 MW.[10] Nepal has been selling power to India for a long time. The context of Nepal's water resources, in general, and its hydropower in particular, is best exemplified through a review of the history of the major events in Nepal, with regard to trans-boundary conflicts and cooperation agreements within the country.

9. Source: http://www.cea.nic.in/.
10. Source: http://www.gauravblog.com/?p=516.

Government-funded projects between 1950 and 1995

The Koshi Agreement was signed between Nepal and India in April 1954 and amended in 1966. It outlined the construction of a dam, head-works and other related infrastructure, called the Koshi Project, with the purpose of flood control, irrigation and the generation of hydroelectric power. The treaty was silent as to the amount of land to be irrigated and electricity to be generated. However, according to S.K. Malla, about 969,110 hectares of land is irrigated in India and 24,480 hectares are irrigated in Nepal (Malla 1995). Also, Nepal was supposed to receive half of the electricity generated from a 20 MW power plant. But the installed capacity of the power plant built at Kataiya in India was scaled down to 13.6 MW and Nepal's entitlement was reduced to 6.8 MW (Pun 2004). As a result, the treaty is not well-viewed in Nepal.

Plans are afoot to build a 269-metre-high dam, called the Koshi High Dam, with a gross reservoir volume of 13,450 million m^3, which is to generate 3,000 MW of power. There is also a plan to irrigate 546,000 hectares in Nepal and 976,000 hectares in India (JPO 2002). If this project proceeds, it will create additional power and enable greater flood control. However, Nepal will have to absorb the cost of flooding 80 villages in 11 districts as well as cover the cost of displacing 400,000 people including indigenous and tribal people.

India has accepted the "absolute territorial sovereignty" of Nepal over the water of the Koshi River (also known as the Kosi River), pursuant to the stipulation in Article 4 (i) which states that Nepal shall have the right to withdraw for irrigation and for any other purpose in Nepal "water from the Kosi River and from the Sun-Kosi river or within the Kosi basin from any other tributaries of the Kosi River as may be required from time to time." This is an important provision for Nepal. As for India, it has "the right to regulate all the balance of supplies in the Kosi River at the barrage site thus available from time to time and to generate power in the Eastern Canal," which has the effect of limiting Indian entitlement to water from the Koshi River.

The Gandak Agreement, pertaining to the Gandak Irrigation and Power Project, was concluded in December 1959 and amended in 1964. Unlike the Koshi treaty, this agreement spells out the amount of land to be irrigated in Nepal. It stipulated that 16,187 hectares (40,000 acres) are to be irrigated by way of the Western Nepal Canal, and 41,884 hectares (103,500 acres) through the Eastern Nepal Canal. The treaty also provided for the construction of a 15 MW power plant, of which 10 MW were earmarked for Nepal. There is no equivalent mention of the amount of land that is to be irrigated in India. But according to a Government of Bihar publication (GoB 1960), a total of 1.6 million hectares (3.9 million acres) of land were to benefit from irrigation in Uttar Pradesh and Bihar while 39,000 hectares are actually irrigated in Nepal (UN 2000).

In this treaty, India has recognized Nepal's territorial sovereignty over the Gandak River with a restriction on the inter-basin transfer of water from this

river during dry months. The agreement states that the Government of Nepal "will continue to have the right to withdraw for irrigation or any other purpose from the river or its tributaries in Nepal such supplies of water as may be required from time to time in the Valley." The parties agreed that separate accords would be struck between the governments of Nepal and India for the use of waters from February to April.

Under the Treaty of Mahakali, concluded in April 1995, Nepal has the right to a supply of 28.35m3/s (1,000 cubic feet per second) of water from the Sarada Barrage in the wet season, from May 15 to October 15; and 4.25m3/s in the dry season. The treaty does not state the total amount of water available in the river or the amount of land to be irrigated in India.

This treaty states that the two parties "have equal entitlement" to the utilization of the waters of the Mahakali River in conformity with the principle of equal sharing. Opponents of the treaty claim, however, that Nepal is not getting its fair share of this deal.

The treaty further states that "the cost of the project shall be borne by the parties in proportion to the benefits accruing to them." The agreement does not state the amount of water that will be shared by each party. However, Ajaya Dixit has stated that 93,000 hectares will be irrigated in Nepal and 1.61 million hectares in India upon completion of this project, which is expected to generate 6,840 MW (Dixit 2004). With the construction of a reservoir for this project, 8,650 hectares of land will be submerged in Nepal, or 43 per cent of the land required for the reservoir. An estimated 65,000 Nepalese are expected to be displaced.

Arguably the most controversial project was the Arun III Hydro Project, which was studied up to the pre-feasibility stage in the late 1980s. The total generation capacity was planned to be 201 MW. An attractive feature of the project was that it would draw its water from mountain glaciers and aquifers, and provide a steady supply of water even in the dry season. A distinct drawback was that a lengthy 122-kilometre road had to be built to the site of the planned hydroelectric facility at great expense of about $125 million. As it was heavily contested, however, the Arun III Hydro Project was cancelled by the World Bank on Aug. 1, 1995. The $1.1-billion project represented 1.5 times the annual national budget of Nepal. The World Bank cancelled the project after a Bank panel found that it had not followed its own procedures with regard to protection of the environment and of indigenous people who would have been affected by the project. The cancellation was a significant milestone that helped to pave the way for private sector investment in Nepal's hydropower sector.

While many claim the termination of the project aggravated Nepal's power shortages, it is also argued that, as a result of the cancellation, the following government-funded projects saw the light of day:

- Modi and its 14 MW.
- Kali Gandaki and its 144 MW.

- Middle Marshyangdi and its 70 MW.

Similarly, the private sector would probably not have been prepared to build the:

- Khimti project with its 60 MW.
- Bhote Koshi and its 36 MW.
- Chilime and its 20 MW.

Therefore, the demise of the Arun III Hydro Project led to an increase of about 294 MW of generating capacity, with total average annual generation of 1,793.36 GW/h at a total cost of $729.81 million. This works out to an average cost of $2,485 per kilowatt (kW), on projects completed in an average of 4.05 years. By contrast, had Nepal taken the Arun III route, it would have gained an additional 220 MW in the decade that ended in 2005, including Arun III, with an average annual generation of 1,845.86 GW/h at a total cost of $1.13 billion, with the average cost working out to $5,143 per kW, on projects planned to be completed in an average of 5.17 years.

Economic liberalization: hydropower projects and investments since 1990

Until 1990, hydropower projects in Nepal were considered public infrastructure projects. Some were built by donor countries and others with funding from multilateral financial institutions in the form of soft loans.

In the past two decades, the Government of Nepal, through the Nepal Electricity Authority, has invested about $800 million to add 235 MW to the system:

Table 3: Public sector investment in hydropower projects, 1990-2010

Project	Year completed	Capacity in MW	Investment in million US$
Modi	2000	14.8	30
Puwa	2000	6.2	15.7
Kali Gandaki A	2002	144	380
Middle Marshyangdi[11]	N/A	70	371
Total		235	797

Data compiled by Ratna Sansar Shrestha, December 2010

11. The contractor is reported to have lodged claims for an additional $143 million U.S., and the total investment will increase significantly if the NEA is forced to pay this amount.

With the advent of economic liberalization in Nepal, private investment, both domestic and foreign, has flowed into the hydropower subsector. The following is an overview of related private sector projects in the last two decades:

Table 4: Private Sector Investment in Hydropower Projects, 1990-2010

Project	Capacity in MW	Investment in million US$[12]		
		Domestic	International	Total
Khimti	60	5.1	134.9	140
Bhote Koshi[14]	36	2.5	97.5	100
Syange	0.183	0.3		0.3
Indrawati	7.5	22.1	1.2	23.3
Chilime	22	32.9		32.9
Piluwa	3	4.4		4.4
Chaku	1.5	2.1		2.1
Sun Koshi	2.5	5.3		5.3
Rairang	0.5	1		1
Baramchi	0.98	2		2
Khudi	3.45	8.3		8.3
Thoppal	1.65	3.3		3.3
Sisne	0.75	1.5		1.5
Sali nadi	0.232	0.464		0.464
Pheme	0.995	1.99		1.99
Pati khola	0.996	1.992		1.992
Seti II	0.979	1.958		1.958
Ridi	2.4	4.8		4.8
Upper Hadi	0.991	1.982		1.982
Mardi	3.1	6.2		6.2
Total	149.706	110.186	233.6	343.786

Data compiled by Ratna Sansar Shrestha, December 2010

Private sector investment to date in the country's hydroelectric system amounts to $343 million U.S., of which $233 million is foreign direct investment (FDI). This investment has produced about 150 MW of installed capacity. Moreover,

12. These conversions from Nepali currency into U.S. dollars are approximate.
13. One of the main foreign equity investors in Bhote Koshi Project has already sold its shares to an investor in Nepal.

$13.5 million was invested by the private sector in buying shares in Butwal Power Company (or BPC, owner of Andhikoha, 5.1 MW; and Jhimruk, 12 MW) held by the Government of Nepal. Thus, in a span of two decades, the private sector has invested $357.3 million in the hydropower sector.

Multilateral financial institutions like the International Finance Corporation (IFC) of the World Bank group and the private sector arm of the Asian Development Bank (ADB) have invested in the Khimti and Bhotekoshi hydroelectric projects, which were implemented by the private sector. Moreover, inhabitants living in the project area have also invested in hydropower projects.

Starting in 1990, the Government of Nepal also signed agreements with the private sector for the development of export-oriented hydropower projects.

Arun III (new) project: A Memorandum of Understanding for the 402 MW Arun III project was signed in March 2008. A previous project for the generation of 201 MW at this same site was cancelled in the last decade by the World Bank. The promoter of the current Arun III project has agreed to provide 21.9 per cent of the electricity produced there free of charge to Nepal. The capacity of this project is now estimated to be about 900 MW.

Upper Karnali: Similarly, a memorandum of understanding was signed in January 2008 for the Upper Karnali project, where 300 MW are to be generated, in an understanding that 12 per cent of the electricity will be given to the Government of Nepal for free, and 27 per cent equity in the project to the Nepal Electricity Authority. This project, too, has been reportedly optimized at 900 MW.

West Seti: In addition to those agreements, the Government of Nepal also signed a project agreement in June 1997 for the West Seti project, with a capacity of 750 MW, in an agreement whereby the government is to receive 10 per cent of the energy for free.

Hydroelectricity: the governance perspective

In this study, governance is defined as the exercise of economic, political and administrative authority to manage a country's affairs at all levels. It comprises the mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences.

This chapter addresses the key parameters in the governance of Nepal's hydropower sector. It provides a brief review of institutional arrangements related to property rights and how they are implemented, as well as offering insights on the economic underpinnings of the government-regulated industry. Short sections on rules and procedures to protect the environment and on the administrative set-up established to deal with issues of hydropower generation complete this overview of governance-related aspects of hydropower-generation in Nepal.

Property rights: conditions and processes for resource exploitation

Apart from being unevenly distributed in time and space, water is also unevenly distributed among various socio-economic strata of Nepal's society in both rural and urban settlements.

A just society respecting the basic right of all people to have access to clean water at affordable prices inevitably has to address this fact. In the context of what those using water resources for hydropower production are entitled to, their property rights not only include fair access to the water resources, but also a fair sharing among different stakeholders of the economic benefits of resource exploitation. In terms of political process, this involves granting equal democratic opportunities for people with water rights as well as to citizens at large, to influence and monitor political processes and outcomes.

Section 3 of the Water Resources Act states: "the ownership of the water resources available in the Kingdom of Nepal shall be vested in the Kingdom of Nepal." Under the authority vested in the Government of Nepal by this provision, it has full authority to issue licences, permits and approvals for the exploitation of the water resources for its various potential uses.

In Nepal, the government issues licences to companies which request them and are deemed to meet the criteria for building and exploiting a hydroelectric facility.[14] Thus, a licence to carry out the business of building a hydropower plant and generating electricity constitutes the official confirmation necessary for the investor/promoter to proceed with the project.[15]

Licensing provisions for electricity production and distribution

Section 3 of the Electricity Act stipulates that no person shall be entitled to conduct surveys or to generate, transmit or distribute electricity "without obtaining licence under this Act," except for such work that is related to projects of up to 1,000 kW.

14. A licence, according to the Oxford Canadian Dictionary (2nd edition), "*is a permit from an authority to own or use something (esp. a gun, dog or vehicle), or do something (esp. construct a building, drive a motor vehicle, or marry).*"

15. Consequently, a licence serves two important functions. It gives comfort to an investor as it provides an authentic document from the Government of Nepal stating that the licencee is entitled to the benefits set out in the document. This kind of assurance is important, especially for foreign investors, as they are otherwise unfamiliar with the conventions and practices of Nepal. This is, in fact, imperative and is required by both foreign lending institutions and Nepali financial institutions. The second reason for a developer to prefer the security of a licence is, when the developer is not from nearby, his knowledge will be limited, much like a foreigner's. In such a circumstance, the pertinent question is who will ensure the licencee of the availability of water for the plant and how will the access to water be gained? Conversely, if the developer is a local person from the area of the project, he or she will face relatively few problems from his neighbours and villagers. Thus, an investor/developer commands respect for the project from the users of the water for time immemorial when he or she is able to produce a licence issued by the Government of Nepal.

There is as well provision for issuing two types of licences under Section 4: one for surveying purposes, to conduct feasibility studies; and the other for project implementation, which could be for the generation of electricity, transmission of power or distribution to consumers.

Survey Licence

Provisions: It is mandatory for the Government of Nepal to issue a survey licence within 30 days of receipt of an application, according to Section 4 of the Electricity Act. However, there is no record of the government issuing a licence within that specified period. As there is no mechanism to appeal against the government's lack of diligence, it raises the question of how to resolve that problem. It also raises the question as to why a foreign investor should even bother to appeal. The private sector is of the view that the time frame ought to be adhered to. The failure to issue a survey licence within 30 days is viewed by many as an abuse of authority on the part of the Government of Nepal.

The term of licence for surveying of a power project may be a maximum of five years, under section 5(1) of the Act.

The Government of Nepal, as of November 11, 2010, had issued survey licences for a total of 13,530 MW of power. It issued licences for 201 small projects of under one MW capacity, totaling 148 MW; 226 projects of one to 25 MW capacity, totaling 1,504 MW; 60 projects of 25 to 100 MW capacities, totaling 3,325 MW; and 28 projects of more than 100 MW capacity, amounting to 8,552 MW.[16] Many of these licences involve projects that do not appear to be moving forward and have not even reached the stage of having produced a bankable feasibility study, which would lead to financing and eventually the construction of the project, its commissioning and, therefore, generation of electricity. There is a significant gap between the number of survey licences issued and the number of such licence holders who actually follow through and develop their hydropower projects.

This raises the issue of whether the Government of Nepal is too liberal in issuing surveying licences. The act of issuing a survey licence also pre-empts and prevents other developers from carrying out projects for which survey licences have been previously issued, notwithstanding the financial means of the would-be licencees. There is no mechanism at present for the purpose of evaluating applications to ensure that specific applicants have the capacity to implement projects.

More specifically, there is no method to test the financial capacity of an applicant to conduct the initial feasibility study and eventually mobilize the necessary financing to implement a project. As such, there are reportedly a number of licencees seeking to sell their licences to those with the ability to mobilize the necessary finances and carry out projects. Thus, a counter-

16. Source: http://www.doed.gov.np/issued_licenses.php.

productive situation currently prevails whereby investors with the financial wherewithal are unable to acquire survey licences while large numbers of licencees, who lack the financial means to develop projects, are hanging on to licences under the pretext that they are seeking financing for their projects.

In effect, the existing hydropower development policy has created a "first come, first served" process for the issuing of licences, thereby precluding the possibility of introducing competitive elements to the licensing process. This suggests a failed policy. For that reason, in the group of amendments proposed by the members of the Constituent Assembly to the pending Electricity Bill, there is a provision requiring the introduction of competition in the licence-issuing process.

The Government of Nepal, beginning in the late 1990s, invited Requests for Proposals (RFPs) for a small number of projects, and surveying licences were issued accordingly. Indeed, an RFP process took place for the Upper Karnali and Arun III projects. But the RFP process appears to be dysfunctional. As a result, instead of inviting bids from the private sector for the issuing of surveying licences, consideration should be given to granting licences on the basis of pre-established policy.

As it is, members of the private sector are apprehensive about the process because there is no guarantee that a survey licencee will ultimately be granted a generation licence to continue and take a project to the next phase, because the generation licence for the project would be granted on the basis of competitive bidding. This means that the original survey licence-holder may not necessarily be awarded the generation licence to develop the facility he or she had initially surveyed. And worse, under this scenario, the survey licence-holder has no way of recovering the costs of doing the feasibility study, while the survey report becomes the property of the Government of Nepal.

Because of this lack of certainty, critics of the RFP process say it is naïve of the government to invite tenders for the generation of licences. Instead of continuing on an *ad hoc* basis, the Government of Nepal would be well-advised to formulate a policy for this purpose and make the necessary changes to the law, thereby enabling the implementation of large projects requiring major investments.

Licence for Generation, Transmission and Distribution

Provisions: It is mandatory for the Government of Nepal to issue a licence for the generation, transmission and distribution of electricity within 120 days of an application, according to Section 4 of the Act. The policy is silent, however, regarding how to best strike a deal and maximize returns to the state. There is no provision or mechanism dealing with this.

According to Section 12 of the Electricity Regulation Act of 1993, a person wishing to obtain a power generation licence has to provide the authorities with: (a) a feasibility study report;

(b) an assurance of financial capability; (c) an environmental impact assessment (EIA) or initial environmental examination (IEE) report, as may be applicable; and (d) a Power Project Agreement (PPA). Therefore, granting of a power generation licence is conditional upon the successful financial completion of the project by a given date.

These provisions give the Government of Nepal the necessary leeway to have another investor come into the picture if the original licencee is not able to arrange funding for the implementation of the project within a given deadline. However, conditional licences have reportedly also been issued with the requirement of having the Power Project Agreement (PPA) amended. The current law does not empower the government to oblige a developer to have its PPA amended, and the private sector is claiming that it is not business-like for the government to do this.

However, considering that the Government of Nepal is the sole owner of the Nepal Electricity Authority, it is in a position to put a halt to any Power Project Agreement. The reason behind having to amend the PPA is the excessively high return that was earned on one particular investment project, which only became apparent later. However, the amending of project agreements has not been imposed on other developers whose project costs have also reportedly gone down, with the outcome being enhanced profits for the investor.

Until Nov. 11, 2010,[17] the Government of Nepal had issued generation licences for 50 projects, with a total installed capacity of almost 822 MW, of which only 22 projects with installed capacity of about 167 MW are currently generating electricity. Eight projects with installed capacity of about 47 MW are under construction.

The Government of Nepal has not received applications nor has it issued any licences for the transmission/distribution of power. However, it has issued a number of licences for the distribution of electricity to consumers, including one licence to Butwal Power Co. (BPC) for certain village development committees in the districts of Syangja, Palpa, Pyuthan, Arghakhanchi and Dang, which had 34,428 connections at the end of the last fiscal year, in mid-July 2010. This represents 1.86 per cent of the consumer base of the Nepal Electricity Authority. There is no further information available in this regard.

Tenure of Licence and Handover of Hydropower Plant after Expiry of Licence

Provision: The maximum term of a licence for generation, transmission and/or distribution of electricity is 50 years, according to Section 5, Sub-section 2 of the Electricity Act.

Industry sources have expressed their opinion that 50 years is an excessively long period to grant a foreign-owned project the right to generate, transmit or distribute electricity. However, amending the term of the contract would

17. Source: http://www.doed.gov.np/issued_licenses.php.

involve use of a discretionary power vested in the Government of Nepal, which would have a secondary effect as changing the term of a licence for a project for domestic use of the power could result in a modification of the buyback rate required for the project to be feasible. Similarly, changing the term of a licence would affect the revenue stream going to the Government of Nepal for an electricity export project. Therefore, judicious use of this leverage is necessary for all parties to benefit.

However, it is fair to conclude that it is important to invite foreign investment in the hydropower sector to Build, Own, Operate and Transfer (BOOT) ownership, in such a way that Nepal stands to acquire clear title to the hydropower plant at the end of the licence's term.[18]

The precondition for a meaningful handover of the hydropower facility is the simple assumption that the plant shall remain operational even after the expiry of the licence, and for a substantial number of years thereafter. For this reason, the quality of the plant's construction, including the equipment, needs to meet high international standards. The law is silent in this respect. Therefore, an amendment to the Electricity Bill has been introduced inserting a provision on the life of hydropower projects, which will be a function of the design and construction standards.

Some legal experts have argued that to require the transfer of ownership of a hydropower plant to the Government of Nepal, in the case of a plant that is more than 50-per-cent owned by foreign investors, after the expiry of the 50-year licence, is an infringement of the constitutionally enshrined right to equality. However, the fundamental idea behind inviting foreign investment is to allow investors to reap their profits over a given period of time, and then at the expiry of that period, the ownership of the facility is transferred to Nepal, which gets to ultimately benefit from the exploitation of its own natural resources. The transaction is thus structured for an eventual transfer of ownership by the foreign investor, who must do so after the agreed-upon period. Hence, there is no question of unequal treatment.

In this regard, Section 3 of the 1992 Electricity Act states that no licence is required to generate up to one MW of electricity. However, the Electricity Bill of 2009 that was introduced to replace this Act envisages abolishing the need for licences in the case of hydropower plants generating three MW or less. This is in line with the policy of liberalization and deregulation being pursued by Nepal.

Royalties and export taxes

Royalties are, according to the online Oxford dictionary, *"a payment made by a producer of minerals, oil, or natural gas to the owner of the site or of the mineral*

18. Sub-section 1 of Section 10 of the Electricity Act states that in the case of foreigners holding more than 50 per cent of the investment in the project company, the ownership of the land, building, equipment and structure related to the electricity generation plant or transmission and distribution line, transfers to the Government of Nepal after the expiry of the term of the licence.

rights over it" and are the main revenues paid to the Government of Nepal in the case of hydropower projects. Those projects involving the export of power to foreign countries are also required to pay token export taxes.

Royalties

Provisions: Royalties are not levied on hydropower projects under 1,000 kW. This is not stated as such in the Electricity Act. However, Section 3 states that a licence is not required to develop a plant with a capacity of less than 1,000 kW and, under Section 11 of the Act, only a licence holder is required to pay royalties. In other words, if it is not necessary to procure a licence for a hydropower project, then it is also not necessary to pay any royalties related to the project.

Developers pay royalties to the Government of Nepal for the right to exploit the nation's natural resources. The current hydropower development policy provides for a two-phase royalty system, in which the first phase lasts 15 years from the starting date of operations, and the second thereafter. During the first phase, there is a capacity royalty payable of 100 rupees per kW and an energy royalty of two per cent. From the 16th year onward, the capacity royalty rate is 1,000 rupees per kW coupled with an energy royalty of 10 per cent.

However, in the Memoranda of Understanding (MoU) for the Arun III and Upper Karnali projects, both of which involve the export of power, the developers agreed to pay royalty rates set out in the new 2001 policy, instead of paying according to the Act which does not make a distinction between projects for domestic electric consumption and projects for foreign consumption. Under those MoUs, the capacity royalty payable is 400 rupees per kW for the first 15 years of the life of the project, and 1,800 rupees per kW thereafter, while the energy royalty is payable at the rate of 7.5 per cent for the first 15 years and 12 per cent thereafter. Additionally, the developer of the Arun III project agreed to provide the government with 21.9 per cent of the generated energy free of charge, while the developer of the Upper Karnali provides 12 per cent of its energy production for free to the government as well as having given a 27 per-cent equity stake, free of charge.

Export Tax

Provisions: Rule 27 of the Electricity Rules stipulates that the export tax payable for exporting electricity, pursuant to Subsection (3) of Section 22 of the Act, "shall be as determined in the agreement made with His Majesty's Government." The West Seti project's company was to pay an export tax at the rate of 0.05 per cent of revenues. However, the MoUs for both the Upper Karnali and Arun III state that the export tax rates are not to exceed 0.005 per cent of export sales revenues. In contrast, the government of India is, reportedly, planning to levy an import duty of 3.20 rupees per unit on the import of power from Nepal.

Provisions to protect interests of Nepal's state and its citizens

Power export is highly controversial in Nepal, given that there is insufficient supply within the country and with consumers suffering the effects of load shedding or rolling blackouts for up to 18 hours a day.

While seeking to attract foreign investors to help develop the hydroelectric sector, the Government of Nepal sought as well, through legislation, to protect the country's water resources from abuse by foreign investors and to promote economic policies asserting the country's authority over hydro-electricity, encouraging investment in hydropower by the general public and requiring parliamentary ratification of agreements related to the export of hydropower.

Investments by project stakeholders and the general public

Provisions: In line with the government's measures to promote domestic investment, it amended the Securities Registration and Issuance Regulation in May 2010 to make it mandatory for enterprises dealing in local natural resources, such as raw materials, to set aside 10 per cent of the issued capital for purchase by the inhabitants of an area affected by a hydropower project and 15 per cent for purchase by the general public.

The objective of investment in these projects by stakeholders, people affected by the projects, has not been attained. Although the reasons for this reluctance to invest by the general public, including local inhabitants, have not been determined, it may be that risk aversion is a factor as there are a wide range of risks in such endeavours, including project construction risks as well as cost- and time-overrun risks.

Export-oriented projects

There are currently several projects in the pipeline essentially earmarked for export of more hydroelectricity to India, including most prominently the Arun III (new project), the West Seti, and the Upper Karnali projects. The importer of the power to India is an entity called PTC India Ltd., an Indian government enterprise.

The three projects West Seti, Upper Karnali and Arun III – among others – are widely contested in Nepal as they involve exporting power to India at less than five cents U.S. per kW/h while Nepal imports power from India at tariffs ranging from 11 to 15 cents U.S. per kW/h.

As water resources are necessary to generate the electric power in such projects, the question is whether these undertakings require parliamentary approval.

Provisions: When the government signs agreements to export electric power, the deals must be ratified by parliament as they involve sharing the use of the country's water resources (electricity generation is deemed to be a use of Nepal's water resource). Ratification of this type of agreement is mandatory, according to Article 126 of

the 1990 Constitution, as the alienation or division of natural resources is involved. The same requirement is set out in Article 156 of the Interim Constitution.

Some members of the public think that export-oriented projects are covered by this provision and, therefore, parliamentary ratification of such agreements is also required. Others contend that the export of power is straightforward trade, and should thus be treated like the export of any other commodity.

Economic aspects of hydroelectric production

In the case of water resources and the related potential for generation of electricity, the critical issues relate not only to ownership, but also to management and fiscal arrangements for those resources, and for hydroelectric generation, transmission and distribution among the central, provincial and local governments as well as the local communities.

The economic policy framework and political decisions will therefore play a key role in determining how several objectives will be achieved in the use of water resources, including equity, efficiency, and economic and political stability, and it will also generate the type of incentives to permit the responsible development of these resources.

This chapter discusses the fee structure that Nepal has put in place for the sale of hydroelectricity, which takes into account seasonal variations in water supply.

Tariffs: their relevance and application

Although international practice varies with regard to setting hydroelectric tariffs, it is considered good practice, both for bulk and retail sales, that tariffs reflect the economic reality of the forces of demand and supply.

The Nepal Electricity Authority has set a fixed standard (bulk) tariff for projects up to 5 MW which is set on the basis of negotiation. Part of these negotiations is a tariff component called "an addition to the (electric) generation cost," or the "cost plus" tariff. In this process, the entity that is the power generator calculates the overall cost for building the generation plant and the cost of generating the power, costs which are to be recovered over time through setting a tariff that provides for their recovery plus a percentage that is negotiated and tacked on, which constitutes the profit margin.

Standard Feed-in Tariff

Provisions: The Nepal Electricity Authority (NEA) announced the standard feed-in tariff in 1998 for the first group of hydropower projects, those of up to 5 MW. The tariff was set at 2.76 rupees per kW/h for the wet season, between mid-April and mid-December, and 4.03 rupees for the dry season from mid-December through mid-April, provided the Plant Capacity Factor, the ratio of the actual output of a power plant over a period of time and its output if it

had operated at full capacity, is 90 per cent; otherwise, the tariff of 2.76 rupees per kW/h is to be paid throughout the year.

The purpose of the announcement was for the NEA to work collaboratively with the private sector toward increasing the installed capacity of the hydroelectric system by formulating a policy to purchase electricity in bulk from the privately-developed projects. Unfortunately, this overture failed to achieve the NEA's objective of attracting new investors, and it announced a new policy later in 1998. In this revised policy, the NEA said it would purchase electricity from projects of up to 5 MW of capacity at a standard tariff of three rupees per kW/h in the wet season and 4.25 rupees in the dry season, denominated on the basis of the Nepali Rupee, setting 1998-99 as the base year. The required exceedance was also lowered to 65 per cent (Q65 procedure).[19] Under the NEA's policy, for projects in the vicinity of NEA's transmission network, a power purchase agreement is signed for 25 years. If the proposed plant is not in the proximity of the NEA's transmission network, the promoter is required to make the necessary capital investments to make the power accessible to the NEA. The tariff is increased at the rate of six per cent per year for five years, not compounded, with the base year serving as the reference point, and is reviewed after that.

The NEA revised the standard tariff in December 2008, in response to the private sector, which had been calling for a tariff hike to reflect inflation and to address the increasing problem of rolling blackouts. The private sector blamed these factors for Nepal's failure to attract private investment in the power sector to the same degree as it had in the previous decade. The NEA thus revised the standard tariff to seven rupees per kW/h and increased the wet season rate to four rupees per kW/h, effective as of the year the project was operational and subject to nine escalations at the rate of three per cent per year.

While required exceedance was further lowered to 40 per cent, the PPA period was raised to 30 years. This increase failed to attract new investment from the private sector as the actual weighed average tariff of a project to be commissioned over two years is 4.56 rupees per kW/h (at the price in effect when this study was written), which is only marginally higher than the 4.44 rupees per kW/h that was paid to the hydropower outfits that came on stream during the period of the previous (lower) tariff.

Negotiated tariff

Provision: The Electricity Act of 1992 provides for three ways of calculating the rate for electricity, on the basis of:

(a) The fixed percentage of avoided cost.

19. The power to be sold to NEA should be calculated on the basis of Q65 i.e. the design discharge should be available sixty five percent of the time during a year for projects up to 5 MW. (http://ahec.org.in/links/International%20conference%20on%20SHP%20Kandy%20Srilanka%20All%20Details%5CPapers%5CPolicy,%20Investor%20&%20Operational%20Aspects-C%5CC24.pdf)

(b) An addition to the generation cost.
(c) The fixed percentage of average tariff of NEA.

The Act has not envisaged setting different rates for primary and secondary energy, nor for peak energy.

Four projects, the Khimti, Bhote Kosi, Indrawati and Chilime, operate under this scheme. Based on information available in the public domain, the tariff for these projects was calculated on the basis of the second method, called the "cost plus" formula.

This means that no PPAs have been signed thus far under the first formula or the third; however, no information has been made public in this respect. The sole requirement that is well known is for the NEA to strike a clear agreement with each developer as to which method is to be used, and then to abide by that formula.

In contrast to the two methods that have ostensibly not been applied thus far, the cost plus formula requires full transparency on the part of the developer as to how certain cost figures were calculated, such as generating and per unit generating costs, as well as any "additions" to the generating cost. Over time, the figure of 16 per cent has been mentioned as the appropriate rate of "addition" to a project promoter's margin. There are those who contend that a formula must be incorporated in the new legislation to determine a fixed return on investment for promoters.

The determination of the tariff according to the cost plus formula would involve a two-step process. As a first step, the parties must agree on what constitutes the estimated total cost of the project. Agreement must also be reached as to what constitutes a reasonable profit margin for the developer. The combination of these two elements should result in a tentative rate or tariff for the promoter.

Under the cost plus formula, the developer has to call for competitive bids or tenders for various contracts, or for a single bid if it is meant to be a turnkey or Engineering, Procurement and Construction contract. The revised estimate of the total project cost must be worked out on the basis of a bidding-tender process for the construction contract(s), and the revised costs for the "interest during construction" period plus any other revision based on further information becoming available. Working out the required rate subsequent to provision of the "addition" will result in the specific developer's final tariff.

The last type of tariff refers to the sale of electricity by the NEA in bulk to members. This is the retail tariff.

Retail tariff

Provisions: Section 17 (1) of the Electricity Act of 1992 contains a provision for the constitution of an Electricity Tariff Fixation Commission with the purpose of setting electricity tariffs and other charges. The retail tariff cannot be changed without the commission's approval. The current retail tariff took effect in September 2001 and has not

been revised since, notwithstanding the effects of inflation since then. The NEA submitted revised tariff rates to the Tariff Fixation Commission in August 2010 for which a final decision had yet to be rendered at the time this paper was completed.

Currently, retailers do not exist in Nepal's electrical system, except for some rural electrification entities (REEs), which operate in areas that buy power from the NEA in bulk and sell it on a retail basis to their members.

Incentives: tax and investment facilities

The Government of Nepal provides various measures for the promotion and development of hydropower projects. These are related to the tax and customs regime or to the choice of legal regime applicable to foreign investment agreements.

Exemption of Import Duties

Provisions: Section 12 (7) stipulates that: "Only 1 percent customs duty will be payable on the import of plant equipment and machinery as well as the spare parts thereof, required for the construction and operation of any hydro-electricity project involved in the generation, transmission or distribution (of hydropower), and no charge for import license and sales tax shall be levied on such imports if such items are not produced in Nepal."

This means that no customs duties (except for a one-per-cent duty for record purposes), sales tax (which was converted to a value added tax, and exempt until the 2005-06 fiscal year, then withdrawn in 2006-07 and reinstated in 2007-08), nor licence fee, should be paid on the import of equipment, machinery and spare parts for the construction/operation of a hydropower plant or transmission/distribution network. However, licencees in Nepal are clamouring for the outright exemption of customs duties and the value-added tax (collectively known as import duties) on the import of construction materials too, including cement, steel rods and similar items.

Income Tax Holiday:

Provisions: Before the amendment to Section 12 of the Electricity Act by the 2001 Income Tax Act, hydropower projects enjoyed certain income tax exemptions. Projects of up to 1,000 kW were not subject to any income tax. Other hydropower projects were not subject to income tax for their first 15 years of operation and thereafter, what such projects were required to pay was "lessened by 10 per cent" of the corporate income tax.

However, all provisions relating to the income tax exemptions were eliminated by the 2001 Income Tax Act, thereby doing away entirely with the concept of an income tax holiday. This created considerable discontent among investors in hydropower. After significant pressure, the tax holiday was reinstated in the 2009 Finance Act, with some modifications. Under the 2009 Act, projects commissioned by mid-April 2019 are entitled to a tax holiday

for the first seven years of operation and are then entitled to a 50-per-cent reduction of the tax payable for another three years.

Repatriation of investment:

Provisions: Under the heading "facility of foreign exchange," Section 13 of the Act states that in the event of foreign currency being invested in the generation, transmission or distribution of hydro-electricity as a loan or share capital, the government "shall make available necessary foreign currency at the prevailing market rate of foreign exchange for the repatriation of investment or repayment of principal or interest of loan," thereby providing a repatriation facility. The same is also guaranteed by Section 5 (2) of the Foreign Investment and Technology Transfer Act of 1992, which specifies that a foreign investor is entitled to repatriate (i) an "amount received by sale of share of foreign investment," (ii) an "amount received as profit or dividend in lieu of foreign investment," and (iii) an "amount received as the payment of the principal of and interest on any foreign loan."

Choice of governing law

Before the amendment of Section 7 of the Foreign Investment and Technology Transfer Act (FITTA) in 1996, the choice of legal regime applicable to govern foreign investment agreements was not foreseen even when a project was financed by a foreign investor. However, considering that it was not expressly prohibited to opt for a foreign legal regime, theoretically at least, the choice existed.

But for greater clarity, the amendment of FITTA provided foreign investors with a choice of legal regime when industries were set up. What is not clear, however, is whether the choice of legal regime, domestic or foreign, is possible in the case of agreements when neither party is a foreigner. Clearly though, there is no law that expressly bars such a choice.

The issue of choice of legal regime is a relevant matter when it comes to settling disputes between parties to an agreement. The main two means in Nepal for the settlement of disputes are arbitration and judicial decision. With the adoption of the 1958 New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards by the Government of Nepal in March 1998,[20] foreign arbitration awards became enforceable by a court in Nepal because this is stated expressly in Section 34 of the 1999 Arbitration Act.

Although it is possible to opt for a contract to be governed by the legal regime of another country, the parties to such an agreement stand to benefit by such a provision only when the ruling of a foreign jurisdiction is enforceable in Nepal or if the courts in Nepal are in a position to adjudicate on the basis of applying foreign law.

20. http://www.uncitral.org/uncitral/en/uncitral_texts/arbitration/NYConvention_status.html.

However as this would involve Nepali judges interpreting laws of foreign countries in foreign languages, there are major doubts as to whether the recourse to seek a judicial decision for dispute settlement would be feasible in cases when the contract states that the law of a foreign country governs the document. This is true with regard to the enforcement of a foreign court's judgment in Nepal, as well as the application of a foreign country's law by a Nepali Court for the settlement of disputes.

Moreover, in Nepal adjudication of litigation by applying Nepali law to an agreement governed by foreign law is not likely to succeed. Litigants are likely to be told by a Nepali judge to litigate their case in the country whose law has been chosen to govern the documents. There are no known precedents in Nepal in this respect.

Thus, considerable problems arise when the liberty to choose a governing law is exercised and needs to be enforced. Except for dispute resolution by arbitration, the right to choose the governing law is currently of very little relevance, if any.

Environmental aspects of hydroelectric production

Environmental sustainability can be used to examine how improved governance in Nepal would allow for the enhanced and sustainable use of water resources and ecosystem integrity. The sufficient flow of high quality water is critical to maintaining ecosystem functions and services, as well as sustaining groundwater aquifers, wetlands and other wildlife habitats. Moreover, poor people's livelihood opportunities, in particular, depend directly upon sustained access to natural resources, including water – especially as they tend to live in marginalized areas that are prone to pollution, droughts and floods.

The competing interests and priorities involved in protecting such an essential resource as water were reconciled under the 1997 Environment Protection Act. The preamble to this Act states that the law was passed "in order to maintain clean and healthy environment by minimizing, as far as possible, adverse impacts likely to be caused from environmental degradation on human beings, wildlife, plants, nature and physical objects; and to protect environment with proper use and management of natural resources, taking into consideration that sustainable development could be achieved from the inseparable inter-relationship between the economic development and environmental protection."

In reality, the implementation of this policy inevitably leads to difficult decisions and trade-offs. For example, after the completion of a hydropower project, the local people living in the upstream reaches of a river will not be allowed to irrigate any additional land. Such irrigation would decrease the amount of water available for the project, leading to the decline of its electricity production and, subsequently, its revenues, thereby harming the project's financial viability.

To avoid this from occurring, Rule 20 of the Electricity Regulation guarantees a specific quantity of water to the licencee, which is set out in the licence. If, for example, the Upper Karnali Project is eventually completed, the people living in Jumla district will be forbidden from developing new irrigation initiatives involving the drawing of water from the Tila River. Thus, it is clear from the existing laws that even though irrigation is the second most important use of water in Nepal, the development of hydropower projects takes precedence. As such, the Electricity Regulations, which have subsidiary status to the Water Resources Act, have curtailed the rights of people with regard to water.

The Environmental Protection Rules of 1997 require that an initial environmental examination (IEE) be carried out in the case of the erection of transmission lines of 33 kilovolts (kV) to 66 kV, for hydropower projects of one to five MW, and for any water resource development activity that displaces 25 to 100 people from their permanent residences. This is set out in Clause E of Schedule 1, under Rule 3 of the 1997 rules.

Similarly, under Schedule 2 of the 1997 rules, an Environmental Impact Assessment (EIA) is required when transmission lines are to be erected with voltages of more than 66 kV, or for a hydropower project of more than five MW in capacity, and for any water resource development activity which displaces more than 100 people.

The Government of Nepal increased the threshold for an initial environmental examination from five MW to 50 MW in its budget for 2008-09, thereby making environmental impact assessments necessary for projects exceeding 50 MW. This step was taken in response to the perceived irritant in the implementation of hydropower projects related to acquiring permits and gaining approvals for the felling of trees, which is already incorporated in and covered by the EIA report. The government seems to have correctly analyzed the problem, but devised the incorrect solution as adopting the EIA was not the root cause of the problem.

Nepal's 2001 Hydropower Development Policy requires that a facility ensure an "environmental flow" of water of at least 10 per cent of the minimum monthly downstream discharge of the river or stream. In some instances, the EIA study requires a higher quantity of water to be released downstream as the minimal environmental flow. Unfortunately, this provision appears to not be properly enforced as bone-dry hydropower projects are not uncommon in the dry season.

Administrative structures and hydropower generation

The complex realities of property rights arrangements and of processes for resource exploitation are also reflected at the organizational level within the institutional and administrative structure of the Government of Nepal.

In 2009, the Ministry of Water Resources was split into two, the Ministry of Energy and the Ministry of Irrigation. The former was assigned the responsibilities relating to hydropower projects. The hydropower policy envisaged setting up a "hydropower development unit" to promote the participation of the private sector in hydroelectric projects and make optimum use of the country's water resources; to approve power projects with a capacity of more than 1,000 KW; and to provide necessary assistance to the private sector in the operation of hydropower projects. This unit was initially called the Electricity Development Center, and was later renamed the Department of Electricity Development.

One of the functions of the Ministry of Energy is to issue licences on the basis of applications processed by the Department of Electricity Development. The 1992 Hydro-Power Development Policy states that "all facilities concerning exchange of foreign currency shall be provided to the foreign individual, firm or company who invests in the construction of a project for generating, transmitting and distributing electricity to the private sector under the foreign investment and single door policy." Under this arrangement, the Department of Electricity Development had been designated as the "one-stop shop" for the development of hydropower projects.

Currently, those seeking to implement a project are required to secure permits and approvals from a multitude of government agencies, including the:

- Company Registrar's Office, for the purpose of incorporation of an entity.
- Department of Industry, to set up the "hydropower industry."
- Ministry of Finance, for tax and duty facilities.
- Ministry of Population and Environment and Ministry of Forestry to seek environmental clearances.
- Department of Industry approval of joint-venture agreement if foreign investment is involved.

One of the key government institutions in the hydropower sector is the Nepal Electricity Authority (NEA). It was created on August 16, 1985, under the Nepal Electricity Authority Act of 1984, through the merger of the Department of Electricity of the Ministry of Water Resources, Nepal Electricity Corporation, and related development boards. The primary objective of the NEA is to generate, transmit and distribute adequate, reliable and affordable power by planning, constructing, operating and maintaining all generation, transmission and distribution facilities in Nepal's power system, both interconnected and isolated.[21]

NEA's major responsibilities are: (a) to recommend long- and short- term plans and policies for the power sector to the government; (b) to recommend, determine and realize the tariff structure for electricity consumption, with prior government approval; and (c) to arrange for training and research to develop skilled manpower in generation, transmission, distribution and related sectors.

21. http://www.nea.org.np/index.php?page=aboutus.

As the Nepal Electricity Authority is the only entity in the country that purchases and sells electricity, a "monopoly" market situation exists. This monopoly would be replaced when a wholesale competitive market emerges, which is expected to take place if there is an eventual unbundling of the NEA. This would result in retailers buying electricity directly from the producers of their choice, and an open grid system (INPS – Integrated National Power System) would be introduced, allowing producers to transmit their power and be paid so-called "wheeling (transmission)" charges. It also would give access to the grid to third-party buyers.

A regulatory body, the Electricity Tariff Fixation Commission, has been set up under Section 17 (1) of the Electricity Act of 1992. It is not an autonomous statutory commission. Rather, its mandate is to "fix the electricity tariff and other charges on the basis of the rate of depreciation, reasonable profit, mode of the operation of the plant, changes in consumer's price index, royalty (etc.)." Basically, the commission's jurisdiction is limited to retail tariffs. Consequently, private sector developers and hydropower project investors do not come under its jurisdiction. The Government of Nepal, which identified this as a shortcoming, has tabled a bill in parliament to create a regulatory commission on electricity. The bill is to be debated by the Legislative Committee.

PART III: Development and decision-making from a comparative perspective

There are lessons to be learned from the history of Nepal's hydro resource development. Milestones are to be found in the relevant laws and signed treaties over the past 60 years. The cancellation by the World Bank of the Arun III project in 1995 was a landmark decision that stands out in terms of the fate of hydropower projects built with domestic and foreign investment.

At present, provisions of the Electricity Act and several other pieces of legislation have become anachronistic inasmuch as these laws were enacted when federalism was not envisaged for Nepal. As a result, all relevant legislation will have to be brought into line with the aspirations and expectations of a federal Nepal. Similarly, various policies, plans and strategies related to water and hydropower will also need to be aligned to the requirements of the new federal arrangement in Nepal.

In its efforts to attract domestic and foreign investment capital to the hydroelectric sector, the Government of Nepal has promoted several initiatives. However, despite these measures, very few of Nepal's hydro resources have been harnessed. The reasons behind this lack of success may lie in flawed mechanisms and incentives that were meant to encourage increased production. Or it could be attributed to the country's institutional arrangements, which have not contributed to a favourable environment for exploitation of the country's hydro resources.

Certainly though, the adoption of federalism in Nepal is likely to have a significant impact on decision-making related to its natural resources, including water. Although Nepal is famous for its significant water resources, this will not translate into additional wealth unless that abundant water is properly harnessed.

Against this backdrop of underinvestment in and underdevelopment of Nepal's hydropower sector, it is useful and relevant to refer to the comparative experience of Switzerland, a federal country with a well-performing hydroelectric sector. The following discussion is based on the Swiss experience, which is potentially very instructive given its federal structure, topography, abundance of water and need for political balance between upland and lowland areas in this small, landlocked European country.

The result of this analysis is a list of key issues and options that will require solutions to manage and regulate the exploitation of hydropower in a future federal Nepal — a list which will soon need to be addressed by the country's decision-makers.

Water and its use: a comprehensive perspective

In this paper, the main focus is on Nepal's generation of hydroelectric power and its distribution. Water, however, has many other human uses and ecological functions that compete with hydropower as alternatives for its deployment. Therefore, all the major issues need to be considered in a coordinated and coherent manner with input from all significant stakeholders. The absence of coordination and coherence would likely lead to conflict and national unrest. It is, therefore, strongly advisable to consider irrigation, drinking water and other water management issues on the same level of importance. For example, should water irrigation upstream of a hydroelectric plant be given priority if the purpose of the irrigation is for subsistence farming? Or, when the need for clean drinking water at a time of scarcity conflicts with the need for hydroelectric power, which competing need should be given priority? To answer such questions, a comprehensive overview is required, one which addresses the conflicting needs in space and over time, and which establishes principles and processes to weigh the competing interests and determine how such conflicts are to be resolved.

Water property rights and conflicting use of water resources: solutions in other federations

To ponder and weigh the differing interests in a constructive and effective manner, a widely shared understanding of the issues is indispensable. The consensus should determine the breadth of the global water strategy that is to be conceived, and how it should be elaborated. For example, what should the fundamental principles be pertaining to property rights of water resources and how should the use of those resources be prioritized with respect to drinking water, irrigation, agricultural use and hydroelectricity?

Nepal's Water Resources Act of 1992 states that the ownership of water resources is vested in the state. The Act also provides a clear order of priority for the use of water. However, while legislation is crucial to set principles and establish procedures, the real challenge very often lies in its implementation, that is the application of norms at the level of individual cases.

After Nepal adopts a new Constitution, questions are likely to arise as to whether water resources are to be owned by the central, provincial or even a local order of government. By whom, how, and at which level of the federal state are decisions to be taken when conflicts of objectives arise? Who is to arbitrate in such cases? For example, what level of the federal entity is to be vested with the power to decide on the use of water resources that are vital for the livelihood of local populations?

These challenges are not exclusively Nepalese. Discord over conflicting uses of hydropower and its production and distribution occurs and can be observed in many federal and non-federal countries. Tradeoffs typically occur between:

- Agricultural production vs. the construction of plants, dams and the related flooding of agricultural land.
- The medium- and long-term economic, social and cultural impact for people whose land is to be submerged by a new dam.
- The impact of the construction and utilization of major hydropower infrastructure on local or regional ecosystems (for example, due to water retention or shortage) vs. environmental assets deserving of or enjoying protection or conservation.
- The impact of hydropower infrastructure vs. the potential economic value of locations with a potential for tourism development.

How can federations deal with these challenges?

Attribution of water rights to the federal or provincial authority

While there is little doubt that the ownership of Nepal's water resources should be public, different solutions are conceivable in federations. The ownership could be vested with the central, provincial or local order of government. In other words, should a body of water found within a constituent unit belong only to that particular constituent unit?

In Nepal, this question is particularly topical as discussion has begun on the number of provinces that are to make up this second order of government, and what their boundaries are to be. While some proposals neglect entirely the aspect of spatial distribution of natural resources, including water, others go as far as to recommend the design of provinces along the lines of major watersheds.[22]

The experience of at least one federation, Switzerland, indicates that major problems can arise if the property rights of water resources are assigned to the local order of government because this leads to difficulties in implementing general water management strategies for a territory whose ownership is fragmented. In addition, the geographical and topographical dimensions of a water basin, from the tip of its upstream source to the bottom of its downstream flow, often exceed the geographical boundaries of a local government unit. Small local governments are also not often in a position to run the business and, if negotiations are pursued with private companies, local governments do not have the legal and technical capacity, or the political leverage, to match those of large corporate entities. Eventually, property rights at the local level would create large financial disparities between recipients of royalties and all others.

The assigning of property rights to an intermediate (provincial) order of government, combined with a system of federally coordinated transfer payments, has proven to be the most advantageous overall scenario. This is the case for Switzerland and several other federations. The solution has proved to be beneficial to processes that reconcile the interests of various orders of

22. See for example Ratna Sansar Shrestha: Different contributions in *Nagrik Daily* between May and August 2009 (Kathmandu).

government, leading to a smooth interplay between actors with different roles, and eventually contributing to coherent solutions. A coordination role by the federal order serves to facilitate the implementation of national strategies and the coordination of hydroelectric power, irrigation and clean water distribution. The integrated management of watersheds, including territories in more than one administrative or political entity, is better facilitated and ensured through trans-boundary commissions.

Water resources management and property rights: rules and roles in a federation

In federations, the way ownership rights of natural resources, including water resources, have been attributed to the various levels of government is of paramount importance to the economic and fiscal operations of the central state, provinces and local communities. Moreover, the solutions that are chosen have a major impact on the nature and exercise of intergovernmental relations.

Regarding the attribution of property rights for its water resources, Switzerland developed the following approach over time:

- The jurisdiction over water and related legislation lies with the *cantons* (that is, at the state or provincial level). In order to effectively counterbalance negative side effects, protective provisions are established and overseen the federal government. This division of powers is strictly respected. Federal authority, with the exception of environmental protection legislation, is limited to establishing principles and providing guidelines and best practices.
- Policies are developed and implemented at the cantonal level in a manner that takes into account the norms of the constitutional framework and federal protection provisions. The *cantons* take federal concepts and turn them into a legal framework, which they then implement. The cantons can also add their own provisions in terms of the usage of water resources, zoning and planning, and environmental policies.
- Local government units are involved in local zoning, clean water distribution, sewage and wastewater treatment, and solid waste management. This includes implementation and maintenance of buildings and equipment, management and finances (primarily through user fees based on user-pays and polluter-pays principles).
- With regard to prioritizing water uses, there are legal norms which enumerate objectives, suggesting a certain order. However, there is no comprehensive, legally binding and accepted hierarchy, with the exception of drinking water provision in emergency situations, which would have the highest priority. Currently, the issue of establishing an overall order of priority is being discussed in the Swiss parliament.

It is in this overall context that hydroelectric power plants are conceived, planned and approved in Switzerland. The following requirements are set

for each project: reconciling the competing usages of water; prioritization; compensation for social or personal negative outcomes caused by the project; as well as the environmental and ecological conditions. The federal government and the *cantons* ensure that the conditions are respected. Property rights are explicitly defined. Sanctions and fines are also included in a "command-control-sanction" sequence of processes.

In procedural terms, a mix of instruments and processes has been developed over time, including:

- Impartial stakeholder consultations conducted on the basis of concrete project proposals and presented in a transparent manner, explaining the potential consequences, both positive and negative.
- Transparent planning and approval processes with the right for registered stakeholder organizations to oppose infrastructure projects by lodging protests with the competent authority.
- The holding of project-related votes on infrastructure construction at the local or regional level.

The challenge of ensuring policy coherence

Under this model, ensuring policy coherence is a challenging task primarily because of the numerous inter-sectoral linkages of water-related legislation at different levels of government, and also because concepts and solutions can vary considerably in different constituent units for historical reasons.

Frequently, the elements of a federal framework — whether it is composed of compulsory norms, soft laws, or overall concepts such as a national water strategy — are all to be considered suitable to promote and increase policy coherence.

Moreover, built-in stakeholder participation, systems of financial compensation, an appropriate institutional structure and clear processes are well-proven strategies to ensure qualitative legislative outcomes. These also generate trust in public institutions and lead ultimately to political stability. Policy coherence is mainly in the hands of the *cantons* for reasons of topography, their proximity to policy implementation and their role in setting priorities in conflicting cases. The federal legislative framework simply states that conflicts must be resolved through roundtable discussions and compromises – it does not dictate priorities to the cantons.

Coherent legislation to successfully deal with inter-sectoral linkages

Water legislation is multi-dimensional and multi-sectoral — therefore very complex. As well, legislation concerning specific water issues often touches upon several different laws.

A closer look at water legislation would be required to illustrate which laws involve the most relevant sectoral interfaces, and how to coordinate them to ensure sustainable development. In Switzerland, in addition to four articles in

the 1999 Constitution dealing with the use of water at the federal level alone, there are also five laws and one ordinance on water, covering a total of nine sectors.[23] At the provincial level, the Swiss *cantons* have started to integrate all of the scattered relevant provisions on water into one comprehensive law.

Institutions and processes for stakeholder inclusion

The experience of other federations shows that stakeholder representation is another key factor in the long-term sustainability of institutions, their processes and settlements of disputed policy issues.[24]

Relevant questions in this context would be: What mechanisms, institutions and organizations exist or could be created to ensure a comprehensive approach to issues related to water use in a federation, and at the watershed level? How can fair participation of the various stakeholders be ensured?

Organizations and bodies with very different functions are conceivable, and are indeed widely used in some federations such as Switzerland. They act – side by side and in a complementary manner – as political sounding boards or as advisory bodies, either for policy formulation or to deal with technical issues. Some even serve as decision-making bodies, whose mandates include the arbitration of disputes and handling of litigation.

This type of organization is often able to bring about compromises at a concrete level when managed with effective leadership, and when it represents the diverse relevant interest groups. Experience suggests that this kind of body is able to significantly increase the pace of decision-making and the viability of its results when it is engaged early in the process and is able to operate behind closed doors. Consultation and solicitation of stakeholder input before the rendering of the final decision are important processes and represent almost an unwritten rule in Switzerland.

From such a perspective, a special body (which could be given a name such as the *National Water Coordination Board*) could become a highly relevant institutional facility to assist in reaching compromises through processes whereby stakeholders share their analyses, specific objectives, means and concerns on issues such as: (a) property rights or water resource issues; (b) the different types of water uses, including their legal, technical and financial aspects; (c) compensation for social and environmental damage; and (d) apportionment of royalties and profit taxes, including a form of equalization formula.

This brings into focus the potential functions of a national Natural Resources Commission, an entity proposed in a Constituent Assembly committee report in the context of the constitution-drafting process, and whose responsibilities may include tasks such as settling disputes among the constituent units or between the central level of government and the constituent units. For this

23. Drinking water, irrigation, wastewater treatment, solid waste disposal and treatment, environment, fishing, hydroelectric power, landscape, and natural sites.
24. Ron Watts, *Federalism and the Constitution of Nepal: 30 Questions and Answers*, Forum of Federations, 2011.

proposed body to be effective, it seems to be very important, if not essential, to reach an understanding and a basic consensus that is as broad as possible among stakeholders on some of the fundamental issues in this sector.

Compensation and dealing with imbalances

It may be necessary to place limits on the most profitable uses of water resources to attain balanced national development over the long term that is also efficient, economical and environmentally friendly. However, imposing limitations for environmental or other conservation reasons may also generate negative side-effects, including:

- reduced prospects of profits for individual investors and entrepreneurs;
- smaller fiscal yields;
- and imbalances between regions and provinces.

The ultimate utilization of the country's water resources will directly impact on their economic or monetary value, and their related local or regional development perspectives. It may, therefore, be necessary to consider providing compensation to offset decreases in monetary gains. Typical solutions could involve eco-compensation schemes, including different modalities within tax systems and net revenue transfers.

It is also important to emphasize that in such compensatory regimes it is typically not possible to receive monetary compensation when priority is given to one use of water over others, in terms of being compensated for the opportunity costs resulting from foregoing another use of water resources. For example, if priority is given to using the water resource for clean drinking water over hydropower, there is no compensation payable for the loss of revenue and profits that would have flowed from its hydroelectric exploitation. However, the opposite is possible in that holders of hydropower exploitation permits may be required to provide compensation for foregoing those options and generating negative effects on other water uses (environment, drinking water, etc.). Such restrictions are set out in the various relevant laws, and specific requirements must be explicitly stated in the permit to construct and exploit hydropower facilities.

Hydropower governed by a sustainable approach

As previously discussed, the definition of water property rights, including the delineation of a priority order for water uses, and the assignment of powers to the different orders of government, play a fundamental role in shaping the conditions of hydropower production and distribution in a federation.

A second set of variables to be determined in the design of a hydropower policy is related to the question of who is entitled to own and operate the infrastructure necessary to exploit the resource for the production of electricity.

Who owns and who operates hydropower infrastructure?

For the sake of clarity, the generation and production of electricity on the one hand, and its transmission and distribution on the other, are separate and distinct – they need to be distinguished. In other words, who will own the hydropower infrastructure (generating plants and national grid) and who will produce the electricity?

Generation and production:

In Switzerland, only a small number of hydropower companies are privately owned corporate entities, whose existence is governed by civil law. In most cases, they are entities which are private in terms of their legal status, but are owned by public shareholders (*cantons* or possibly the central government). In the latter case, the shares are held totally, or almost, in the hands of the public, with the balance held by private shareholders.

Transmission or distribution:

Similarly, the transmission lines in the national grid may be the property of a national, publicly owned corporate entity. The distribution grids of the publicly owned corporate entities can be provincial and/or local.

In such a set-up, only the wholesale business may be fully subject to private sector ownership. In addition, tariffs would be set by an independent regulatory body.

There are inherent risks related to publicly owned electricity enterprises, in particular where accountability regimes are weak. Also, state-owned companies are subject to direct political interference at the management level. On the other hand, the strong involvement of the public sector offers definite advantages, including that there is no immediate need for profit-maximizing with its attendant downsides, and that it facilitates the implementation of national strategies and coordination from a macro perspective. Another advantage is that public sector policies dealing with the impacts of hydropower production and its distribution to other sectors, and other necessary steps (such as complementary projects, compensation and restrictions) can be more easily set up and addressed by a publicly owned electricity body.

Obviously, an approach based on a strong role for the public sector implies and pre-supposes that the federal state and constituent units are able to raise and invest the necessary capital.

Financial and fiscal implications of a sustainable hydropower system in a federation

Both the sustainable development of Nepal's water resources and the economic viability of each hydropower project fundamentally depend on which costs are eventually accounted for, and how the net profits are shared.

Also critically important in the federal context is the sharing of costs and revenues in their broadest sense, all of which needs to be negotiated carefully among the central, provincial and local levels of government.

As can readily be observed in established federations, a comprehensive overview includes: (a) expenditures to compensate those incurring social and environmental costs; (b) royalties and a profit tax; and (c) an equalization mechanism whereby national and local interests are reconciled.

On the cost side, the ideal financial arrangement and sequencing would include the following components, ranked in their order of priority:

Payment of monetary compensation to residents adversely affected by the construction of dams and transmission lines.

Payment of monetary compensation or implementation of complementary projects to attenuate the environmental impact of hydropower infrastructure such as dams and/or transmission lines.

The fair distribution of royalties between local governments and provinces. Part of such royalty payments should be based on the principle of origin, but a large part should also be determined according to equalization criteria. Royalties should not be paid entirely to the jurisdictions where the hydropower plants are located. Thus, the distribution of water resources is not determined by the political boundaries of provinces and local governments.

The taxation of profits could be local or provincial, and proceeds apportioned between the jurisdiction where the enterprise is headquartered and the place where it actually produces the electricity.

Equalization is regarded as an effective mechanism for sharing benefits among territorial collectivities. In the case of Nepal, provinces and local governments where a company's activities take place should receive a portion of the profits derived from exploiting the resources (royalties, profits and capital taxes if any).

With such a perspective, objectives of vertical and horizontal equalization among different levels of government, as well as environmental protection measures, can be effectively pursued whereby imbalances among various levels can be addressed, for example, in terms of wealth in natural resources, economic disparities and delivery of public services.

On the revenue side, the critical factor is clearly the tariffs. Who sets the prices, and will they be set at the national or provincial level? What will be the pricing policy for electricity? Will the objective be to cover only social costs and commercial costs (including obsolescence, amortization and renewal of the equipment) or does the policy aim to generate profits? Swiss experience suggests that the following cost components should be considered:

Tariffs should be cost-covering, that is, they should include amortization costs of the infrastructure over the period of time corresponding to the duration of the licence.

Social compensation and environmental protection costs should be included — that is, with no contribution or investment required from the taxpayer.

A binomial tariff may be the most appropriate in view of cost transparency. It is composed of a basic access tax, independent from the effective consumption of power, and a price per consumed kilowatt. Binomial tariffs have the advantage of separating the fixed costs, based on access to the grid, and the ongoing cost of electricity production.

The market is not fully competitive as it is made up of a few large investors and one national transmission grid. Therefore, price regulation by public authorities may be necessary to rein in excessive profits which can come about when a handful of suppliers control a large market share at the expense of the users, who are captive customers. This is also essential owing to the pivotal role of energy in growth and national production. In the Swiss case, the producers of hydro-electricity are independent companies, though their shares are publicly held. This duality enables rates to be regulated while allowing for consideration of non-market objectives and policies as well as the calculation of true and accurate costs.

Pricing, however, may become an issue in Nepal with the advent of a new level of government, the provinces, and their increased level of autonomy under the new Constitution. In extreme cases, this could lead to scenarios whereby provinces that have surpluses of generating capacity choose to divert the excess power only to the most profitable destinations, such as India, thereby shutting off the supply to other provinces and allowing the hydro-rich provinces to benefit from higher revenues.

If pricing is decided at the national level, as in Switzerland, then such practices would be prohibited by the national body as being in violation of the national interest. If the tariffs are set at the provincial level, it would be advisable to have an independent national authority to control rates and ensure that they cover costs. Such an authority would also ensure that profit margins are reasonable considering the quasi-monopolistic nature of the business.

The questionable scenario in which one province exports hydroelectric power to a foreign entity while parts of the country are in dire need of power should, at the very least, be subject to the approval of national stakeholders. Establishing an overriding clause that reflects the national interest may be necessary and appropriate to prevent such a scenario.

Conclusions

Nepal's decision to become a federation will have a profound impact on the organization of its water and hydropower sector, and on the exercise of public authority at all levels.

The experience of the long established federation of Switzerland with its water and hydropower sector was reviewed in this study with the purpose of shedding greater light on this vital sector in order to better understand the related and important governance challenges facing the future federal Nepal.

Examining and learning from the experiences of others can be very inspiring and offer additional insights. Comparative processes combined with the weighing of analogous scenarios are a genuine method of adult learning. However, caution is required. No single case can serve as a perfect model of best practice nor is it perfectly replicable. Each case or country experience needs to be analyzed in its own right and with regard to its own uniqueness. In such a perspective, being aware of differences may be as important as (or even more important than) detecting superficial similar features.

In this light, any comparison between the situations in Nepal and Switzerland also has to take into account the features that are unique to each country. For example, the current governance system of the Swiss water and hydropower sector is a product of 100 years of evolution. Also, the state (or canton) level of government and the local level (cities and villages) have always had strong political positions within the framework of the country. In historical terms, these entities preceded the country's federal structures and institutions. In their essence, Switzerland's *cantons* and local communities had, and still exert, considerable fiscal and financial power, allowing them to exercise their full authority.

This is in stark contrast with the current federalization of Nepal, which is likely to be primarily led by the centre and from the top. It corresponds with the vision and hope of a nation in need of fast and sustainable development. Economic growth, jobs, solutions and quick gains are expected in record time. Inevitably, certain public institutions will be challenged by weak financial capacity, particularly at the sub-national level.

Whatever the current point of departure, it is indispensable for a federal Nepal to design, establish and implement a water and hydropower policy, and set up related institutions. For this to occur, realistic expectations based on broad and informed views are essential. The Forum of Federations and the authors of this publication would be very satisfied if this comparative study contributes to providing additional insights into the range of potential solutions for Nepal, the interdependencies between existing problems to be solved, and the time needed to work out certain processes.

This paper will be a success if it assists relevant stakeholders to identify and more realistically assess the options open to Nepal, and helps deepen their understanding of the complexities and dimensions of the challenges that lie ahead in the development of Nepal's hydropower resources.

Appendix I: Hydro Power Projects in Nepal, 2009/10

A. Operational

I. Major hydro projects

S.N.	Project	Capacity (kW)	S.N.	Hydro projects	Capacity (kW)
1.	Kali Gandaki "A"	144,000	7.	Gandaki	15,000
2.	Middle Marsyandi	70,000	8.	Modi Khola	14,800
3.	Marsyangdi	69,000	9.	Devighat	14,100
4.	Kulekhani No. 1	60,000	10.	Sunkosi	10,050
5.	Kulekhani No. 2	32,000	11.	Puwa Khola	6,200
6.	Trisuli	24,000		**Total:**	**459,150**

II. Small hydro projects

a. Grid connected

S.N.	Project	Capacity (kW)	S.N.	Project	Capacity (kW)
1.	Chatara	3,200	9.	Khandbari**	250
2.	Panauti	2,400	10.	Phidim	240
3.	Tatopani (Myagdi) (I + II)	2,000	11.	Jomsom**	240
4.	Seti (Pokhara)	1,500	12.	Baglung	200
5.	Phewa (Pokhara)	1,000	13.	Surnaiyagad (Baitadi)	200
6.	Tinau (Butwal)	1,024	14.	Doti	200
7.	Sundarijal	640	15.	Ramechhap	150
8.	Pharping***	500	16.	Terhathum**	100
				Total:	**13,844**

b. Isolated

S.N.	Project	Capacity (kW)	S.N.	Project	Capacity (kW)
1.	Heldung (Humla)	500	13.	Chaurjhari (Rukum)**	150
2.	Kalikot	500	14.	Aarughat (Gorkha)	150
3.	Accham	400	15.	Taplejung**	125

4.	Jhupra (Surkhet)***	345	16.	Okhaldhunga**	125
5.	Darchula I + II**	300	17.	Rupalgad (Dadeldhura)	100
6.	Bhojpur**	250	18.	Syangja***	80
7.	Dhankuta***	240	19.	Manang	80
8.	Jumla**	200	20.	Gorkhe (Ilam)***	64
9.	Syarpudaha (Rukum)**	200	21.	Helambu	50
10.	Bajura	200	22.	Chame	45
11.	Bajhang**	200	23.	Dhading	32
12.	Dolpa 200			**Total:**	**4,536**

III. Private sector hydro projects

Independent power producers (IPPs) connected to INPs:

S.N.	Poject	Capacity (kW)	S.N.	Project	Capacity (kW)
1.	Khimtikhola (HPL)	60,000	13.	Chaku Khola (APCo)	1,500
2.	Bhotekoshi (BKPC)	36,000	14.	Patikhola	996
3.	Chilime (CPC)	22,000	15.	Pheme Khola (KHP)	995
4.	Jhimruk (BPC)	12,000	16.	Upper Hadi Khola	991
5.	Indrawati III (NHPC)	7,500	17.	Baramchi (UH)	980
6.	Andhikhola (BPC)	5,100	18.	Seti-II 979	
7.	Khudi Khola (Khudi HP)	3,450	19.	Sisne Khola (GBHP)	750
8.	Mardi Khola	3,100	20.	Rairang (RHPD)	500
9.	Piluwa Khola (AVHP)	3,000	21.	Salinadi (KSHPS)	232
10.	Sunkoshi Small (SHP)	2,500	22.	Sange Khola (SHP)	183
11.	Ridi Khola	2,400			
12.	Thoppal Khola (THP)	1,650		**Total**	**166,806**

B. Hydro power projects under construction:

a. Major hydro projects

	Project	Capacity (kW)
1.	Upper Tamakoshi	456,000
2.	Chamelia	30,000
3.	Kulekhani-III	14,000
4.	Gamgadhi	400
	Total:	**500,400**

b. Independent power producers (IPPs)

	Project	Capacity		Project	Capacity
1.	Lower Modi	I 9,900	5.	Lower Indrawati (SHP)	4,500
2.	Sipring Khola	9,658	6.	Mai Khola	4,455
3.	Ankhu Khola	I 8,400	7.	Hewa Khola	4,455
4.	Siuri Khola (NGPL)	4,950	8.	Lower Piluwa	990
				Total:	**47,308**

C. Hydro power projects with PPA concluded

Private sector hydro projects

S.N.	Project	Capacity (kW)	S.N.	Project	Capacity (kW)
1.	Upper Madi	19,008	16.	Jumdi Khola	1,750
2.	Lower Balephi	18,514	17.	Theule Khola	1,500
3.	Mai Khola	15,600	18.	Jhyadi Khola	998
4.	Namarjun Madi	11,880	19.	Dorkhu khola	990
5.	Madkyu Khola	9,968	20.	Seti Khola	465
6.	Lower Sunkoshi-III	9,900	**PPA Concluded for Capacity Upgrade**		
7.	Nau Gad Khola	8,500	1.	Baramchi Khola	3,178
8.	Upper Mailun A	5,000	2.	Hewa Khola	2,055
9.	Tadi khola	5,000	3.	Chaku Khola	1,500
10.	Radhi Khola	4,400	4.	Jiri Khola	1,210

11.	Charanawati Khola	3,520	5.	Bhairab Kunda	1,150
12.	Middle Gaddigad	2,970	6.	Belkhu Khola	198
13.	Upper Hugdi Khola	2,599	7.	Narayani Shankar Biomass	100
14.	Pikhuwa Khola	2,475			
15.	Middle Chaku	1,800		**Total:**	**136,228**

Under termination proccess

S.N.	Project	Capacity (kW)	S.N.	Project	Capacity (kW)
1.	Upper Modi Khola	14,000	3.	Daram Khola	5,000
2.	Langtang Khola	10,000	4.	Lower Nyadi	4,500
				Total:	**33,500**

D. Hydro power projects planned and proposed

a. Major hydro projects

S.N.	Proect	Capacity (kW)	S.N.	Project	Capacity (kW)
1.	Budhi Gandaki	600,000	5.	Upper Trisuli 3 'A'	60,000
2.	Nalsyagu Gad (Storage)	400,400	6.	Upper Modi 'A'	42,000
3.	Upper Seti (Storage)	128,000	7.	Upper Trisuli 3 'B'	37,000
4.	Seti Trishuli (Storage)	128,000	8.	Rahughat Khola	27,000
				Total:	**1,422,000**

b. Diesel power stations

1.	Duhabi Multifuel	39,000
2.	Hetauda	14,410

c. Solar power stations

1.	Simikot	50
2.	Gamgadhi	50

Transmission Lines

a. Major existing lines

i. 132 kV transmission lines

S.N.	Transmission Lines	Length (KM)	Type of CKts.	S.N.	Transmission Lines	Length (KM)	Type of CKts.
1.	Anarmani-Duhabi	85.0	Single	2.	Hetauda-Gandak P/S	154.0	Single
3.	Kusha-Katiya (India)	19.0	Single	4.	Bharatpur – Pokhara	97.0	Single
5.	Duhabi-Hetauda	282.0	Double	6.	Bardaghat-Butwal	43.0	Double
7.	Hetauda-KL2 P/S	8.0	Single	8.	Butwal-KGA P/S	58.0	Double
9.	Bharatpur-Marsyangdi P/S	25.0	Single	10.	KGA P/S-Lekhnath	48.0	Single
11.	Marsyangdi P/S-Suichatar	84.0	Single	12.	Pokhara-Modikhola P/S	37.0	Single
13.	Suichatar-KL2 P/S	34.0	Single	14.	Butwal- Tanakpur P/S	407.0	Single
15.	Suichatar-New Bhaktapur	26.9	Single	16.	Pathalaiya-New Parwanipur	17.0	Double
17.	New Bhaktapur-Lamosangu	48.0	Double	18.	Marsyangdi-M. Marsyangdi	44.0	Single
19.	Lamosangu-Khimti P/S	46.0	Single		**Total:**		**1562.9**

ii. 66 kV transmission lines

S.N.	Transmission Lines	Length (KM)	Type of CKts.	S.N.	Transmission Lines	Length (KM)	Type of CKts.
1.	Chilime P/S-Devighat P/S	43.56	Single	2.	Suichatar-New Patan	4.0	Double
3.	Trisuli P/S-Balaju	29.0	Double	4.	Teku-K3 (Underground)	3.5	Single
5.	Debighat P/S-Balaju	30.0	Single	6.	Suichatar-K3	6.9	Single
7.	Debighat P/S-New Chabel	33.0	Single	8.	New Patan-New Baneshwor	2.8	Single
9.	Balaju-Laincahur	2.3	Single	10.	Bhaktapur-New Chabel	12.0	Single
11.	Balaju-KL1 P/S	36.0	Double	12.	New Baneshwor-Sunkoshi P/S	61.0	Single
13.	KL 1 P/S-Birgunj	72.0	Double	14.	Debighat-Trisuli	4.56	Single
15.	Suichatar-Teku	4.1	Single	16.	Indrawati-Panchkhal	10.0	Single
					Total:		354.72

b. Under Construction

i. 220 kV transmission lines

S.N.	Transmission Lines	Length (KM)	Type of CKts.
1.	Khimti-Dhalkebar	75	Single
2.	Hetauda-Bharatpur	72	Double

ii .132 kV Transmission Lines

S.N.	Transmission Lines	Length (KM)	Type of CKts.
1.	Thankot-Chapagaon	28.5	Double
2.	Chameliya-Attariya	129	Single

iii. NEA Joint Venture under Public Private Partnership Program

	400 kV Transmission Lines	Length (KM)	Type of CKts.
1.	kV Dhalkebar-Muzzaffarpur Cross Border Line	45.00	Double

c. Planned and Proposed

S.N.	Transmission Lines	Length (KM)	Type of CKts.
1.	220 kV New Marsyangdi-Matatirtha	85	Double
2.	132 kV Sangati-Lamosangu	40	Double
3.	132 kV Kabeli-Damak	90	Double
4.	132 kV Middle Marshyangdi- Dumre-Marshyandi	44	Double
5.	132 kV Dumree-Damauli	18	Single
6.	132 kV Butwal-Kohalpur Second circuit	208	D/C Tower
7.	220 kV Bharatpur-Bardghat	73	Double
8.	132 kV Hetauda-Kulekhani-IISiuchatar second circuit	44	D/C Tower
9.	220 kV New Hetauda-Dhalkebar-Duhabi	283	Double
10.	220 kV New Hetauda-Matatirtha	45	Double
11.	220 kV Bardaghat-New Butwal	30	Double
12.	220 kV Trishuli-Thankot	54	Double
13.	132 kV Kohalpur-Attariya second circuit	200	D/C Tower
	Total:		1,214

NEA Joint Venture under Public Private Partnership Program

S.N.	Transmission Lines	Length (KM)	Type of CKts.
1.	400 kV Duhabi-Purnia Cross Border Line*	22	Double
2.	400 kV New Butwal-Gorakhpur Cross	25	Double
3.	66 kV Sanjen-Chilime	12	Double
	Total:		**59**

* Border Line

Transmission Line Sub-Stations					
Existing			**Planned & Proposed**		
S.N.	**Capacity**	**Unit MVA**	**S.N.**	**Capacity**	**Unit MVA**
1.	132/11 kV	186.00	1.	132/33 kV Syangja	15.00
2.	132/66 kV	248.40	2.	132/33 kV Anbukhaireni	15.00
3.	66/11 kV	485.20	3.	132/33 kV Damak	30.00
4.	132/33 kV	470.50	4.	132/11kV Chapali	30.00
5.	66/33 kV	25.00	5.	132/33 kV Kusum	30.00
	Total	1415.10	6.	132/33 kV Matatirtha	32.00
			7.	132 kV Hapure	30.00
	Under Construction		8.	132 KV Hetauda (Kamane)	30.00
1.	132/11 kV Matatirtha	22.50	9.	132 KV Pathlaiya	22.50
				Total:	**234.5**
				Planned & Proposed	
			1.	New Butwal Switching Station	
			2.	New Bharatpur Switching Station	
			3.	Pathlaiya Switching Station	

Overall Scenario of Power Projects in Nepal

Sector	Capacity (kW)
Total Major Hydro Grid Connected	472,994
Total Small Hydro Isolated	4,536
Total Hydro NEA	477,530
Total hydro IPP	158,315
Total Hydro -Nepal	635,845
Total thermal (NEA)	53,410
Total Solar (NEA)	100
Total Installed Capacity (including Private and Others)	**689,355**

Notes: * Line length within Nepal portion. ** Leased to the Private Sector.
*** Not in Normal Operation.

Source: Nepal Electricity Authority.
Available online at http://www.fncci.org/text/pp-eup.pdf.

Appendix II: About the contributors

Hugo Aschwanden
Hugo Aschwanden, PhD, is Head of Section, Water Resources Management, in Switzerland's Federal Office for the Environment, and Project Leader within the framework of the Swiss Water Agenda 21. His expertise is in runoff modelling and forecasting, integrated river basin management, water policy development, and the EU-Water Framework Directive.

Bernard Dafflon
A professor of public finance and policies at the University of Fribourg (Switzerland) since 1986, Bernard Dafflon has concentrated his research publications on decentralization and fiscal federalism, local public finance, and institutional political economy. He has worked for the Council of Europe, the World Bank Institute, the Agence Française de Développement, and the Swiss Agency for Development and Cooperation.

Ratna Sansar Shrestha
Ratna Sansar Shrestha, FCA, is a management professional specializing in the financial/economic, legal and managerial aspects of hydropower projects, renewable energy technologies, environmental enterprises, carbon trading, etc. He is a Fellow of the Institute of Chartered Accountants of Nepal and a corporate lawyer accredited to the Nepal Bar Council. Currently, he is a member of the board of directors of Everest Bank Ltd as well as Butwal Power Company Ltd. Mr. Shrestha also worked as a member of board of directors of Nepal Electricity Authority from December 2002 to August 2004. He is attached to Kathmandu University School of Engineering as a visiting faculty in its Master of Engineering program, and a member of Nepal's Water Tariff Commission.

Werner Thut (Editor)
Werner Thut, PhD, is a specialist in economic history and constitutional law. He was seconded to the Forum of Federations by the Swiss Ministry of Foreign Affairs/Swiss Agency for Development and Cooperation to act as the Forum's Vice President and Head of Development Assistance from August 2008 to July 2011.

Appendix III: Stakeholders Consulted

Politicians	
Prakash S. Mahat	Energy Minister, member of Nepali Congress
Lila M Pokhrel	Chief, Water Resource & Energy Dept, member of UCPN Maoist
Bureaucrats	
Anup Upadhyaya	Joint Secretary, Ministry of Energy
Sriranjan Lacoul	Joint Secretary, Ministry of Energy
Utility, grid operator	
Jivendra Jha	Executive Director, Nepal Electricity Authority
NGOs/INGOs	
Subarna D Shrestha	President, Independent Power Producers' Association of Nepal and CEO, Sanima Group
Hari Bairagee Dahal	President, Small Hydropower Developers Association of Nepal and developer of Piluwa, lower Piluwa, Sisne, and Rairang projects
Hydro Entrepreneurs	
Sandip Shah	Vice President, SN Power Invest and owner of Khimti. Developing Tamakoshi 3 and former president of IPPAN.
Ranjan Lohar	CEO of BPC and owner of Andhikhola, Jhimruk. Developer of Khimti, Nyadi and Kabeli A
Financiers	
Manoj Goyal	CEO, Clean Energy Development Bank
Ramesh Bhattarai	CEO, Employees' Provident Fund
Hisanobu Shishido	Acting Country Director, World Bank
Academics	
Dipak Gyawali	Chief, Institute for Social and Environmental Transition
Ajaya Dixit	Chief, Water Conservation Foundation
Bhola Thapa	Dean, KU School of Engineering
Sudhindra Sharma	Chief, Interdisciplinary Analyst
Consultants	
Keshab M. Amatya and Rabindra M. Shrestha	Directors of Nepal Consult (P) Ltd.

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