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2019

Lessons on how to Promote and Execute Equity Capital in the Renewable Energy sector of Nepal

DOLMA FOUNDATION
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Dolma Foundation is a non-profit organisation, promoting prosperity by investing in education and sustainable business in Nepal that are risky for the private sector.

This report series was produced and authored by Matthew Ribeiro-Norley and Vishal Bista. The team is grateful for collaboration and data within Dolma and from various agencies in Nepal. The cut-off date for data in this report was January 2019.

SUGGESTED CITATION

This chapter is an excerpt from the publication: Lessons on how to promote and execute equity capital in the renewable energy sector of Nepal (Dolma Foundation, 2019).

DISCLAIMER

This publication has been funded by the UK government through the Department for International Development (DFID). The findings, interpretations, and conclusions expressed in this paper are the author's alone and do not necessarily reflect the views or official policies of the UK government.

EXECUTIVE SUMMARY

CHAPTER 1: ENERGY MARKET ANALYSIS

- Chapter 1 sets the tone for the series in highlighting that commercial institutional investors are the only sector with the capacity to finance this gap.

- Nepal currently sits on a USD 17.8 bn infrastructure gap (excluding transmission and distribution) which needs to be addressed.

- A prime solar belt region with 300 days of sunshine, and holding an economically feasible potential of ~43,000 MW of hydropower, Nepal boasts impressive renewable energy potential.

- Despite this, Nepal's total installed capacity (March 2018) stands at 1,017 MW – 968 MW from hydro resources and 49 MW from thermal alternatives. Solar capacity is limited to 1.2 MW.

- Electricity imports remain high in the dry season (Oct-Mar) for both peak load and base load energy, and as of March 2019 stood at 650 MW.

- The Nepalese Rupee has remained pegged to the Indian rupee since 1993, primarily in the interest of price stability.

- Based on Dolma's findings, the Project Internal Rate of Return for hydropower projects in Nepal range from 15-20%.

- The main barriers to entry in Nepal include political stability, policy stability, currency, weak governance, climate change and bureaucracy.

- Barriers to exit include the process of repatriating funds (whereby multiple authorities are required to sign-off after taxes are paid); as well as the lock-in period of up to three years after IPO on the Nepal Stock Exchange.

- While there is a clear opportunity to export electricity to India in future, a clear framework agreed by both parties has not yet been enforced.

CHAPTER 2: CLIMATE CHANGE

- Chapter 2 reflects on the environmental and social implications of a changing climate. Known for its pristine glaciers and abundant flora, the Himalayan region has witnessed an alarming number of climate-related tragedies in the last two decades. Between 2000 and 2015, ICIMOD estimates that 45,534 people died due to flooding, 10,893 to extreme heat, and 191 by drought, in Himalayan countries alone.

- Higher temperatures have resulted in glaciers receding at alarming rates, adding volume to Glacial Lakes which pose a threat to those living downstream in the event of a burst. Moreover, unpredictable river flow can be a threat to farmers.

- This chapter also puts into perspective that while CO2 rates remain high, the most immediate threat to the region – as identified in a series of recent reports from the Intergovernmental Panel on Climate Change (IPCC) and International Centre for Integrated Mountain Development (ICIMOD) – are short-lived climate pollutants, such as black carbon.

- Despite its shorter life-span (approximately 50 years), black carbon is a warming agent with 1,500 times the warming effect of CO2. According to research, fossil fuel sourced black carbon appears to have twice the particle-specific warming potential of biomass sourced black carbon.

- Based on conversations Dolma has had with regional climate scientists, prioritising the mitigation of short term climate pollutants is paramount to reversing Himalayan glacial melt – of which one third is expected to disappear by 2100 in a business-as-usual environment.

CHAPTER 3: TRANSMISSION AND DISTRIBUTION

- Chapter 3 traces Nepal's energy infrastructure development and progress. Unlike energy generation, Nepal's transmission network grew at an annual rate of 8% from 2008 to 2012.

- Electricity markets in Nepal are gradually un-bundling. Until 1990 all production, transmission and distribution were vertically controlled by the Nepal Electricity Authority.

- Since 1990, Independent Power Producers have added ~500 MW to the grid.

- Despite plans to un-bundle the NEA's transmission and distribution business following The Hydropower Development Policy 1992, it was only with assistance from the Asian Development Bank in 2015 that the National Transmission Grid Company was set up.

- As this publication went to print, the newly-found distribution company had still not made any significant progress.

- There are some USD 817 mn allocated to the enhancement of Nepal's transmission and distribution, mainly led by key donors such as ADB, Government of Norway, MCC and JICA.

- A further USD 471.5 mn is being spent on policy and institutional reforms led mainly by the World Bank, ADB, and Canadian Government.

CHAPTER 4: REGULATORY ADVOCACY

- Chapter 4 puts forward a number of recommendations to government that would facilitate the enabling environment for international investors.

- Nepal has over the last five years (2013-2018) amended and introduced several regulations to facilitate public-private partnership and encourage further private sector investment.

- Despite the government's best intentions to prioritise infrastructure, some have labelled the planning "erratic": since 2001 there have been five strategic documents on energy capacity targets, one every three years on average.

- The most recent government plan, from 2016, calls for the construction of 10,000 MW by 2030.

- The World Bank and others have argued that to attract and retain investment to the tune of tens of billions of dollars, an enabling environment is required.

- "Quick-Win" regulatory reforms that would have a disproportionately positive impact on the infrastructure investment environment in Nepal:

1. Automatic route for foreign investment
2. Foreign currency power purchase agreements
3. Return on equity (ROE) clarifications
4. Alternative and auxiliary energy tariffs (new technologies such as batteries)

- Long-term reform opportunities beyond the scope of this project:

1. Sovereign credit rating
2. Cost-plus approach
3. Competitive bidding
4. Protection for seasonality
5. Benefit sharing
6. Cooperation with regional partners

CHAPTER 5: INSTITUTIONAL INVESTOR INVESTMENT LANDSCAPE

- Chapter 5 identifies three key catalysts for driving institutional investors into frontier markets like Nepal: low global interest rates; the commercial viability of renewable technologies; and heightened public, shareholder and regulatory opinion in relation to carbon emissions.

- The need to attract large amounts of FDI to finance Nepal's power needs is well documented, both the Investment Board of Nepal and National Planning Commission agree that to meet just domestic demand, approximately USD 18 bn is required in capital investment (both debt and equity), or USD 1.5 bn annually.

- The Dolma team interviewed some of the world's largest institutional investors, testing the risk and return mandate for Nepal against their current and emerging risk strategies. Interviewees included funds with

assets under management from USD 1 bn to 6 tn.

These were our findings:

- Some investors suggested that the required return on equity for construction risk could be up to 20%, provided a Nepal project vehicle can demonstrate equivalency to investment grade status after successfully mitigating risks.

- Among institutional investors there is a clear negative bias against credit and currency risk, suggesting that FX risk, real or perceived, prevents perhaps trillions of dollars from flowing to the poorest economies.

- Dolma's findings also suggested that a country's credit rating is fundamental to getting an investment proposal through the first step of the investment procedure. In some cases, the lack of a sovereign credit rating and international sovereign bonds for Nepal has been too large a barrier to overcome in our discussions with some investors who are often restricted to considering countries that are at least investment grade (BBB-).

- Some solutions to perceived risks included adopting Political Risk Insurance (PRI); Currency Hedging Mechanisms; and Bank Guarantees, amongst others.

- Investors interviewed fell into two groups –leaders and followers – the former willing to take higher risk in search of greater yield and the latter less so; 2) there is no clear connection between Assets Under Management (AUM) and risk profile when it comes to investing in frontier markets like Nepal.

CHAPTER 6: COMPLEMENTARY INVESTORS

- Chapter 6 discusses complementary investors (or blended concessional finance) which provide a new wind of opportunity for institutional investors – previously unable to invest in frontier market because of perceived risk. Blended capital works to de-risk perceived obstacles.

- Investment instruments typically involve the deployment of grants, concessional lending, guarantees, and equity. These are deployed using adaptable programme, policy and sector investment loans, debt swaps, PPPs, advanced market commitments, and first loss reserve tranches.

- Green bonds have recently also proven to be a potential solution by providing debt financing to eligible climate change projects. As of 2018, green bond issuance reached some USD 250 bn.

- Complementary investors have played a key role in attracting investment to Nepal's renewable sector – these include Development Finance Institutions such as FMO, OEEB, DGGF and FINNFUND, as well as Multilateral platforms like IFC and ADB.

- As stated in chapter 5, Dolma finds that at least two blended finance instruments are required for institutional investors to consider a renewable energy project in Nepal: political risk insurance and a currency hedge.

- Dolma's research finds that countries successful in solving these risks for investors were able to make bold moves within their own domestic economies.

- Nepal could follow the path of successful governments in doing so by creating its own government backed instruments and enacting reform.

CHAPTER 7: LEGAL STRUCTURING

- Chapter 7 explains the legal structuring backdrop which is an essential component for foreign investors considering large infrastructure in Nepal.

- To invest in Nepal through the FDI route, it is important to analyse and decide upon which country to invest from. To date there are 15 jurisdictions which hold a Dual Taxation Agreement (DTA) with Nepal which mitigates the risk of paying double taxation.

- Dolma finds that Mauritius is generally viewed as the "gateway" to Nepal because both countries hold a DTA – Mauritius is

also known as a transparent jurisdiction that ranks well according to the financial services index. It also has experience fund management and administrative services which manage approximately USD 670 bn in assets.

- Despite Mauritius' favourable positioning, the choice of domicile is based on the circumstances and preferences of individual investors.

- Dolma views the UK as one of many strong locations to set up a fund manager, and has based the examples in chapter 7 on an English limited partnership or UK company as the fund vehicle.

CHAPTER 8: FINANCIAL STRUCTURING

- Chapter 8 explores key regulated and non-regulated institutions that could act as potential sources of financing for energy projects in-country.

- Nepal is yet to formulate specific regulatory provisions for private equity funds that invest in private companies.

- There are a number of private equity players investing in renewable energy in Nepal, which include IFC, Dolma Impact Fund I and Equicap.

- Dolma found that key exit issues for international investors include, but are not limited to the following:

1. Valuation at exit
2. Taxation in change of ownership
3. Repatriation issues

- Dolma found that there could be some challenges for investors keen to invest through a project finance model, particularly for debt financing:

1. A limited tenor and floating interest rates on long term loans.
2. Generally, a limited capacity for banks to lend.
3. A limited scope for corporate bonds, which is still a nascent market.

- The chapter also explores key financial issues for investors and how to integrate these solutions at the fund level: these include suggestions for currency risk, political risk, and debt risk.

CHAPTER 9: PROJECT DESIGN AND ENGINEERING

- Chapter 9 focuses on the practical realities of executing renewables projects in Nepal, acknowledging that besides hydropower – Nepal's most mature energy asset class – other newer technologies such as solar and batteries could play a significant role in servicing growing supply, and providing auxiliary services.

- Despite Nepal's installed generation capacity standing at 1,100 MW, there are some 7,000 MW in licenses that have been issued by the government to IPPs. The vast majority of these are for hydro-run-of-river (RoR) projects.

- Dolma has identified a priority pipeline of hydro and solar projects that are optimal from a project execution perspective.

- The chapter also includes a summary of leading battery technologies and which would be most suited in Nepal's context.

- While there are no Nepali contractors that offer Engineer Procurement Construction (EPC) contracts this chapter analyses local firms that have a track record for hydro and solar projects in-country.

- As financiers are increasingly aligning their investment mandates to the UN's Sustainable Development Goals, the chapter also outlines high level strategies for climate adaptation and resilience.

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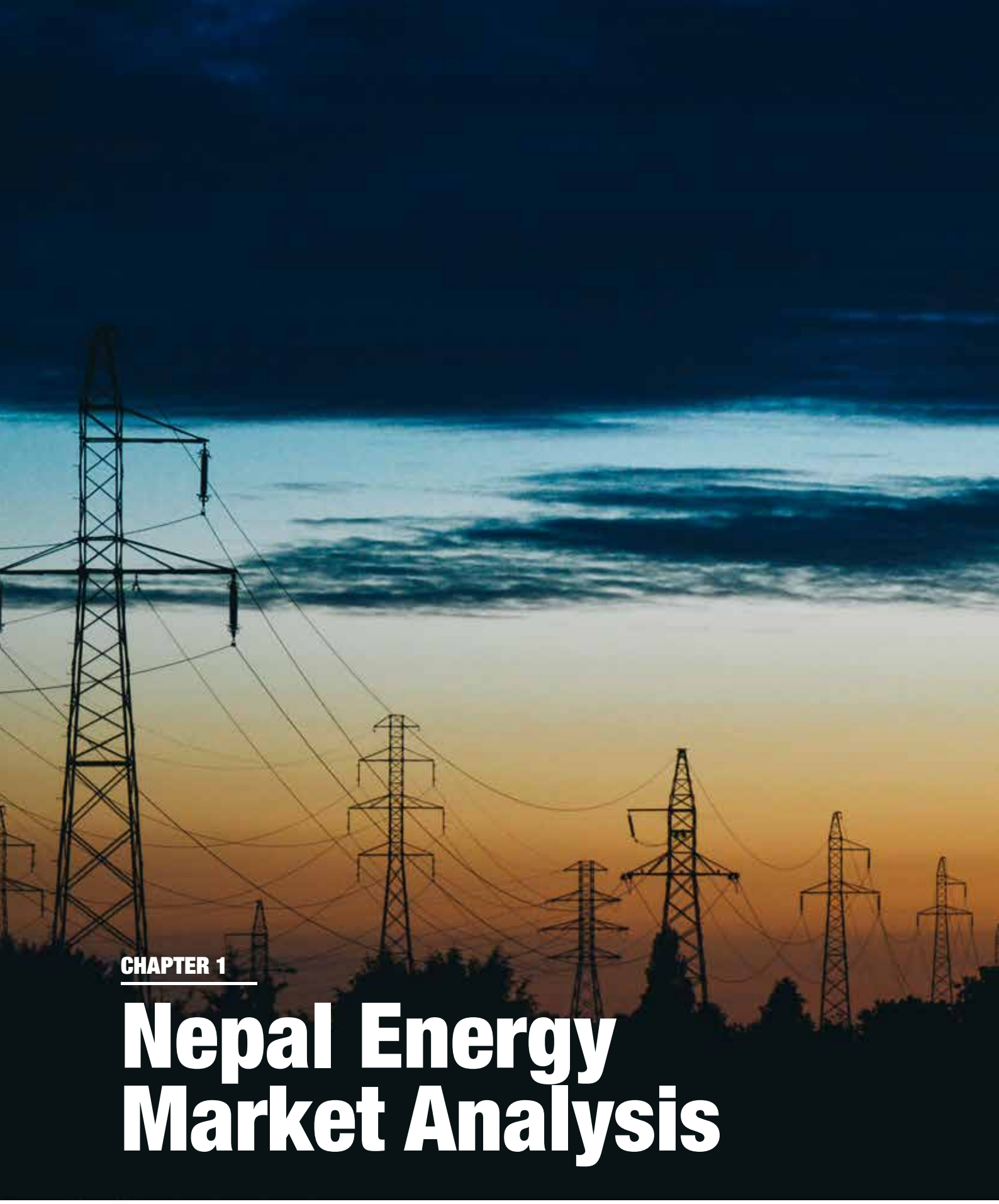
CHAPTER 1

An overview of Nepal's renewable energy potential, opportunities for international investment in the backdrop of key macroeconomic indicators.



CHAPTER 1

Nepal Energy Market Analysis

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Nepal Energy Market Analysis

ABBREBIATIONS

TABLES

FIGURES

ABBREVIATIONS

ADB	ASIAN DEVELOPMENT BANK
CAGR	COMPOUNDED ANNUAL GROWTH RATE
CSP	CONCENTRATED SOLAR POWER
DHI	DIFFUSE HORIZONTAL IRRADIANCE
DNI	DIRECT NORMAL IRRADIANCE
DOED	DEPARTMENT OF ELECTRICITY DEVELOPMENT
EIA	ENVIRONMENTAL IMPACT ASSESSMENT
FDI	FOREIGN DIRECT INVESTMENT
FITTA	FOREIGN INVESTMENT AND TECHNOLOGY TRANSFER ACT
GDP	GROSS DOMESTIC PRODUCT
GHI	GLOBAL HORIZONTAL IRRADIANCE
GON	GOVERNMENT OF NEPAL
GWH	GIGAWATT HOURS
IBN	INVESTMENT BOARD NEPAL
INR	INDIAN RUPEES
IPP	INDEPENDENT POWER PRODUCERS
KM2	KILOMETER SQUARE
KW	KILOWATT
KWH	KILO WATT HOURS
MAED	MODEL FOR ANALYSIS OF ENERGY DEMAND
MOE	MINISTRY OF ENERGY
MW	MEGAWATTS
NEA	NEPAL ELECTRICITY AUTHORITY
NEPSE	NEPAL STOCK EXCHANGE
NPR	NEPALESE RUPEES
PPA	POWER PURCHASE AGREEMENT
PV	PHOTOVOLTAICS
SAARC	SOUTH ASIAN ASSOCIATION FOR REGIONAL COOPERATION
SARI/EI	SOUTH ASIAN REGIONAL INITIATIVE FOR REGIONAL INTEGRATION
UN	UNITED NATIONS
USD	UNITED STATES DOLLAR
VAT	VALUE ADDED TAX
WECS	WATER AND ENERGY COMMISSION SECRETARIAT

1.1 INTRODUCTION

It is no secret that Nepal faces an acute shortage of Foreign Direct Investment (FDI) relative to its neighbours (see Figure 1). According to the World Bank's recent report, "Powering Recovery", and similar publications, the lack of adequate financing for infrastructure projects has proven to be a major setback for development.

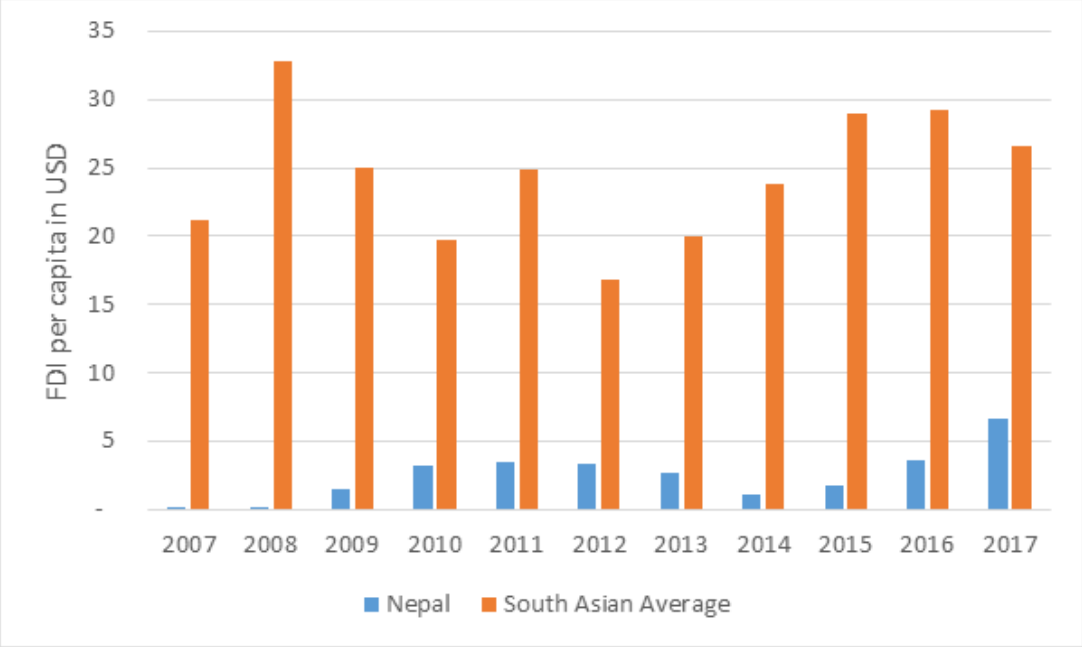
Given the current global economic climate of low interest rates and bond yields, as well as international recognition of the causes of climate change, institutional investors (including pension and life insurance funds) are increasingly re-positioning themselves towards developing markets and raising their allocations to renewable energy. According to the Financial Times, a third of global pension funds are turning towards infrastructure projects in search of greater yields.

This phenomenon presents an opportunity for Nepal – one that is essential to take advantage of to finance the ~USD 25 bn (excluding transmission and distribution) required to achieve the government-stated target of 10 GW in 10 years. According to the Nepal Banking Association, the theoretical maximum available for hydro in the domestic banking sector is NPR 180 bn (USD 1.7 bn). Development Finance Institutions (DFIs) may be able to allocate around USD 2 bn, the IFC dominating with approximately USD 1.5 bn. Assuming generous domestic equity participation at USD 2 bn, this leaves an additional FDI financing requirement of approximately USD 17.8 bn. For context, the government's budget is USD 11 bn at the current exchange rate (September 2018).

The commercial institutional investor market is perhaps the only sector with the capacity to finance this gap, with OECD pension funds holding assets under management (AUM) of USD 25 tn.5 In addition, if this sector could be attracted to Nepal's energy sector, it may be induced to financing other much-needed infrastructure projects in Nepal.

This series of reports will help to understand risk and opportunities in Nepal from the perspective of an institutional investor and suggest solutions to reduce or hedge these risks. Market Analysis, the first report in the series, explores the potential renewable energy generation, along with existing generation and transmission infrastructure in Nepal. It gives an overview of the current regulatory environment in Nepal. It then explores risks relating to exit and entry. Finally, it explores the possibility of Nepal trading electricity beyond its borders.

FIGURE 1: NEPAL'S FDI PER CAPITA COMPARED WITH THE SOUTH ASIAN AVERAGE



1.2 RENEWABLE ENERGY POTENTIAL GENERATION IN NEPAL

Nepal boasts an impressive renewable energy potential, which has been well documented by independent researchers, multilateral agencies, and the government. The need for greater energy production and Nepal's natural advantage for renewable energy generation is undisputed.

HYDROPOWER

- 43,000 MW of economically feasible potential
- 225 bn cubic meters of water flows from rivers in Nepal to India, contributing to over 70% of freshwater supply in North India
- The terrain that stretches between the tall snow-capped mountains in the north and the plains of the south provide the steep gradient required for hydropower development
- Incentives available to hydropower developers:
  - Income tax exemption for 10 years and 50% off for five years thereafter
  - VAT exemption on imports; VAT refund of USD 50,000/MW at commercial operation date
  - Foreign currency denominated PPA for projects above 100 MW (subject to NEA approval, granted on a case-to-case basis)

TABLE 1: TOP 5 HYDROPOWER PLANTS BY CAPACITY INSTALLED IN NEPAL

Project	Capacity (MW)	Developer
Kali Gandaki A	144	NEA
Madhya Marsyangdi	70	NEA
Marsyangdi	69	NEA
Khimti	60	IPP
Upper Marsyangdi A	50	IPP

TABLE 2: THEORETICAL, TECHNICAL, AND ECONOMICAL HYDROPOWER POTENTIAL OF NEPAL

Major River Basins	Theo-retical Potential (in MW)	Technical Potential	Economic Potential		
		No. of project sites	Potential in MW	No. of project sites	Poten-tial in MW
Sapta Koshi	22,350	53	11,400	40	10,860
Sapta Gandaki	20,650	18	6,660	12	5,270
Karnali and Ma-hakali	36,180	34	26,570	9	25,125
Southern Rivers	4,110	9	980	5	878
Total	83,290	114	45,610	66	42,133

SOLAR

Solar (both Photovoltaic and Concentrated Solar Power is a less developed asset class in Nepal, and its potential for development remains high. The 2008 UN "Solar and Wind Energy Resource Assessment in Nepal", still widely referenced, stresses that Nepal is in a prime solar belt region, located at 30 degrees latitude with 300 days of sunshine. National average solar radiation varies from 3.6 to 6.2 kWh/m2/day.

Grid connected conc entrated solar power

- Roughly 37,501 km2 of Nepal falls under CSP potential, which is 25% of its total area.
- If only 2% of the best solar irradiance is used for power generation, CSP could yield 1,829 MW.
- There are currently no existing CSP installations in the country.

GRID CONNECTED SOLAR PHOTOVOLTAIC

- The commercial potential for PV (photovoltaic) grid connection is estimated at 2,100 MW.
- Currently, only 1,214 Kilowatts (kW) of grid-connected photovoltaic capacity is installed in Nepal.
- The NEA is constructing a 25 MW solar plant at their Devighat Hydropower Station. This project is financed by the World Bank and is expected to be online in 2018.

The national landscape for solar PV/CSP in Nepal is promising from a natural resources point of view – i.e., there is high solar irradiance across the country. One hurdle, however is a lack of transmission substations to absorb power. Given these limitations, most solar scoping studies, including the Asia Development Bank's Solar grid impact study, focused mainly on the Terai (southern plain region bordering North India) region of Nepal, where there is a mature transmission infrastructure. The Dolma Foundation was interested in scoping other parts of the country, namely higher altitude regions where irradiance is known to be greater and there is less competition for land, but with limited options for power evacuation should a plant be commissioned. The country's solar irradiance map is shown in Figure 2.

It should be noted that the measure for solar irradiance is GHI (Diffuse Horizontal Irradiance), which is different from DNI (Direct Normal Irradiance) in the sense that it represents the total amount of shortwave radiation received from above by a surface horizontal to the ground. This value is of interest to PV installations.

Nepal's GHI levels, independent of other criteria such as infrastructure availability, point to two hotspots:

1. Mustang and Manang regions
2. Nepal's Far West region

Both sites are useful reference points, being relatively flat, with high solar irradiance, and located at a commercially viable altitude of 3,000 meters. According to the latest Transmission Master Plan,3 a number of substations within a few kilometres' radius of areas with prime solar irradiance are planned to go online in the next 2–3 years.

As infrastructure development progresses, the high altitude solar space will present an opportunity for developers to balance Nepal's grid in the drier seasons when hydropower generates less energy. However, this conclusion does not consider other factors, such as site access in remote regions and environmental and social analysis.

FIGURE 2: SOLAR RADIATION AND NEA SUBSTATION LOCATIONS

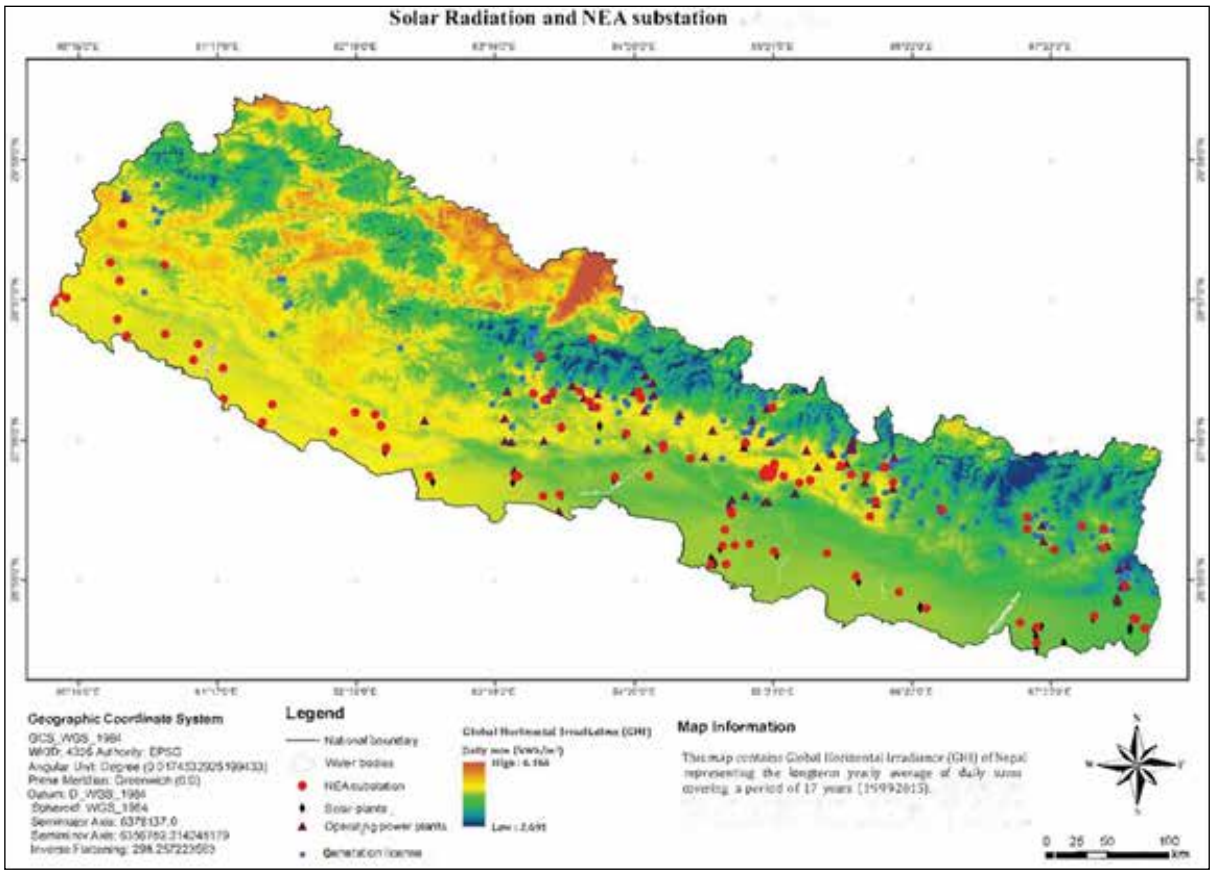


FIGURE 3: NEPAL GLOBAL HORIZON IRRADIANCE HOTSPOTS [5]

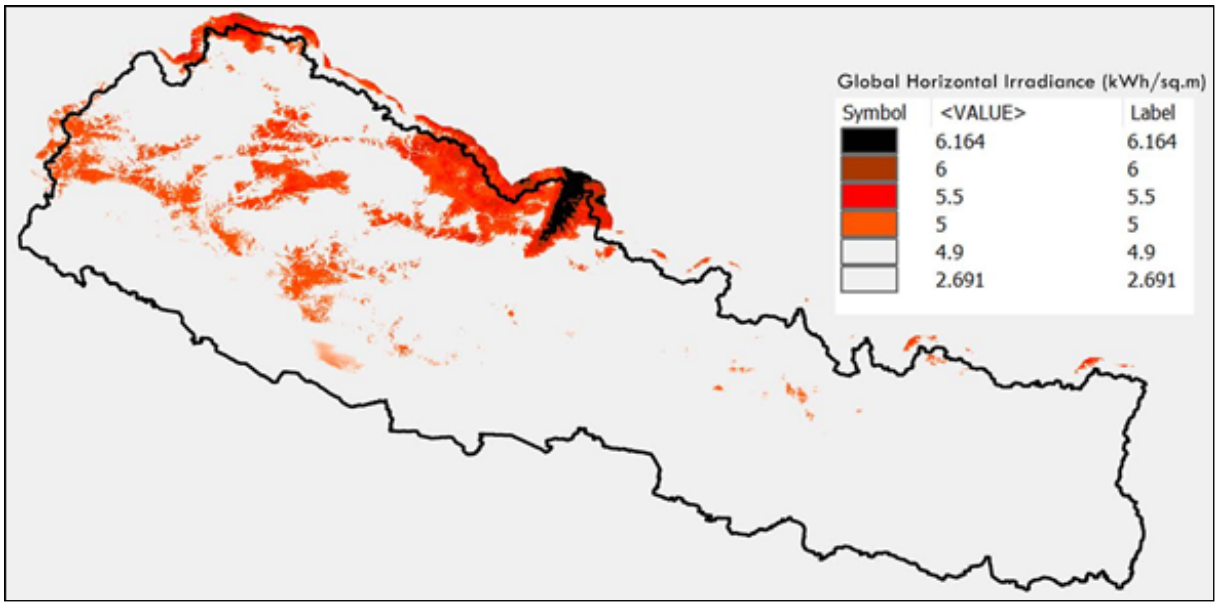


FIGURE 4: MUSTANG & MANANG IRRADIANCE (GHI)5

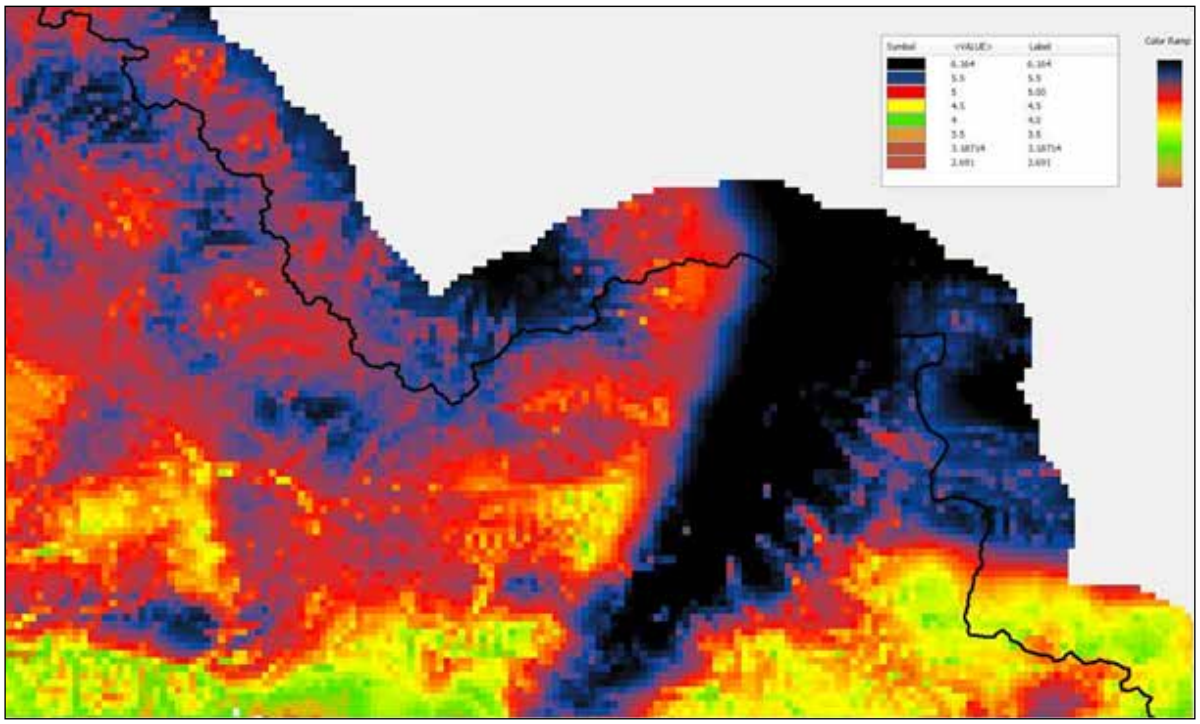


FIGURE 5: MUSTANG & MANANG ALTITUDE 5

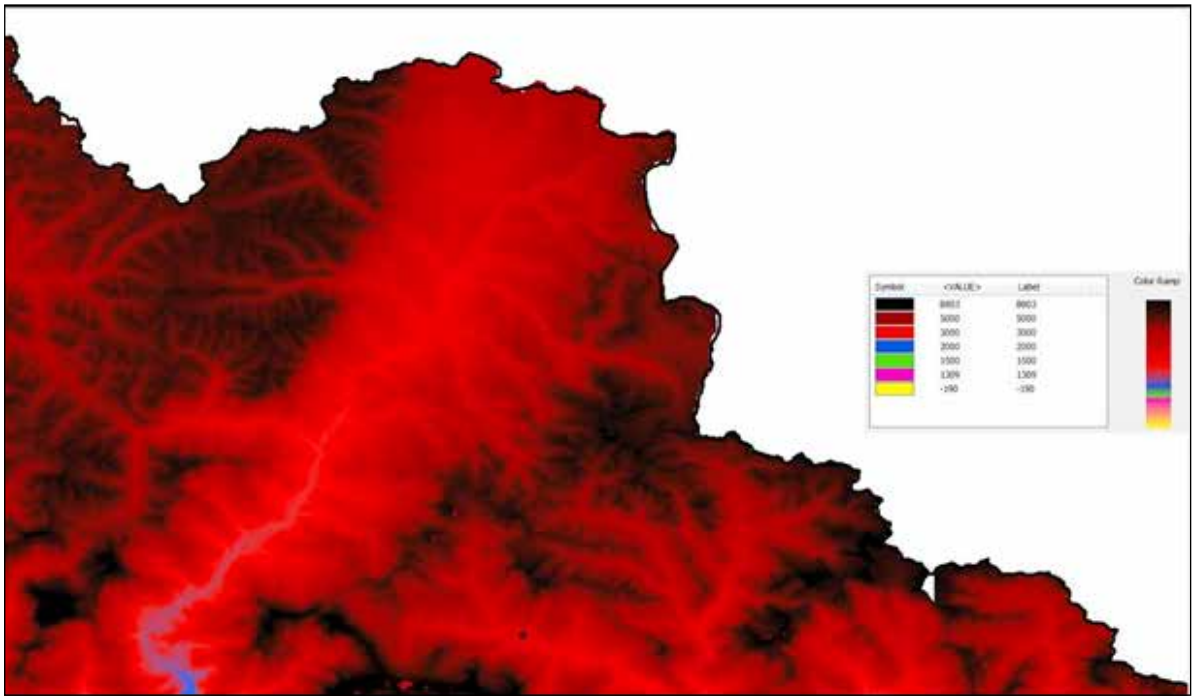


FIGURE 6: BHIJER – FAR WEST IRRADIANCE (GHI) 5

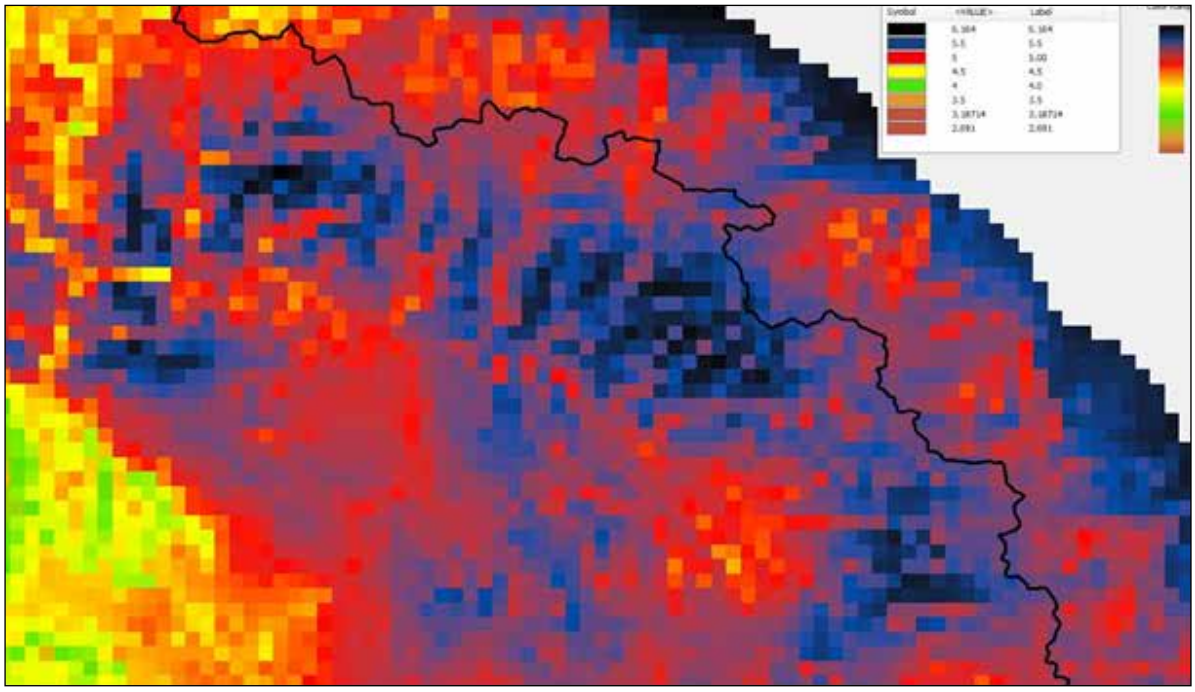
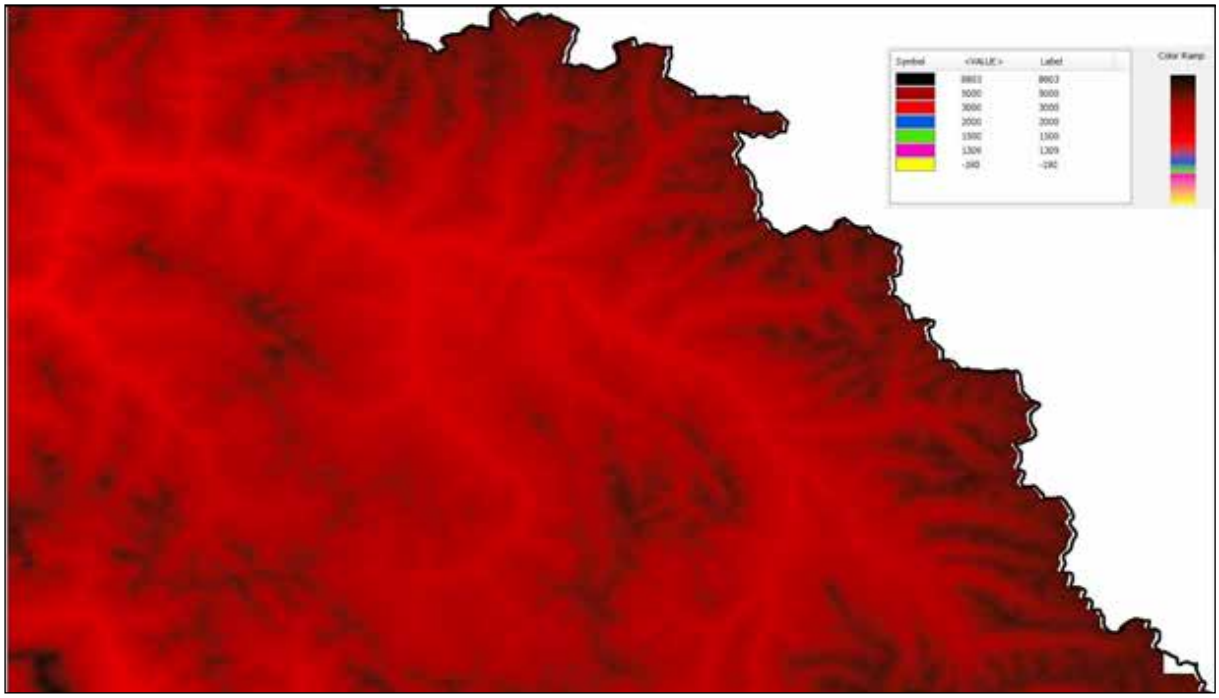


FIGURE 7: BHIJER – FAR WEST ALTITUDE 5



1.3 EXISTING GENERATION AND TRANSMISSION INFRASTRUCTURE AND FUTURE POTENTIAL

EXISTING GENERATION AND INSTALLED CAPACITY

Historically, energy generation in Nepal has been controlled by the NEA, which owns around 50% of the country's installed capacity. The remaining share is owned by 38 independent power producers. As of March 2018, Nepal had a total installed capacity of 1,017 MW, 968 MW of which comes from hydro resources and the remainder from thermal alternatives. Despite the country's solar PV/CSP potential, its installed capacity is limited to 1.2 MW.

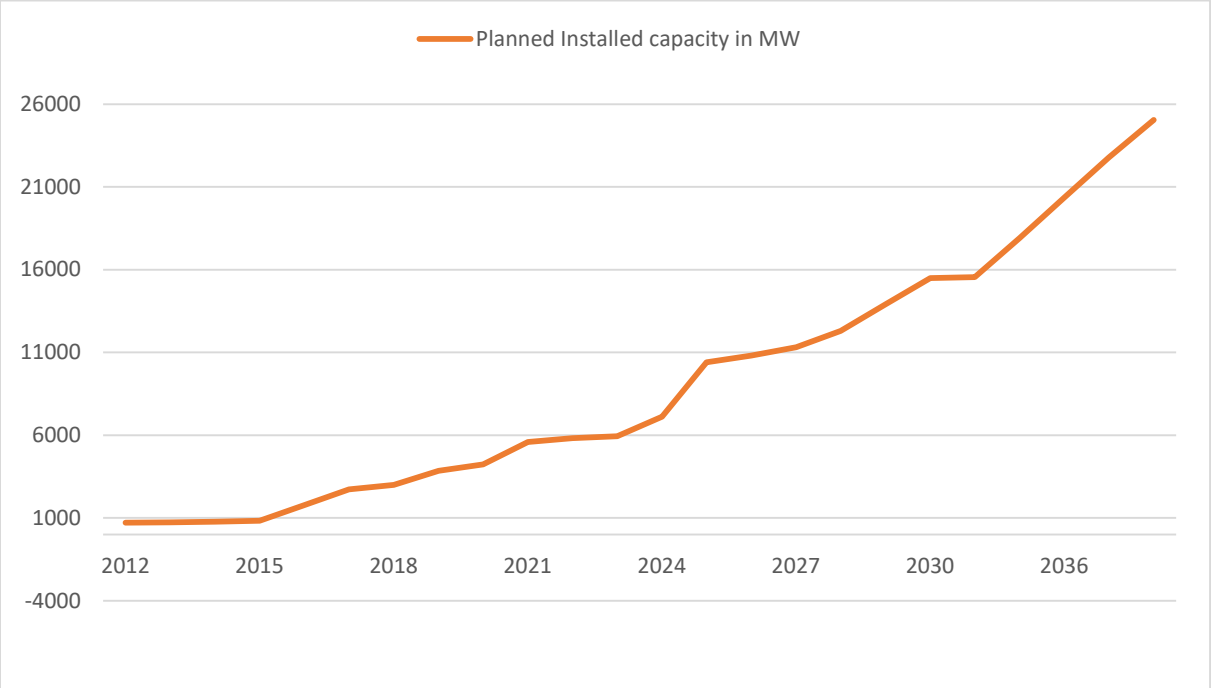
According to the NEA's FY 2016–17 report, Nepal's existing high voltage transmission network comprises 2,819 circuit km of 132 kV lines and 1,996 Mega Volt Amps (MVA) of substation capacity at the 132 kV level. Unlike the generation segment of the country, transmission has shown significant growth between 2010 and 2017, during which the 132 kV transmission line network has grown at a rate of 8.8% annually. The country also has a 66 kV transmission network with 494 circuit km of lines and a transformer capacity of 622 MVA.

The Nepal government received grant assistance from the US government through the Millennium Challenge Corporation (MCC). The NEA plans to build a 300 km of mid-hill 400 kV Transmission Line Network. The Khimti-Kathmandu 400 kV network, which is under construction with the assistance of ADB, will be connected to this network.

Nepal's transmission grid is linked to India's via 22 links at the 132 kV, 33 kV, and 11 kV levels. About 80–100 MW of power is exchanged between the two countries in radial mode via these links.

In the dry season of 2017–2018, NEA imported approximately 500 MW of electricity from India, primarily through the 400 kV Dhalkebar-Muzaffarpur (D-M) line, 132 kV Raxaul-Parwanipur line, 132 kV Kataiya-Kusaha line, and 132 kV Tanakpur line. The D-M line, currently charged at 132 kV, ensures full synchronisation of the Nepal power system with the Indian grid. This connection is to be upgraded to 220 kV in 2018 and 400 kV in 2020.

FIGURE 8: NEPAL'S PLANNED INSTALLED CAPACITY IN MW



1.4 LICENSES ISSUED AND GENERATION PROJECTIONS

HYDRO

According to the Department of Electricity Development, some projects (generating a total of 15,980 MW) have been issued survey licenses, of which projects generating a total of 4,974 MW hold a generation license and are under, or awaiting, construction. The World Bank's Nepal Development Update, "Powering Recovery" (September 2016), refers only to projects with a combined capacity of 1,800 MW that have mobilised fin ancing and are currently under construction, as highlighted in figure 9 below. We estimate that as of July 2018, projects with a combined capacity of 3,000 MW are at various stages of construction.

Over the last decade, the installed capacity has increased by around 50 MW per year. In the last few years, this figure has increased to around 150 MW per year. A total of 1,000 MW will be commissioned in the current fiscal year, 2017–18, starting in mid-July; in the next fiscal year, the capacity addition will be around 600 MW, as the 456 MW Upper Tamakoshi Hydro is expected to go online in this period.

The World Bank suggests that the GoN's 10,000 MW target is possible but would take 15–20 years to achieve. For reference, the Nepal Electricity Authority (NEA) has suggested that domestic growth requires approximately 4,000 MW in the next 10 years.

SOLAR

As of June 2018, solar projects totalling 223 MW of generation capacity were issued survey licenses in Nepal. All recent licenses were issued on, or after, July 2016.

TABLE 3 SOLAR PROJECTS WITH SURVEY LICENSES

Project	Capacity	Validity
Solar Power Plant, Dang	20	2019
KTM Energy Solar Hybrid Power Project, Rani, Biratnagar	10	2018
KTM Energy Solar Hybrid Power Project, Tankusuwari, Biratnagar	10	2018
Mithila Solar PV Power Project, Dhanusa	10	2019
Lamki Solar Energy	10	2018
Attariya Solar Energy	10	2018
Utility Scale Solar PV		
10	2019	
Mithila 2 Solar PV Project, Dhanusa	10	2019
Others, <10 MW (36 projects)	133	
Total	223	

FIGURE 9: PROJECTED GENERATION CAPACITY ADDITION (WORLD BANK) 4

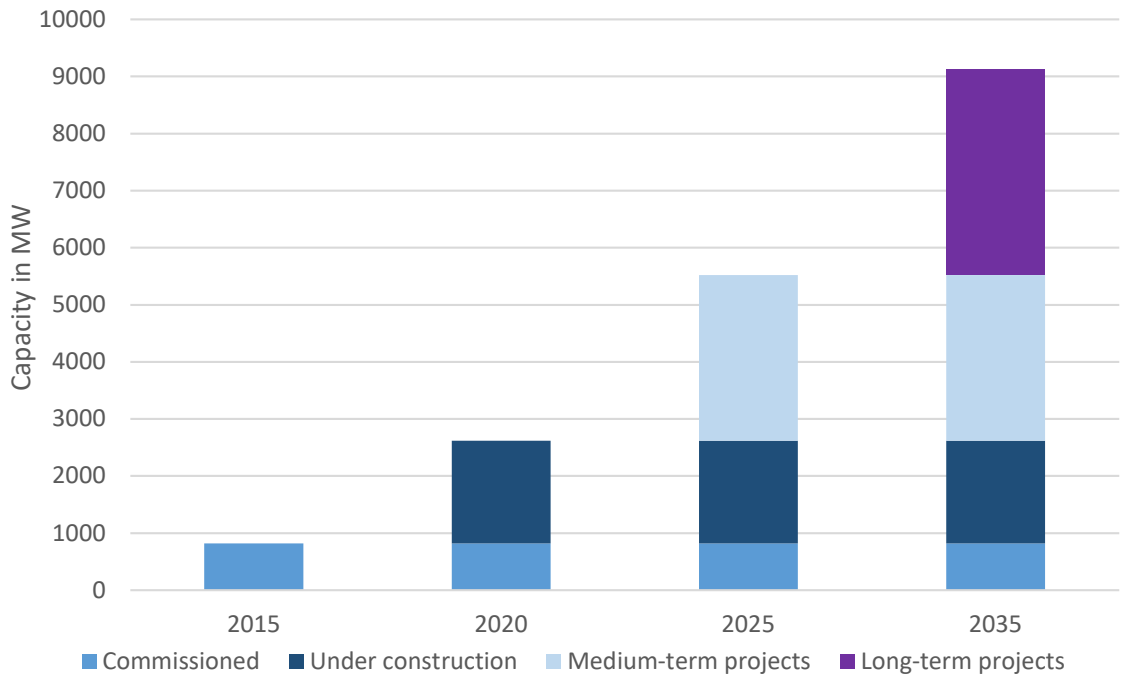
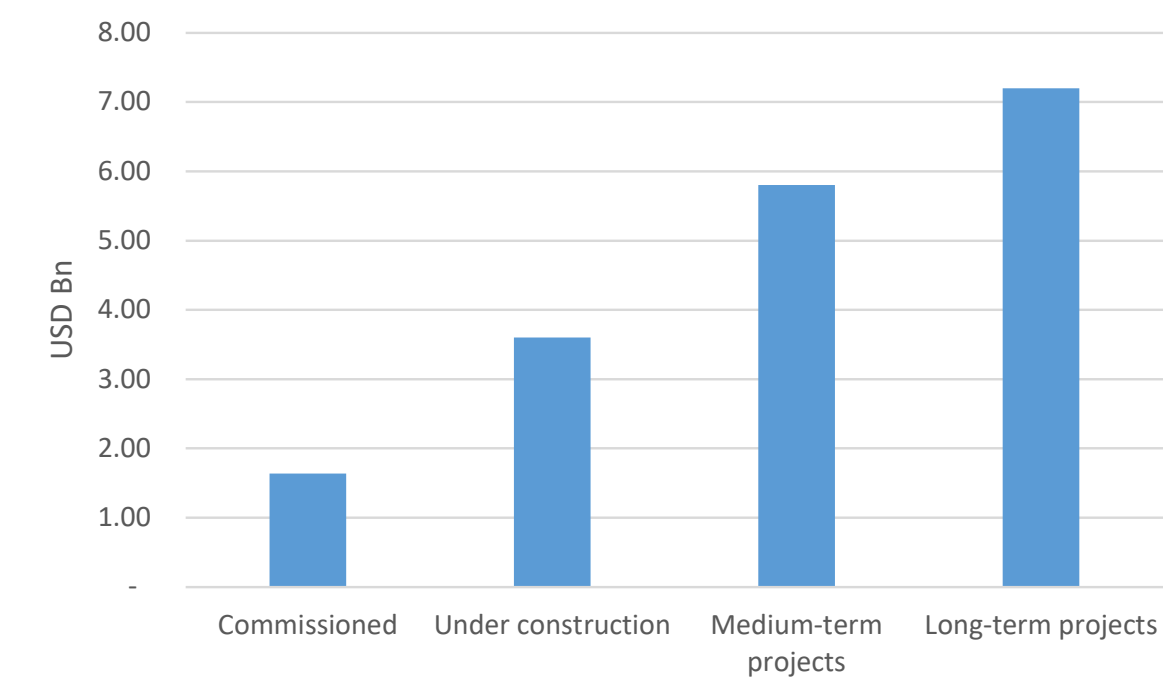


FIGURE 10: ESTIMATED INVESTMENT VALUE OF HYDROPOWER PROJECTS 4



1.5 POWER DEMAND/DEFICIT IN NEPAL

Despite its abundant natural resources, Nepal has one of the lowest rates of per capita electricity consumption in the region. Demand is nearly double the supply, and projections from the Investment Board of Nepal suggest this trend will continue until major projects finalise construction and are brought online.

At present, peak demand is estimated at 1,800 MW, while installed capacity stands at just 960 MW. In the past, the NEA resorted to severe load-shedding (up to 16 hours per day) to manage limited distribution, but in winter 2016/2017, it increased imports of coal-fired energy from India, which resulted in zero load shedding in the Kathmandu valley for the first time in decades. While this approach fixed the supply crisis temporarily, a more significant effort will be required to solve Nepal's limited domestic supply in the long run.

The forecast from the NEA is an extrapolation of historical demand, while the forecasts of the IBN and Water and Energy Commission Secretariat (WECS) are based on a Model for Analysis of Energy Demand (MAED) developed by the International Atomic Energy Agency (IAEA). Similarly, NEA's demand forecast does not include latent demand for electricity, which would exist had there been no load shedding.

The projections made by WECS assume a population growth rate of 1.4%, with urban population increasing from 38.26% at present to 53.54% in 2035. GDP growth rate is 4.5%, with the share of agricultural GDP decreasing from 31.32% to 21.99% and the share of manufacturing GDP increasing from 6.33% to 14.14% (from 2015 to 2035).

Holding these assumptions, annual electricity demand is forecasted to increase from ~3,900 GWh in 2015 to ~30,000 GWh in 2035. This increased demand is driven primarily by the manufacturing and household sectors. In manufacturing, CAGR of GDP is expected to be at 8.79% while the CAGR of energy demand is expected to be 12.47%. Similarly, energy demand at household increases at a CAGR of 9.61%, primarily due to an increase in urban population, substituting other forms of energy for electricity, increased access to electricity, etc.

FIGURE 11: NEPAL ELECTRICITY DEMAND FORECAST 2

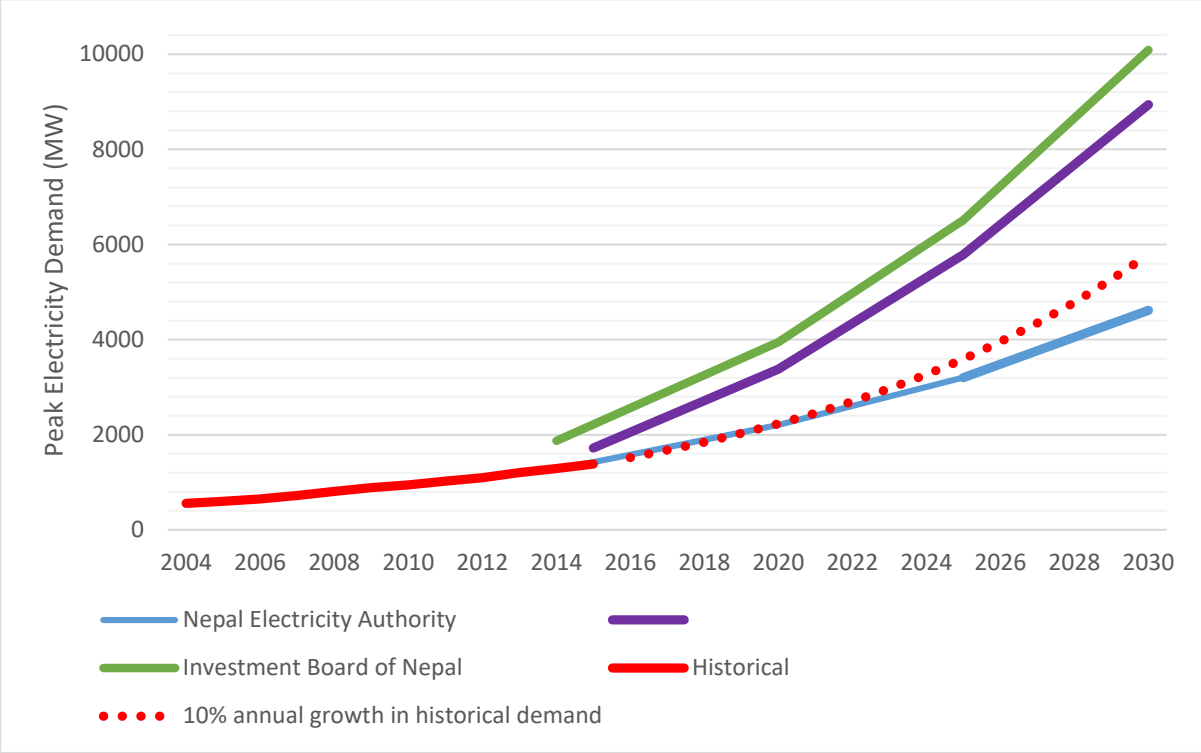


FIGURE 12: FORECASTED GDP COMPOSITION OF NEPAL 2

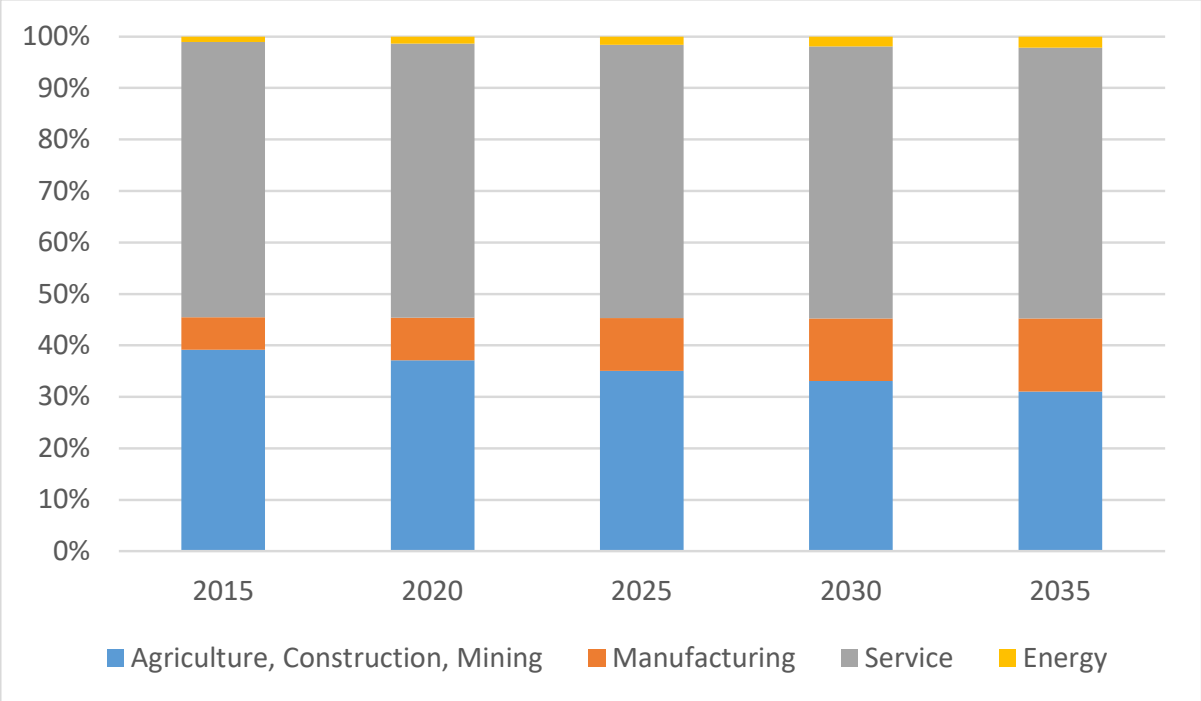


FIGURE 13: FORECASTED ELECTRICITY DEMAND (IN GWH) BY SECTOR6

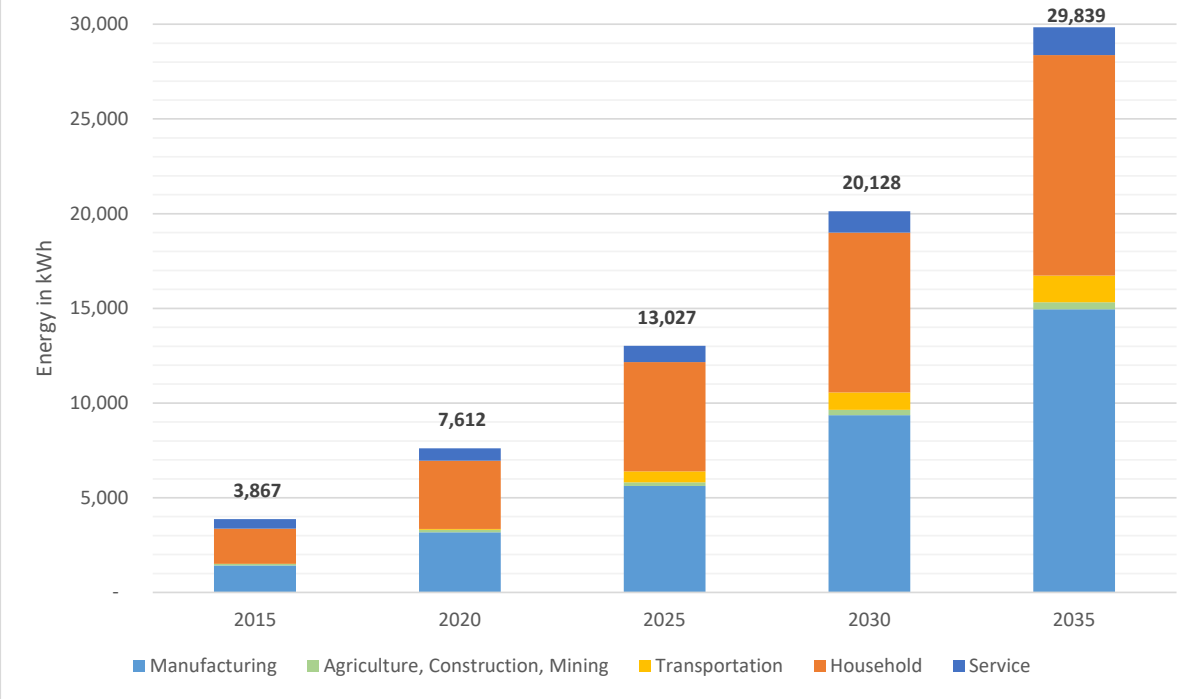
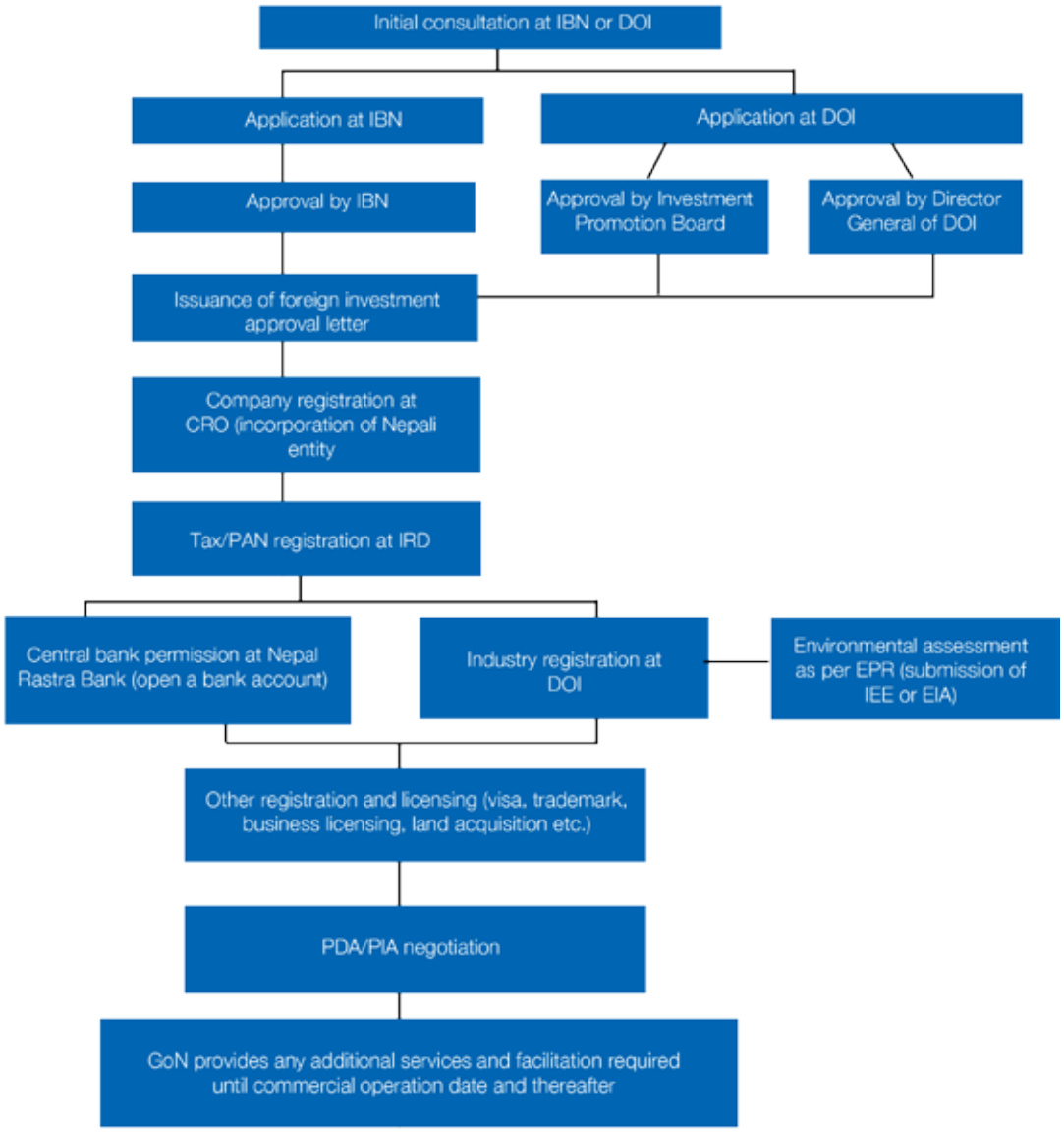


FIGURE 14: INVESTMENT APPROVING AGENCIES FOR FOREIGN INVESTMENT IN NEPAL

Investment Size	Application at	Approval by
>= USD 100 mn	Investment Board of Nepal (IBN)	Investment Board of Nepal (IBN)
>= USD 20 mn	Department of Industry (DOI)	Industrial and Investment Promotion Board
< USD 20 mn	Department of Industry (DOI)	Director General of DOI

FIGURE 15: PROCEDURE FOR STARTING INFRASTRUCTURE VENTURE IN NEPAL



1.6 REGULATORY ENVIRONMENT

LEGALITIES AROUND ENTRY AND EXIT

The Foreign Investment and Technology Transfer Act (FITTA) 1992 governs FDI and classifies the following activities as foreign investment:

a) Investments in shares (equity)
b) Reinvestments of earnings derived from a)
c) Investments made in the form of loans or loan facilities
d) Technology transfer

A foreign investor needs to invest a minimum of USD 50,000 to bring FDI to Nepal. Investments can be made in a public or private company. Investment approvals are granted either by the Investment Board of Nepal or the Industrial and Investment Promotion Board in the Department of Industries.

INVESTMENT BOARD OF NEPAL

The Investment Board Nepal (IBN) is a high-level, fast-track government agency designed to facilitate economic development by mobilising and managing domestic and foreign investment.

APPROVALS/LICENSES NECESSARY FOR PROJECT COMPLETION

Hydropower projects above 1,000 kW require a survey license from the Department of Electricity Development (DoED), and a license to generate, transmit, or distribute electricity. In addition, the following are needed:

- Project proponent must obtain a survey license before starting survey work, as well as a feasibility study and EIA.
- After the survey is completed, a generation license must be obtained from the DoED to start construction and operate the project.
- The maximum term of a survey license is 5 years.

LEGALITIES AROUND SELLING POWER

The state-owned NEA is responsible for electricity supply through the national grid. It is the sole buyer of all grid power produced in Nepal and has a monopoly on the transmission and distribution of electricity. It is also responsible for energy exchanges with India and imports electricity from the Indian grid.

In 2017, the Government of Nepal formed the following companies as part of the unbundling process of NEA:

1. Generation Company
2. Transmission Company
3. Engineering Company
4. Power Trade Company

As of September 2018, the NEA distribution companies in the seven provinces have still not been formed. The original NEA company still carries out generation, transmission, and distribution activities, but all new activities will be conducted through these subsidiaries.

The NEA owns 29 hydroelectric plants, amounting to 510 MW, connected to the grid. In addition, it purchases power totalling 450 MW from 38 independent power producers (IPPs). As the sole buyer of grid electricity in the country, the NEA has clear Power Purchase Agreement (PPA) policies for hydropower projects up to 25

MW. The NEA has already prepared a policy to sign PPAs for projects of up to 100 MW at the same rate. However, the PPA rates are not clear for projects above 100 MW and are negotiated on a case-by-case basis by the NEA. It is important to note that since the NEA is the sole buyer in Nepal, an electricity market does not exist.

CONCESSIONS AND INCENTIVES

By law, certain concessions or rebates are offered to entities operating in the renewable energy space. The 2002 Income Tax Act and other tax acts give incentives to renewable energy developers, such as:

- Any licensed person or entity producing electricity through hydro, solar, or biofuel starting commercial production, transmission or distribution by mid-April 2024 will receive 100% tax exemption for the first 10 years and 50% exemption for the next five years.
- VAT exemption and VAT refund available for energy companies.

See Section “Tax Laws in Nepal and Recommended Domicile Nations” in the Financial Structuring report for details on tax incentives in Nepal.

REGULATORY ENVIRONMENT

There are two key bodies in charge of the electricity sector in Nepal. A number of recent legislative measures (see Table 5) define the electricity paradigm that developers face.

MINISTRY OF ENERGY

The Ministry of Energy is entrusted with the formulation, implementation, monitoring, and evaluation of policies, plans, and programmes for the production of energy, including hydropower. The ministry’s objective is to manage the production of energy for the expansion of industrial and economic activities.

DEPARTMENT OF ELECTRICITY DEVELOPMENT

The DoED is responsible for stimulating the electricity sector andx improving its financial effectiveness at the national level by attracting private investment. The department is entrusted with serving the Ministry of Energy in implementing government policies related to the electricity sector. It also issues survey and generation licenses to prospective developers.

TABLE 5: ENERGY SECTOR REGULATIONS

Law/Programme	Description
Hydropower Development Policy (2001)	Ensures supply of hydropower electricity at a reasonable price, improves rural electrification, creation of employment and development of hydropower as an industrial enterprise.
Electricity Act (1992)	Provides directives on licensing, generation, transmission, and distribution surveys; transmission and distribution of electricity; standardising and safeguarding electricity services.
Water Resources Act (1992)	Makes arrangements for the rational utilisation, conservation, management, and development of water resources that are available in Nepal in the form of surface water and underground water. Also makes timely legal arrangements for determining beneficial uses of water resources.
Electricity Regulation (1993)	Provides direction to distributors and consumers of electricity and sets standards for voltage frequency and power factor of electricity.
Electricity Theft Control Regulations (2002)	Treats electricity theft as a criminal offence, locates illegal connections in rural areas, and gives NEA new powers to deal with the problem.
Electricity Leakage Control Rules (2002)	Sets direction on reporting of stolen electricity, investigation and inquiry, assessment of stolen electricity, loss or damages.
Electricity Regulatory Commission Act (2017)	Designed to regulate the electricity sector of Nepal – from generation tariff to transmission charges, distribution charges, and consumer tariffs. The commission is to look at ensuring quality, reliability, and affordability of power supply in Nepal.

1.7 CROSS BORDER INFRASTRUCTURE AND POWER TRADE REGULATIONS

RATIONALE FOR POWER TRADING

Though it has great potential for clean energy development, the South Asian region faces acute power shortages every year. In theory, countries in the region could complement each other, as each has a different seasonal pattern of demand and supply of energy, diversity of peak demand, and diversity in composition of energy sources.

In Nepal, for example, available capacity in the dry season decreases to approximately one-third of installed capacity, so regional power trading coul help ensure that daily outages and unplanned interruptions are kept to a minimum.

TABLE 7: PLANNED AND PROPOSED POWER TRADING LINKS BETWEEN NEPAL AND INDIA 13

Substation in		
Nepal	India	Voltage Level (kV)
Attaria	Bareily	400
Lamki	Bareily	400
Kohalpur	Lucknow	400
Inaruwa	Punera	400
Bardaghat	Gorakhpur	400
Duhabi	Jogbani	400

Similarly, in summer, excess capacity could potentially be exported to Northern India, Bangladesh, and Pakistan, which face high loads during these months.

Besides smoothing out problems relating to annual supply and demand, power trading could also lead to economies of scale in energy, increased revenues from trade and industrial activities, increased industrial productivity, and economic growth.

The main reason for expanding hydropower capacity in Nepal is that energy from low-cost hydro projects would replace energy from the coal-fired power plants that supply India's northern grid. Using imported coal would be expensive because of coal transportation costs from the nearest port, roughly 1,200 km away from the load centre in Delhi. Nepal's hydro plants, located within 600 km of Delhi, would be relatively cheaper and an attractive option to meet electricity demand in India's northern electricity grid.

POWER TRADE REGULATIONS

Nepal is a party to the SAARC Framework Agreement for Energy Cooperation. The agreement contains broad provisions for establishing a regional market for electricity, including non-discriminatory access to transmission, market-based pricing of electricity exchanged, and the establishment of a body to coordinate regional power integration and trade.

Besides the SAARC agreement, Nepal signed a Power Trade Agreement with India in 2014. The agreement creates a framework for cross-border sale of electricity, sharing infrastructure and open, non-discriminatory access to each other's electricity markets.

CURRENT AND PLANNED INFRASTRUCTURE

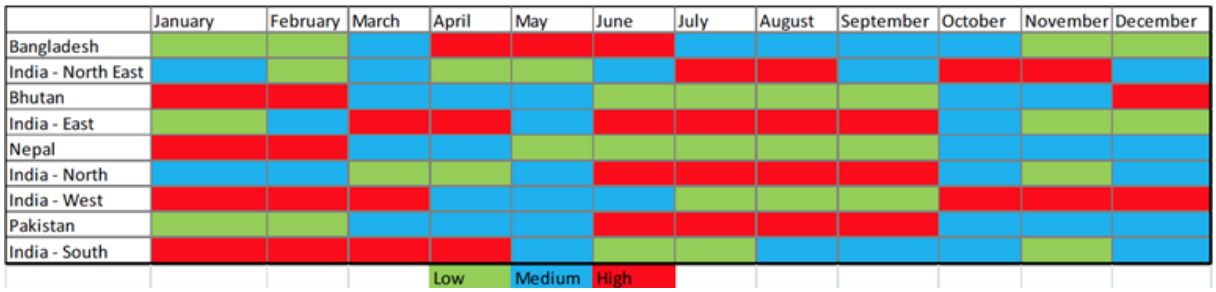
Power trading between Nepal and India takes place through four major transmission lines (Table 6).

TABLE 6: MAJOR POWER TRADING LINKS BETWEEN NEPAL AND INDIA

Transmission Link	Evacuation Cap (MW)	Traded (MW)	Voltage Level (kV)
Dhalkebar-Muzza-farpur	1,200	NA	400
Raxaul-Parwanipur	130	80	132
Kusaha–Kataiya	130	80	132
Gandak-Rampur	50	25	132
Mahen-dranagar-Tanakpur	50	30	132
Kataiya- Rajbiraj	10	8	33
Raxual- Birgunj	10	10	33
Sitamadhi-Jaleswor	10	8	33
Nepalgunj-Nanpara	10	8	33
Jayanagar-Siraha	8	8	33

Besides existing infrastructure, three major inter-country connections are planned between India and Nepal (Table 7).

FIGURE 16: MONTHLY ELECTRICITY LOAD PROFILES ACROSS SOUTH ASIAN GRIDS



1.8 CURRENCY STABILITY AND ASSOCIATED RISKS

BACKGROUND

The Nepalese Rupee (NPR) has been pegged to the Indian Rupee (INR) since 1993. The GoN has maintained this peg primarily in the interest of price stability and fears of rampant speculation should Nepal allow its currency to float.

There is a clear gap in India and Nepal's economic growth trends – in 2015, India's growth rate was 6.5% and Nepal's was 4.2%.

Over the last decade the USD has appreciated significantly against the NPR. As of September 2017, 1 USD traded at 116 NPR. While it is difficult to predict an outlook for the next 10 years, a persistent upward trend may be expected.

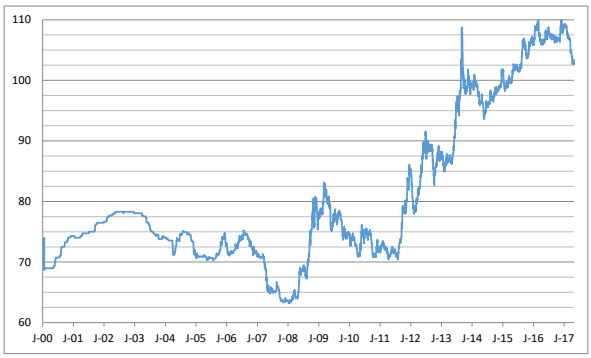
ANALYSIS OF INDIAN RUPEE

Growth in India is projected to increase from 6.7% in 2017 to 7.4% in 2018 and 7.8% in 2019, lifted by strong private consumption as well as the fading transitory effects of the currency exchange initiative and implementation of the national goods and services tax.

LATEST UPDATE

- The Nepalese Rupee started 2018 positively, trading at 1 USD = 102 NPR. This was a steep appreciation from a 10-year low rate of 1 USD = 109 NPR recorded in February 2016. However, the currency has since depreciated against USD again, and as of September 2018 hit an all-time low of 1 USD = 117 NPR.
- Foreign exchange variation risk is outside the control of IPP investors (other than projects with a partial USD PPA). In Nepal, where the average annual depreciation of the NPR has been 3.35% in the past decade, it is a substantial risk.
- According to Deloitte,17 tariffs without forex risk protection can result in losses up to 26% of the capital cost of the project, rendering such investments unprofitable and impossible to finance.
- The government has finalised the PPA for the Upper Trishuli-1 hydroelectric project. There is a provision for currency hedging in this PPA. Although the hedging mechanism is yet to be finalised, according to relevant stakeholders, the project developers would be exposed to a band of currency depreciation/ appreciation – i.e., if the currency value goes outside a certain band, then it will be covered by the hedging fund. Both the developer and the NEA will contribute towards the hedging fund.
- A project developer can use TCX, a DFI funded currency hedging fund, to hedge their currency risk. (See section on TCX in the Financial Structuring report.)

FIGURE 17: USD TO NPR (2000–2017)




NEPAL RASTRA BANK
RUPEES
ONE THOUSAND
नेपाल राष्ट्र बैंक ।
असतोमा सद्गमय।
कोठमाडौं । नेपाल ।
1000

1.9 CAPITAL REQUIREMENT AND RETURN ON EQUITY FOR CONSTRUCTION AND GENERATING ASSETS

CAPITAL REQUIREMENT

Nepal's government reaffirmed its plans to significantly expand domestic hydropower capacity at the annual Investment Summit, held in March 2017. At the event, the Ministry of Energy pledged to build 10,000 MW in hydropower by 2030. This is a recurring trend – many new governments have used inflated energy projections to highlight their commitment to infrastructure development in Nepal.

Dolma estimates that USD 20 bn is required to meet the GoN's target, approximately USD 7 bn of which is available from domestic sources of capital. On Dolma's further analysis of this milestone target in the context of available debt/equity in Nepal, approximately USD 4 bn in equity and USD 9 bn in debt is required through FDI. The liquidity crunch in Nepal's banking sector through most of 2017 pushed up interest rates for hydropower projects.

CAPITAL REQUIREMENT FOR EXISTING LICENSES (HYDRO AND SOLAR)

According to Nepal's Department of Electricity Development, there are 35 survey licenses issued for hydro projects above 100 MW and and 37 for solar projects above 1 MW.

TABLE 8: ISSUED SURVEY LICENSES BY DOED AND CAPITAL REQUIREMENT AS OF JUNE 20181

Asset Class	Number of Licenses	Total Capacity (MW)	Capital Req. (USD millions)
Solar (>1 MW)	37	216	194.4
Hydro (>100 MW)	35	11,293	22,586
TOTAL	72	11,509	22,780.4

RATE OF RETURN FOR CONSTRUCTION AND GENERATING ASSETS IN NEPAL

Based on findings from Dolma's first fund, Dolma Impact Fund, the average project internal rate of return IRRs for hydropower in Nepal ranges from 15% to 20%. These returns reflect the broader market expected IRR for projects and equity.

The solar market, on the other hand, is still in its infancy and there have been no private sector financial closes for any on-grid project to date. Assuming 1 MW = USD 2 MILLION

HYDRO AND THE STOCK MARKET

The Nepal Stock Exchange (NEPSE), the only stock market in Nepal, is dominated by two sectors:

a. Banking and financial institutions
b. Hydropower

As of 31 August 2018, 19 hydropower companies are listed in NEPSE. The total market capitalization of the hydropower sector as of 31 August 2018 was NPR 63 bn (USD 561 mn at prevailing exchange rates).

TABLE 9: NEPSE LISTED HYDROPOWER COMPANIES

S.N.	Stock Name	MW	Total number of shares	Price per share (NPR)*	Market cap (in mns NPR)	Market capitalisation (in million USD)	Market cap (in mns USD) / MW
1	Api Power Company Ltd.	8.5	11,340,000	260	2,948	26.1	3.1
2	Arun Kabeli Power Ltd.	25	15,000,000	242	3,630	32.2	1.3
3	Arun Valley Hydropower Development Co. Ltd.	3	9,330,123	130	1,213	10.7	3.6
4	Barun Hydropower Co. Ltd.	4.5	2,551,500	132	337	3	0.7
5	Butwal Power Company Limited	76.7	22,186,720	434	9,629	85.3	1.1
6	Chhyangdi Hydropower Ltd.	6	2,700,000	120	324	2.9	0.5
7	Chilime Hydropower Company Limited	22.1	39,651,130	711	28,192	249.7	11.3
8	Dibyashwori Hydropower Ltd.	4	2,640,000	102	269	2.4	0.6
9	Himalayan Power Partner Ltd.	27	10,654,170	245	2,610	23.1	0.9
10	Khanikhola Hydropower Co. Ltd.	6.4	4,657,143	105	489	4.3	0.7
11	National Hydro Power Company Limited	7.5	13,859,112	77	1,067	9.5	1.3
12	Nepal Hydro Developers Ltd.	3.52	2,600,000	160	416	3.7	1.0
13	Ngadi Group Power Ltd.	30	5,355,548	179	959	8.5	0.3
14	Radhi Bidyut Company Ltd	4.4	4,510,040	217	979	8.7	2.0
15	Rairang Hydropower Development Company Ltd.	5.5	5,600,000	146	818	7.2	1.3
16	Ridi Hydropower Development Company Ltd.	2.4	5,010,551	115	576	5.1	2.1
17	Sanima Mai Hydropower Ltd.	22	21,100,000	294	6,203	55.0	2.5
18	Synergy Power Development Ltd.	9.6	7,000,000	107	749	6.6	0.7
19	United Modi Hydropower Ltd.	10	11,500,000	165	1,898	16.8	1.7
					63,306	561	

Nepali investors are optimistic about hydropower stocks, which is reflected in high price increases in some of the stocks. Table 9 shows significant share price growth from an initial price of NPR 100. Average market capitalisation per MW is NPR 227 mn (USD 2.02 mn), compared to an estimated construction cost per MW of NPR 200 mn.

1.10 BARRIERS TO ENTRY

FOREIGN DIRECT INVESTMENT

- **Political Stability:** Because of a prolonged political transition in Nepal after the Maoist insurgency ended in 2006, political stability was a major issue for foreign investors. Frequent government changes affected the policy framework for electricity development. However, after the recent three-tier elections in Nepal and the formation of a majority government at the federal level, investors seem to be more confident that there will be a stable government for the next five years. This should ensure reduced political risk and greater inclination for foreign investments.
- **Policy Stability:** The Hydropower Policy 2001 has still not been enacted as the Electricity Bill has been in parliament for the last six years. The Electricity Bill needs to be enacted at the earliest. Moreover, more than 32 laws, policies, and procedures that affect the development of energy projects need to be harmonised. The recent enactment of the Electricity Regulatory Commission Act is a positive step to introduce independent regulation in the electricity sector.
- **Currency:** According to Deloitte, to promote foreign investment in power generation, the GoN will need to ensure that forex risk is covered in the structuring of tariffs under the hydropower PPAs.17 In doing so, the Government through the Ministry of Energy need to insist on as long a tenure as possible for debt financing (which typically accounts for 70% of the capital of a hydro project).
- **Credit Rating:** Nepal does not have a sovereign credit rating, so institutional foreign investors are less likely to consider Nepal an option as most institutional investors require their investments to be in a country with at least an investment grade sovereign rating.
- **Governance:** There is a lack of governance in the private sector and lack of professionals on the boards of private sector organisations. Similarly, there is a lack of awareness about the statutory compliances that need to be fulfilled while running organisations. There is little adherence to environmental, social, health, and safety standards. Local standards and regulations often do not meet international standards. As a result, foreign investors are hesitant to invest in the country.
- **Climate Change:** According to the UN, Nepal is particularly susceptible to the effects of climate variations, flash-floods, forest fires, and drought. This will be magnified by climate change.
- **Bureaucracy:** There are difficult and lengthy approval procedures to enter the country as a foreign investor.
- **Labour issues:** Labour unions are prevalent and often have high and unrealistic expectations that companies cannot fulfill; they may resort to protests by stopping production.

LOCAL KNOWLEDGE

- A local partner is important to ease relations with government authorities and to help resolve local disputes.

LICENSING

- A difficult regulatory environment constrains the private sector as businesses are required to comply with 130 processes from over 41 ministries and government agencies. (Refer to section 1.3 for more details.)

GENERAL RISKS

- **Stability in the financial sector:** Some financial institutions are at risk of insolvency due to substandard risk management practices, poor corporate governance, and high credit exposure compounded by under-resourced supervision and weak enforcement of prudential norms. The regulatory framework remains weak and the operational capacity to manage the fiscal costs of a financial crisis is limited.
- **Climate change and natural disasters:** Recent records show an increasing number of droughts, floods, hailstorms, landslides, and crop diseases, mostly affecting livelihoods of the poor. Nepal is located on the edge of a tectonic plate and is at risk of earthquakes.
- **Poor country governance:** Nepal still ranks low on international governance indicators such as Transparency International's Corruption Perception Index 2017 (122 out of 175 countries). Similarly, there is also a lack of enforceability of laws and accountability from the government.
- **Poor infrastructure:** Nepal has unreliable electrical power and low-quality transportation networks, which are some of its economic bottlenecks.

1.11 BARRIERS TO EXIT

WREPATRIATION OF PROFITS AND DIVIDENDS

As per section 5 (2) and (3) of FITTA, 1992, foreign investors are entitled to repatriate the following amounts from Nepal:

a) The amount received by the sale of the shares of foreign investment as whole or any part thereof
b) The amount received as profit or dividend from a foreign investment
c) The amount received as the payment of principal and interest on any foreign loan
d) The amount received under agreement for use of technology rights, patents, trademarks, technical know-how or acquiring any foreign technical, consultancy, management, or marketing service

According to the IBN, repatriation can be secured once all taxes are fully paid and all necessary legal obligations have been met. The repatriation approval is given by the central bank on the basis of the recommendation of the concerned regulatory authority (Department of Industry/Investment Board of Nepal, Department of Electricity Development/Ministry of Energy, Nepal Telecom Authority/Ministry of Communications, etc.).11 It might take time to receive clearances given that multiple authorities must authorize approvals.

PROMOTER LOCK-IN PERIOD OF THREE YEARS

The lock-in period of three years for pre-IPO shares is one of the key challenges for exits. According to the Securities Registration and Issuance Regulations 2073, pre-IPO shares held by shareholders of a company can be sold only after three years from the date of IPO. The three years lock-in period for investors is on the higher side compared to that in other SAARC countries – India's is six months; Sri Lanka's is one year. Securities law in many other countries have less stringent lock-in periods for investors who are not promoters.


SLOW DOWN

1.12 OPPORTUNITIES FOR EXPORTING ELECTRICITY TO NEIGHBORING MARKETS

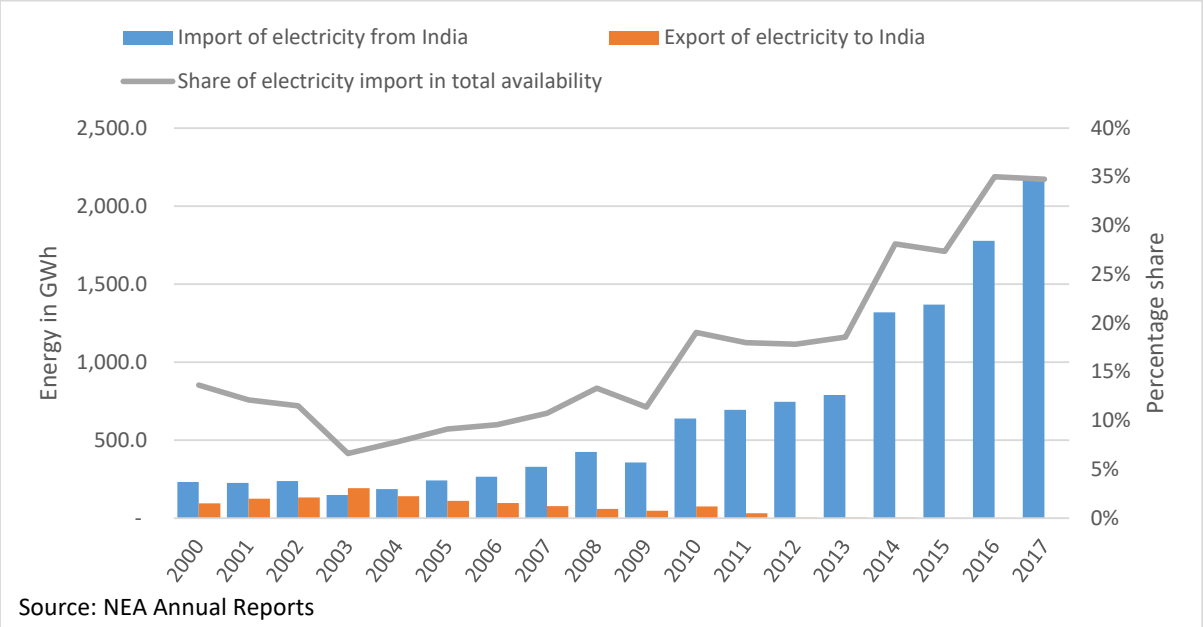
As previously noted, Nepal has an electricity trade relationship with India and no other neighbour. Figure 16 tracks electricity trade between Nepal and India for 10 years, starting in 2003. It shows a growing trend of increasing reliance on electricity imports to smoothen problems with supply in Nepal.

According to SARI/EI, Nepal has a good prospect for bilateral electricity trading with India and Bangladesh. Some countries, such as Bhutan, have similar resources and similar seasonal shortages while others such as Pakistan and Sri Lanka are too far off for bilateral electricity trade. According to an ADB report, Bangladesh's fuel mix of power is dominated by natural gas, and in the absence of discovery of new gas reserves, it may witness gas reserve depletion by 2023 and a severe power crisis (Figure 17).

According to the same ADB report, the increased cost of electricity generation because of depletion in natural resources is expected, in India's case, to increase electricity prices by 70% in between 2015 and 2030. In order to be cost effective, India also needs to find other forms of electricity.

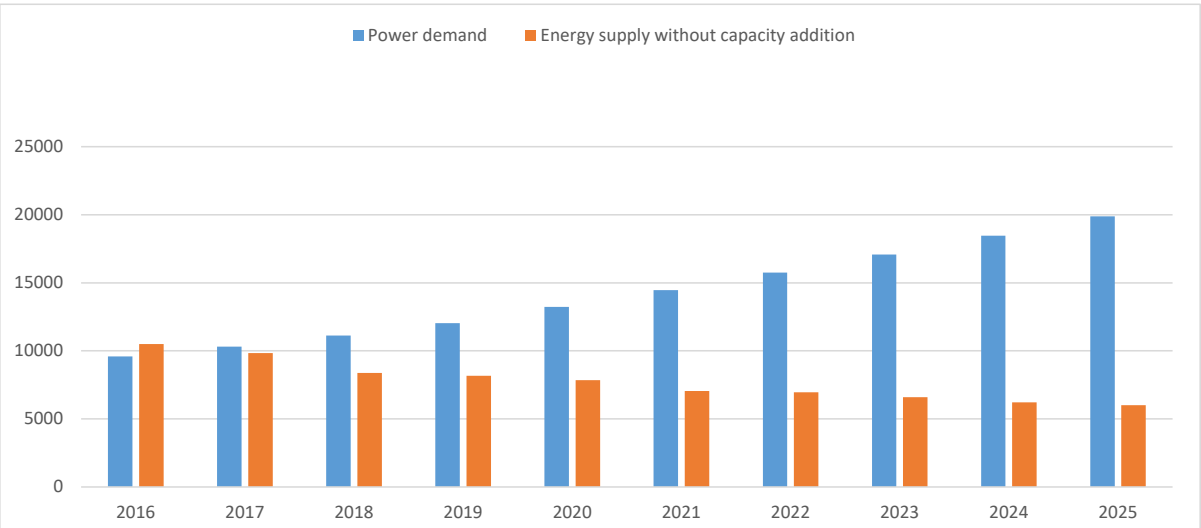
The situation in India and Bangladesh is an opportunity for Nepal to develop its hydro and solar resources and export clean carbon-free energy to these power-hungry nations. World Bank research envisages what the installed generation capacity could be if there were full regional interconnection among South Asian countries. The research assumes a baseline scenario with no increased interconnections across countries beyond what is currently in place or what countries are committed to. This baseline scenario is then compared with a scenario that has a fully integrated regional system. The research shows that there is a cumulative increase in installed capacity in a regionally integrated system compared to the baseline scenario. Bangladesh and India would lower their installed capacity by 11 GW and 35 GW respectively in 2015–2040 and substitute coal and gas energy with clean hydro energy from primarily Nepal and Bhutan. With a fully integrated regional grid, Nepal is expected to increase its installed capacity by 52 GW, mainly for export to its neighbours.

FIGURE 18: ELECTRICITY TRADE BETWEEN NEPAL AND INDIA 12



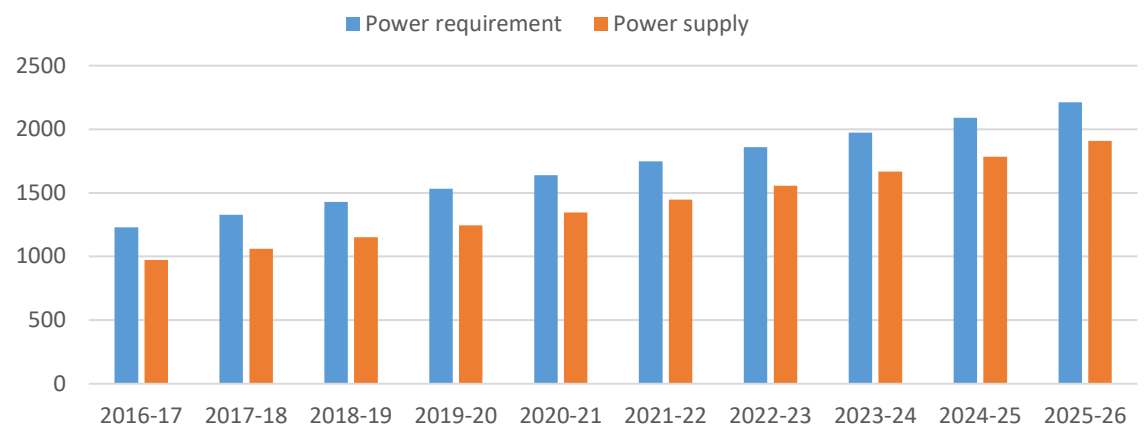
Source: NEA Annual Reports

FIGURE 19: POWER DEMAND SUPPLY SCENARIO IN BANGLADESH (IN MW) 23



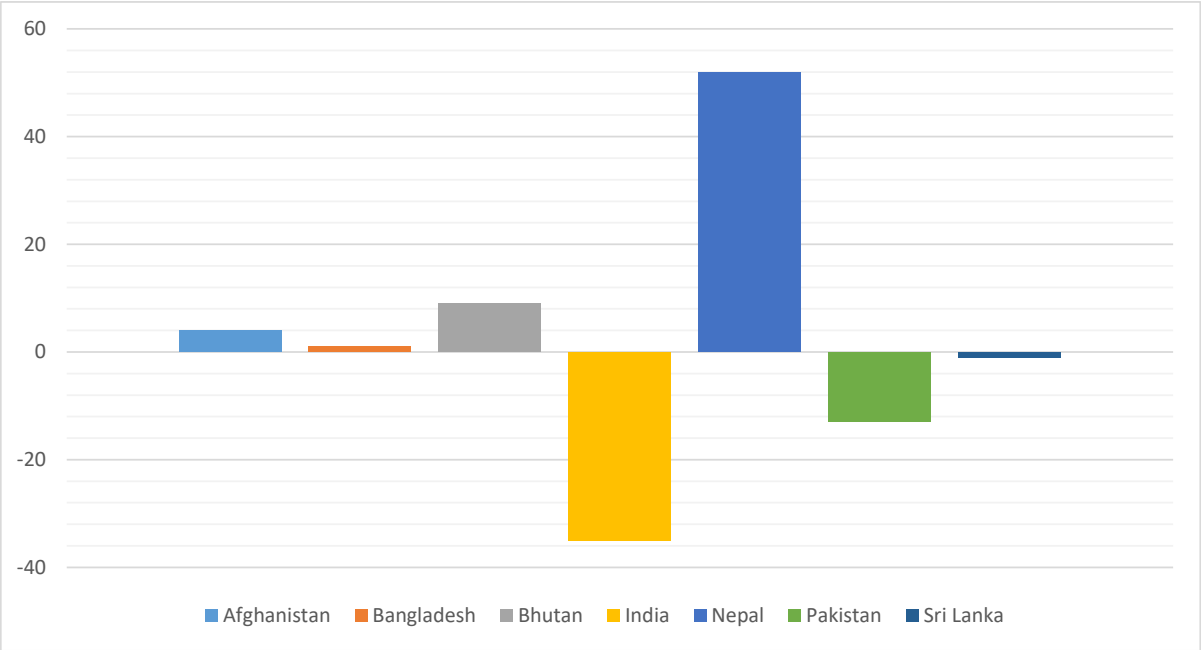
Source: People's Republic of Bangladesh, Ministry of Power, Energy and Mineral Resources, Bangladesh Power Development Board. 2016.

FIGURE 20: POWER DEMAND AND SUPPLY OF INDIA (IN BNS OF UNIT POWER) 23



Source: Government of India, Ministry of Power, Central Electricity Authority. 2016a. Draft National Electricity Plan (Volume 1)—Generation.

FIGURE 21: CUMULATIVE CHANGE IN TOTAL INSTALLED CAPACITY RELATIVE TO REGIONAL COOPERATION AND TRADE IN 2015–2040 PERIOD, BY COUNTRY (GW)



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CHAPTER 2

A look into the environmental consequences of CO2 and short-lived pollutants such as black carbon generated from fossil fuel production in the Himalayan Hindu Kush, and implications that this holds for human life and ecosystems in the densest pocket of extreme poverty on earth.

CHAPTER 2

Climate Change

UKaid
from the British people

dolma foundation

CHAPTER 2

Climate Change

ABBREBIATIONS

TABLES

FIGURES

ABBREVIATIONS

ADB	ASIAN DEVELOPMENT BANK
AEPC	ALTERNATIVE ENERGY PROMOTION CENTRE
BR	BLACK CARBON
CER	CERTIFIED EMISSIONS REDUCTION
CO2	CARBON DIOXIDE
EPA	ENVIRONMENTAL PROTECTION AGENCY
ETS	EMISSIONS TRADING SCHEME
GLOF	GLACIAL LAKE OUTBREAK FLOOD
GW	GIGAWATT
HKH	HINDU KUSH HIMALAYAS
ICIMOD	INTERNATIONAL CENTRE FOR INTEGRATED MOUNTAIN DEVELOPMENT
IBRD	INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
MW	MEGAWATT
NREL	NATIONAL RENEWABLE ENERGY LABORATORY
PM	PARTICULATE MATTER
SDG	SUSTAINABLE DEVELOPMENT GOALS
UMPP	ULTRA MEGA POWER PLATS
UNFCCC	UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE
USD	UNITED STATES DOLLAR

1.1 INTRODUCTION

The mountains and valleys of the Hindu Kush Himalayas are some of the most inaccessible, remote regions in the world today. Home to millions of ecosystems, the mountains also provide hospice to human settlements that rely on stable ecological systems to preserve their way of living.

Despite an abundance of natural resources, the Himalayas have recently been acknowledged as one of the most environmentally sensitive regions on earth. According to recent scientific publications, temperatures have risen by nearly 2 degrees since the start of the 20th century. With reports of glaciers retreating, permafrost melting and increasingly erratic weather patterns – water and food sources for the 600 million people living downstream are under significant strain. This chapter analyses this "silent environmental crisis" and the national, bilateral and multilateral efforts to date in reversing some of the damaging consequences of climate change in the region.

1.2 ECONOMIC AND SOCIAL REASONS FOR BLACK CARBON EMISSIONS, AND EFFECT ON GLACIAL MELT AND HYDROLOGY IN THE REGION

THE REGION AT A GLANCE

Figure 1 shows the build-up of black carbon in the Himalayas. Nepal is clearly a hotspot, with levels of well over 100 micrograms/m2/year.

While fossil fuel power generation increases global warming through global CO2 emissions, the emission of black carbon, particularly from coal and biomass (wood burning in particular), is causing a localised crisis in the Himalayas. As the world's seventh largest consumer of biomass, accounting for 0.8% of the global share of production, Nepal can play a critical role in mitigating further glacial melt caused by black carbon in the region. This can be achieved by deploying utility-scale hydro and solar generation, which will offset the use of carbon-emitting forms of energy while addressing United Nations Sustainable Development Goal (SDG) 7, which underlines "access to affordable, reliable, sustainable and modern energy" as being essential "for jobs, security, climate change, food production or increasing incomes".

The Himalayan Hindu Kush region has the highest level of solar radiation in the world. Less than 4% of the Himalayan region, if equipped with solar arrays, could generate 3.1 trillion kWh – equivalent to the total electricity consumption of China in 2007. The Himalayas – often called the "Third Pole" – hold the third-largest deposits of ice and snow in the world after the North and South Poles. Nepal alone has an estimated technically and economically feasible hydropower potential of at least 40,000 MW. If sufficient capital and a high level of corporate and environmental and social governance is attracted for large-scale development, there may be an opportunity to offset carbon emissions from proposed regional coal-fired plants in neighbouring countries. Nepal's hydro potential is roughly equivalent to the planned 48,000 to 50,000 MW of India's coal-fired Ultra Mega Power Projects (UMPPs).

The lifecycle greenhouse emission assessment, also known as "cradle-to-grave" analysis, is a useful metric to measure the actual CO2 emissions from individual energy sources. This approach measures all the stages of the product's life, from raw material extraction to materials processing, manufacture, distribution, use, repair, maintenance, and disposal/recycling. Figure 2 illustrates NREL's Lifecycle analysis for electricity generation technologies powered by both renewable and non-renewable resources.

The mix of coal-powered generation in India, and high levels of diesel generation and biomass burning (including wood and dung) in Nepal is due to a lack of access to electricity. This is contributing to increased glacial melt. Approximately half the population in Himalayan countries (excluding China but including Pakistan, Nepal, Bangladesh, and the Indian states of Bihar, UP, Sikkim, Himachal Pradhesh, and West Bengal) has no access to electricity. For these reasons, Nepal is an obvious target for mitigation and adaptation funding – a central objective after the 21st meeting of the United

Nations Framework Convention on Climate Change (UNFCCC) negotiations in Paris in November 2015, also known as COP21.

Table 1 below outlines how much 1 MW of renewable energy according to different capacities, or load factors, offsets the same amount of Indian coal-fired imported power, which accounts for 0.95 kg of CO2 per kWh.

IMPACTS OF CLIMATE CHANGE: CRYOSPHERE, HYRDOLOGICAL REGIMES

According to the International Centre for Integrated Mountain Development (ICIMOD), an intergovernmental research body, the Hindu Kush Himalayan glaciers are shrinking and retreating as a result of climate change, which is creating new glacial lakes and expanding old ones, and creating potentially hazardous moraine-dammed lakes that form below the terminus of glaciers as they recede. The increasing temperature is also leading to the disappearance of smaller lakes that are not glacier-fed, while supraglacial ponds are growing and merging, increasing lake area but reducing the number of lakes.

TABLE 1: ENERGY ASSET CLASS CO2 OFF SET PER 1 MW

MW	Energy Asset Class	Load Factor	CO2 Offset (tonnes)
1	Solar PV	18%	1.5
1	Hydro	40%	3.3
1	Solar CSP	20%	1.7
1	Onshore Wind	28%	2.6

TRENDS IN THE THIRD POLE

According to research conducted by Zhang et al. (2015) in coordination with ICIMOD, small lakes (<0.2 km2) were more sensitive to climate change; lakes closer to glaciers and at higher altitudes, particularly those connected to glacier termini, had undergone larger changes in area; and glacier□fed lakes showed faster expansion rates than non-glacier fed lakes.

TRENDS IN THE NEPAL HIMALAYAS

Both the number and area of glacial lakes decreased between 1960 to 2010, which can be partly attributed to the lower resolution of the second study and to the merging of supraglacial lakes.

REGIONAL IMPACTS OF CLIMATE CHANGE

The regional impacts of climate change have been well documented by ICIMOD. ICIMOD reports that between 2000 and 2015, 45,534 people were killed by flooding, 10,893 by extreme heat, and 191 by droughts in Himalayan countries alone. In 2015, ICIMOD outlined 10 key takeaways from their research, shown in Table 2.

PROJECTED TRENDS IN RENEWABLE ENERGY

Increases in peak flow are likely to pose a risk to hydropower plants, which can be damaged by floods and may also have reduced lifespans because of increased sedimentation. The total water availability in the Indus, Ganges, and Brahmaputra basins is expected to increase because of increased flows during the first

half of the 21st century. This will stimulate hydropower development. But climate change projections become more uncertain in the long term, as do hydrological projections.

PROJECTED TRENDS IN GLACIAL LAKE OUTBURST FLOODS

Glacial lake outburst floods (GLOFs) have proven to be a serious risk for hydropower sites. GLOFs are sudden, unpredictable outbursts that have earned the name “mountain tsunami”

Table 2 ICIMOD Key Messages Climate Change

1	Temperatures across the mountainous Hindu Kush Himalayan (HKH) region will increase by about 1–2 degrees Celsius (in some places by up to 4–5 degrees) by 2050
2	Precipitation across the HKH region will change by 5% on average and up to 25% by 2050
3	The monsoon is expected to become longer and more erratic
4	Extreme rainfall events are becoming less frequent but more intense and are likely to keep increasing in intensity
5	Glaciers will continue to suffer substantial mass loss, especially in the Indus basin
6	No decreases in annual volume of precipitation is expected through to 2050
7	More floods and droughts are expected
8	Communities living immediately downstream of glaciers are most vulnerable to glacial changes
9	The contribution of various water sources to river flow will change
10	Changes in temperature and precipitation will have serious and far-reaching consequences for climate-dependent sectors such as agriculture, water resources, and health

because of the catastrophic impact they have on communities living downstream. Though it is possible to assess conditions that make a GLOFs likely, it is impossible to predict when a dam or ice barrier will fail and whether the failure will be complete or partial.6

With climate change, glaciers are receding and the number and size of moraine-dammed lakes is increasing. Lakes in contact with a glacier are likely to grow particularly fast as glacier retreat accelerates.

PROJECTED TRENDS IN GLACIAL MELT

Most Himalayan glaciers have both retreated and lost mass since the mid-19th century; however, the pace of melting in the last three decades is unprecedented. The Indian Institute of Science states that roughly 95% of glaciers in the Himalayan region are retreating.

The greatest relative reductions have been experienced by the Salween (-44 to -67%) and Mekong (-39 to -68%), as their current glacial areas are the smallest. In the Indus basin, a change in glacier extent ranging from -20 to -28% is projected. Changes in glacier area in the Ganges and Brahmaputra basins follow similar trends (-35% to -45%).

According to Lutz, even glaciers in the highest mountains of the world will not escape the effects of climate change. Even if today’s level of emissions are greatly reduced, glaciers in the Everest region (Dudh Koshi basin, Nepal) are projected to lose, on average, 39% of their ice by 2050 and 83% by 2100.

While significant research needs to be done to better establish the relationship between black carbon and glacial melt in general, ICIMOD finds that around 30% of glacial retreat observed in the HKH can be attributed to to black carbon emissions.

RECENT REGIONAL CLIMATE-RELATED ANOMALIES AND DISASTERS

JUNE 2013: UTTARAKHAND, INDIA

In June 2013, the northern Indian state of Uttarakhand faced extreme rainfall. According to the Indian Meteorological Department, on 17 June 2013, the state received 240 mm of rain, more than four times the usual average rainfall during this period. This was attributed to the interplay between westerly and monsoonal circulations. This heavy precipitation resulted in the swelling of rivers in both upstream and downstream areas.

In addition to rain, a huge quantity of water was probably released from the melting of ice and glaciers due to high temperatures in May and June, as well as GLOFs. The subsequent damage from the flooding killed more than 5,500 people and around 1,000 went missing. Heavy damage to infrastructure, including highways and bridges, was recorded.

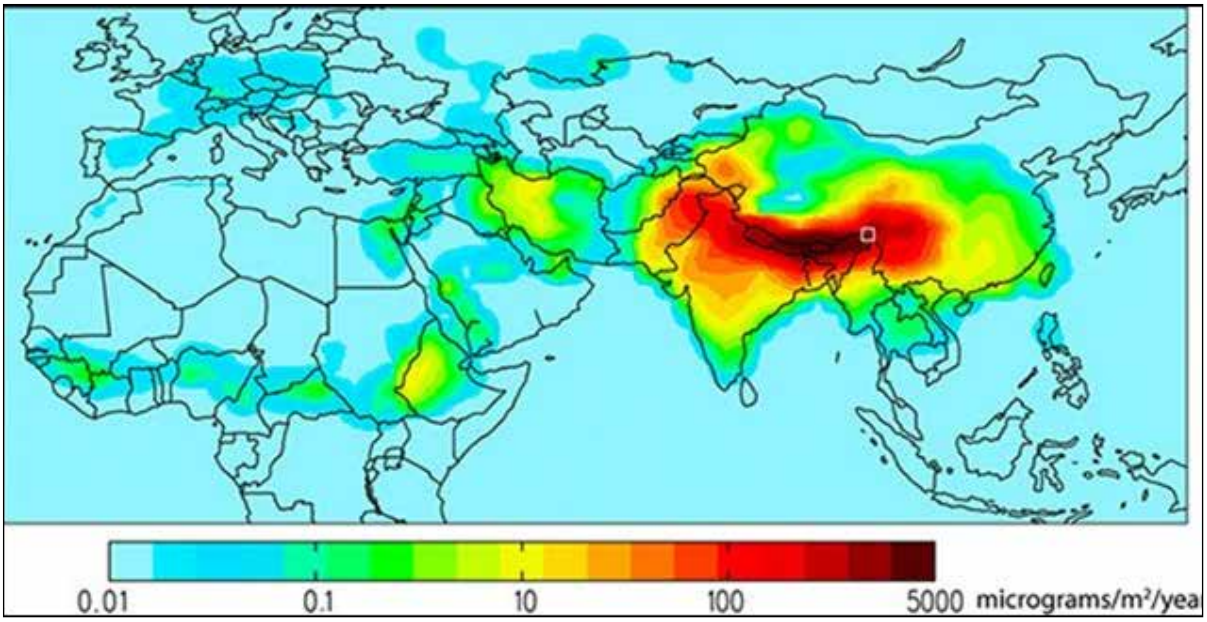
2010–2017: DOLAKHA, NEPAL

Access to sufficient amounts of water is crucial to agriculture. In Dolakha, a mountain district of Nepal, seasonal variations in rainfall are challenging cultivation patterns. Only 2% of annual precipitation occurs from December to February. Climate change is expected to increase average temperatures in Dolakha, especially night-time temperatures, which would improve the conditions for cultivation in the cold season. However, warmer weather needs to be accompanied by sufficient water for cultivation. Water harvesting, by means of tanks and pipes, would meet the dry season need for water for those who have access to a well. But the diverse geography of the Himalayas means no single solution is universally applicable.

AUGUST-SEPTEMBER 2017: NEPAL, INDIA AND BANGLADESH

The tail end of the monsoon in 2017 was one of the largest downpours in recent history, and it will be remembered for the death of over 1,200 people, with 100,000 affected.

FIGURE 1: GLOBAL CONCENTRATION OF BLACK CARBON



Source: UNEP/WMO Integrated Assessment of Black Carbon and Tropospheric Ozone, Summary for Decision Makers

FIGURE 2: RENEWABLE AND NON-RENEWABLE TECHNOLOGY LIFECYCLE ANALYSIS

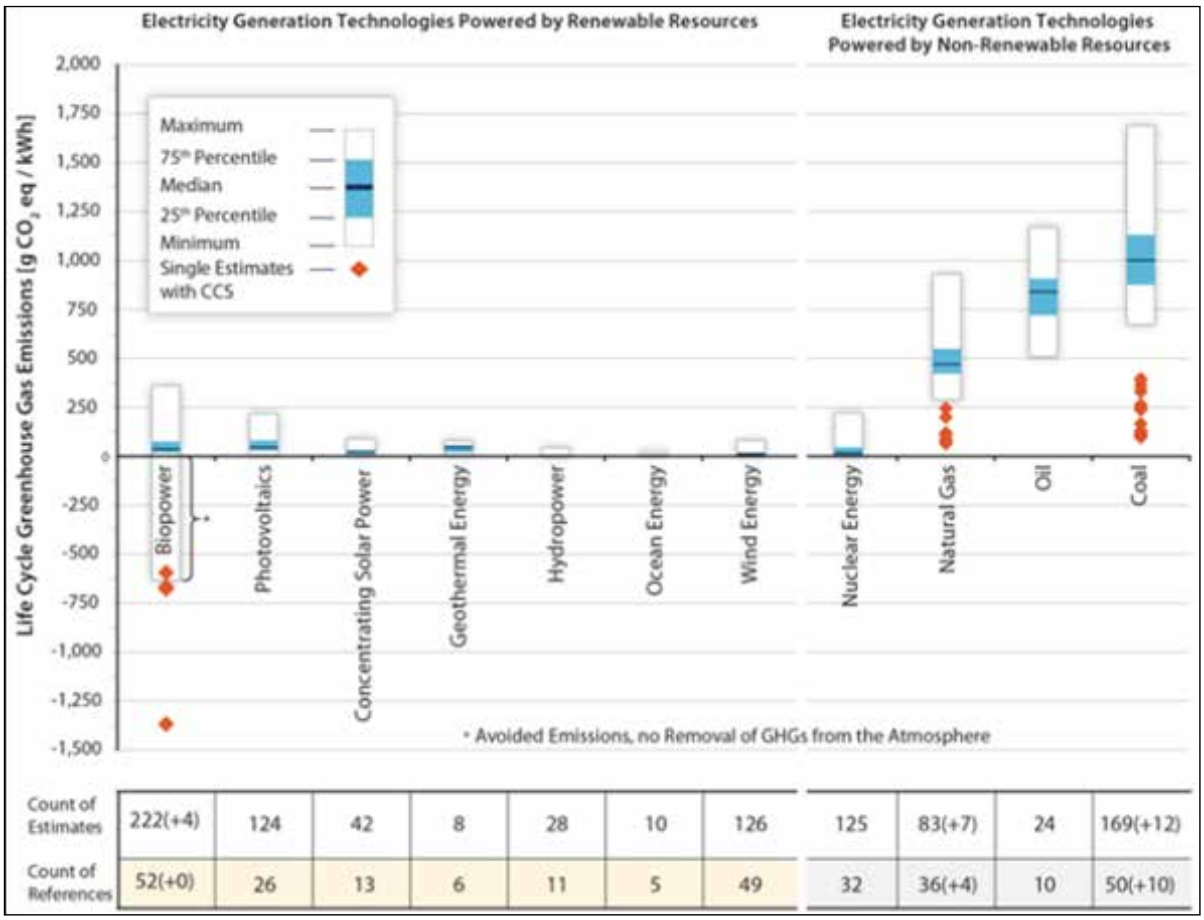
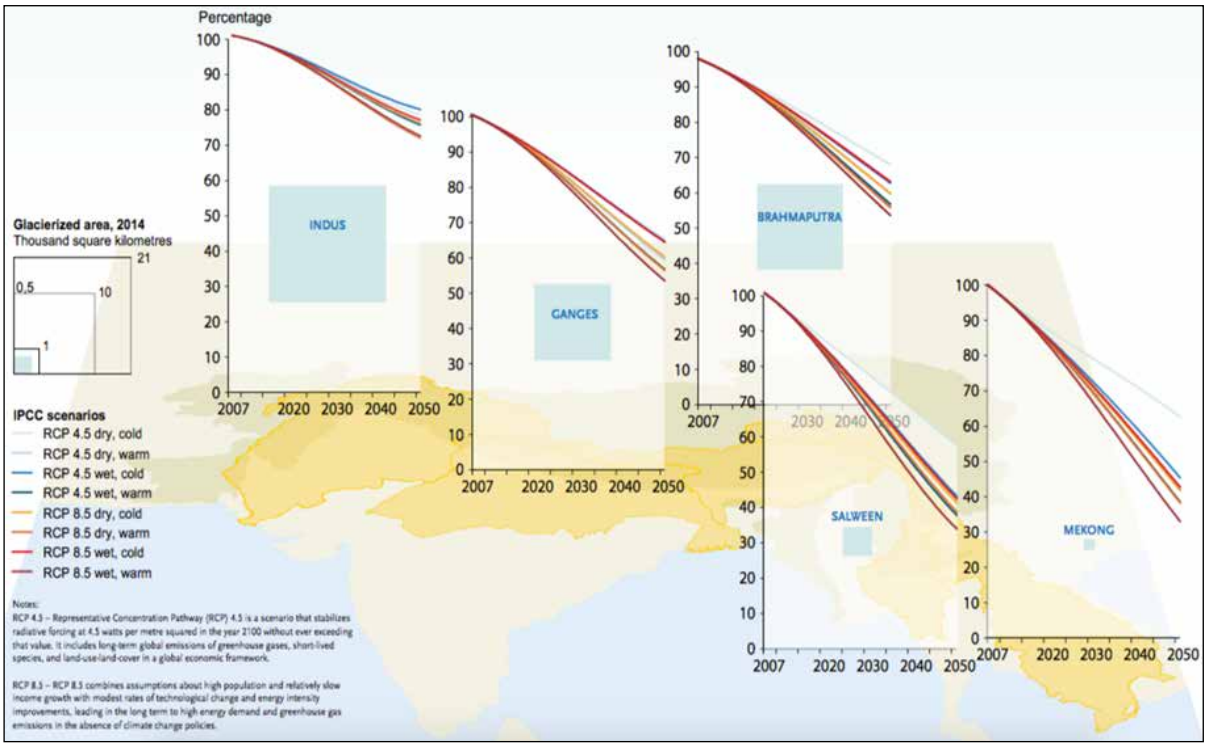


FIGURE 3: PROJECTED GLACIAL AREA CHANGE BY 2050



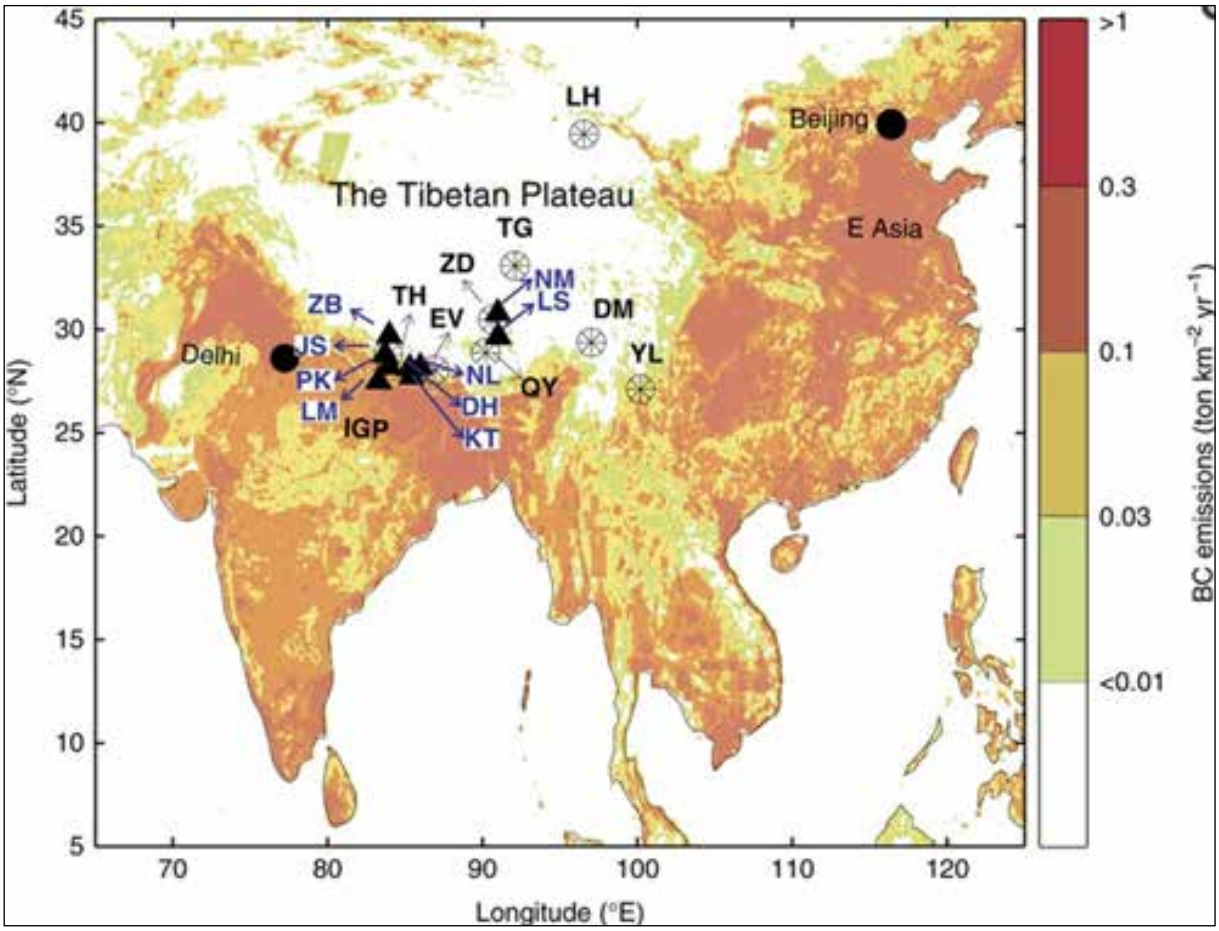
1.3 ANALYSIS OF BLACK CARBON IN THE REGION (COAL-FIRED GENERATION AND BIOMASS COMBUSTION)

Black carbon is the by-product of an unrivalled regional shortage of clean energy. This section details the scientific perspective on the effects of black carbon on the crysophere in the Himalayas and the contributing factors to its growing presence.

There are four key ways that dust can affect the cryosphere: (1) reflectivity decrease, (2) warming of the atmosphere, (3) altered precipitation patterns, (4) climate feedback. The sources of this type of emission come from two areas: fossil fuels and biomass. According to Li et al. (2016), for the Himalayas this is spread across contributions from fossil fuel (46%) and biomass (56%) combustion from the Indo-Gangetic Plain, whereas black carbon in the remote northern Tibetan Plateau is predominantly from fossil fuel combustion (66%), consistent with Chinese sources.

Li et al., also states that fossil fuel sourced black carbon appears to have approximately twice the particle-specific warming potential of biomass-sourced black carbon. Figure 4 details this.

FIGURE 4: REGIONAL CONCENTRATION OF BLACK CARBON



1.4 ONGOING REGIONAL INITIATIVES TACKLING CLIMATE CHANGE

Despite the pressing issues facing the region, there are several mitigation and adaptation funds as well as initiatives that are supported directly through specific initiatives in the field of finance for climate vulnerable regions of the world.

MULTILATERAL AND BILATERAL INITIATIVES

Table 3 is a list of projects that are active in the climate change space which could be used to draw funds for projects in Nepal.

REGIONAL INVESTMENT FUNDS

The progress of investment funds with a mandate for renewable energy in South Asia, let alone Nepal, has still got some way to go. However, strides have been made in India in the private equity space, which accounted for 60% of Foreign Direct Investments in 2016. The surge of investments in India's renewable energy space is a promising sign for Nepal.

TABLE 3: MULTILATERAL AND BILATERAL CLIMATE FUNDS WITH NEPAL AS A MANDATE

Fund/Type	Implementing Entity	Financing mechanism	Regions	Funding Level (USD)	Sectors	Target
ADB Climate Change Fund/ Multilateral	• Asian Development Bank (ADB)	• Co-financing • Grant • Technical assistance	• Asia	• 50 mn	• Energy • Agriculture • Energy Efficiency • Renewable Energy • Transport • Water	ADB Developing member countries
ASEAN Infrastructure Fund/Multilateral	• ADB	• Co-Financing • Loan • Technical assistance	• Asia	• 485.3 mn	• Energy • Environment • Rural Infra structure • Water	Sovereign guaranteed national and sub-regional projects of ASEAN developing member countries
Canada Climate Change/Multilateral	• International Finance Corporation (IFC)	• Loan, equity, Technical Assistance	• Global	• 276.55 mn	• All	UNFCCC Non-Annex; Parties to the Convention
Canada Climate Fund for the Private Sector in Asia/Multilateral (executed by ADB)	• Asian Development Bank (ADB)	• Concessional financing Grants	• Asia	• 63.22 mn	• All	Low, lower-middle income and small island developing countries
Climate and Development Knowledge Sector/ Multilateral	• Government of the Netherlands and Government of the United Kingdom	• Co-financing Grant Technical assistance	• Latin America • Asia • Africa	• •0.66 mn per project	• Adaptation • Capacity Building	Developing countries
Climate Insurance Fund/Bilateral	• KfW, Blue-Orchard	• Insurance	• Global	• 60 mn (seed investment)	• Adaptation • Disaster Risk Reduction	Qualified insurance/ reinsurance companies as well as other entities active in the value chain of insurance based in ODA recipient countries

Climate Public Private Partnership/ Bilateral	• Donor governments	• Equity Loan Grant	• Asia	• 283 mn	• Adaptation • Mitigation	Objective is to stimulate the development of climate funds and climate-friendly projects expected to play a key role in accelerating growth of investment in renewable energy and other low-carbon solutions
Danish Climate Investment Fund/ Bilateral	• Investment Fund for Developing Countries (IFU)	• Co-financing Loan Technical assistance Equity	• Developing Countries	• 200 mn	• Energy Efficiency • Renewable Energy	Must be commercially sustainable and employ known climate technology; a Danish company must participate in the project (or it must relate to a Danish economic interest)
GEF Trust Fund/ Multilateral	• GEF	• Grant	• Worldwide	• 3000 mn over 2015–2019	• Climate change • Energy Efficiency • Renewable energy	Countries eligible to receive World Bank financing or UNDP technical assistance through its target for resource assignments
Germany's International Climate Initiative/Bilateral	• Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), Germany		• Developing countries	• 1085 mn	• Mitigation • Adaptation	Projects in IKI's four areas of support: mitigation, adaptation, conservation of carbon sinks, and biodiversity
Green Climate Fund/Multilateral	• COP (UNFCCC) and Green Climate Fund Board	• Grant, Concessional loan, Guarantees, Equity	• Worldwide	• 100 (bn)	• Adaptation • Mitigation • REDD| • Technology transfer • Capacity Building	All developing country parties to the UNFCCC
IFC Partial Credit Guarantees/Multilateral	• IFC	• Loan Guarantee	• Worldwide	• N/A	• Adaptation • Mitigation	In accordance with IFC investment guidelines
IFC Risk Sharing Facility/Multilateral	• IFC	• RSF	• Worldwide	• N/A	• Adaptation • Mitigation	In accordance with IFC investment guidelinesrc
International Climate Initiative (Germany)/Bilateral	• BMUB, Germany	• Grant Loan	• Worldwide	• 138 mn p.a.	• Adaptation • Mitigation	Climate and biodiversity projects in developing countries and countries in transition
Japan's Fast Start Finance/Bilateral	• Japanese Ministry of Finance	• Grant Loan ODA Guarantees	• Worldwide. Approximately 50% of Japan's grant aid is focused on adaptation in LDCs	• 15 bn (11 bn public, 4 mn private)	• Agriculture • Energy Efficiency • Renewable Energy	Developing countries that have entered direct bilateral discussions with the Japanese government; some private sector actors may also be considered
KfW Development and Climate Finance/Bilateral	• KfW	• Grant Loan ODA Structured financing	• Worldwide	• Varying, dependent on project	• Energy • Agriculture • Water • Technology	Public and private entities

Korea Green Growth Trust Fund/Multilateral	• World Bank	• Grant Technical assistance	• Worldwide	• 40 mn (additional funding pending approval	• Energy • Environment • ICT • Water	IBRD/IDA country members
Least Developed Countries Fund/ Multilateral	• GEF	• Grant	• Worldwide	• 932 mn	• All	All LDC parties to UNFCCC
MDB Pilot Project for Climate Resilience/Multilateral	• MDB Climate Investment Funds (CIF)	• Grant • Loan • ODA	• MDB countries	• 1 bn	• Climate Resilience • Energy • Infrastructure • Low-Carbon • Sustainable Land Management • Water	MDB eligibility, in the following countries: Bangladesh; Bolivia; Cambodia; Mozambique; Nepal; Niger; Yemen; Zambia
Nordic Climate Facility/Multilateral	• NEFCO	• Co-financing	• Africa • Asia	• 289–578k	• Energy • Sanitation • Water	Applicant must be an active institution holding a registered place of operations in Scandinavia; average turnover of the applicant must be at least double the NFC funding requested
Nordic Environment Finance Corporation Carbon Finance and Funds/Multilateral	• NEFCO	• Grant • Technical Assistance	• Eastern Europe • China • South Asia • SE Asia	• 190 mn	• Energy Efficiency • Fuel Switching • Renewable Energy	Projects should be within the requirements of COP 21
Public-Private Infrastructure Advisory Facility/ Multilateral	• World Bank	• Grant Technical assistance	•Worldwide	• 15 mn	•Adaptation •Capacity Building	Developing or transitioning economies in the OECD
US Global Climate Change Initiative/ Bilateral	• USAID	• Grant • Loan • Guarantee	• Developing Countries	• 350 mn p.a.	• Clean Energy • Sustainable Landscape • Resilience	Developing Countries
World Bank Carbon Funds and Facilities	• World Bank	• Carbon finance	••Worldwide	• 2.5 mn	• Energy, Energy Efficiency, Agriculture	World Bank/IDA Countries

TABLE 4: MAJOR PE INVESTORS THAT HAVE INVESTED IN INDIA'S RENEWABLE ENERGY SECTOR

Investor	Invested in	Investment Total	Year
Helion Ventures, Mauritius			2008
IDFC Alternatives, India	Mytrah Energy		2010
JP Morgan Chase, US	Leap Green Energy	USD 200 mn	2010
IDFC Alternatives, India	Green Infra		2011
Morgan Stanley Infrastructure Partners, US	Continnum Energy	USD 212 mn	2012
Goldman Sachs, US	Renew Power	USD 135 mn	2013
Goldman Sachs, ADIA, Global Environment Fund, US	Amplus Energy	USD 150 mn	2015
GE Financial Services, US	Welspun Renewables	USD 570 mn	2015
Actis, UK	Ostro Energy	USD 30 mn	2015
I Squared Capital, US	Amplus Energy	USD 150 mn	2015
GIC, Singapore	Greenko Enegy Holdings	USD 256 mn	2016
GIC, Singpaore and Abu Dhabi Investment Authority	Greenko Energy Holdings	USD 230 mn	2016
IFC	Hero Energy	USD 125 mn	2016
Caisse de Depot et placement du Quebec	Azure Power	USD 180 mn	2016
Piramal Enterprise (India), APG Asset Management (Netherlands)	Essel Green Energy	USD 132 mn	2016
Asia Climate Partners and Olympus Capital Asia, Hong Kong	Suzlon	USD 200 mn	2017
Macquarie Group, Australia	Hindustan Power Projects	USD 600 mn	2017
Abu Dhabi Investment Authority (CDPQ), Canada	Renew Power	USD 265 mn	2017
Piramal Enterprise (India), APG Asset Management (Netherlands)	Essel Green Energy	USD 132 mn	2016
Asia Climate Partners and Olympus Capital Asia, Hong Kong	Suzlon	USD 200 mn	2017
Macquarie Group, Australia	Hindustan Power Projects	USD 600 mn	2017
Abu Dhabi Investment Authority	Renew Power	USD 265 mn	2017

1.5 REGIONAL RENEWABLE ENERGY TARGETS

Because of pressure to align renewable energy targets with the UNFCCC global targets and a general need for South Asian countries to improve their electricity supply, there has been a concerted push to target renewable energy development in the region. India has set a precedent by committing to 175 GW by 2022; neighbouring states have made a significant attempt to broaden the market for green developments (see Table 5). In this case, run-of-river hydropower was classified as a renewable energy asset class.

POTENTIAL MARKET

Although different countries in the region hold varying targets for renewable energy development, there appears to be an effort to scale up on grid supply from hydro, wind, and solar. This presents an opportunity for foreign direct investment into the renewables market in South Asia, which totals 196,785 MW.

Assuming a 60/25/15 regional percentage mix between solar PV, hydropower, and onshore wind respectively, the size of the potential market is reflected in Table 6. This mix is not based on scientific calculation but merely one of many estimated scenarios of how South Asia's 196,784 renewable target could be managed.

TABLE 5: REGIONAL INSTALLED CAPACITY AND RENEWABLES TARGET

Country	Installed Capacity (MW)	2030 Target (MW)	2030 Renewables Target (MW)
Bangladesh	13,179	34,000	3,400
Bhutan	1,615	10,000	8,385
India	282,023 (country wide) Bihar: 2,759 Uttar Pradesh: 15,721 Uttarakhand: 3,177 West Bengal: 9,563	500,000	175,000
Nepal	1046	10,000	9,030 (80% hydro and 20% solar)
Pakistan	24,850	40,000	2,000

TABLE 6: REGIONAL POTENTIAL RENEWABLE MARKET

Energy Asset Class	Cost per MW (USD)	Potential Market (MW)	Cost of Market Materialising (USD)
Solar PV	800,000	118,071	94,456,800,000
Hydropower	2,000,000	49,196	98,392,000,000
Onshore Wind	1,450,000	29,517	43,799,650,000

1.6 CARBON FINANCING

Certified emission reduction (CER) credits are emission units equivalent to a tonne of CO2. They are issued by the Clean Development Mechanism (CDM) of the United Nations Framework Convention on Climate Change (UNFCCC). Emission reducing projects generate CER credits and may be purchased to meet Kyoto targets.

CER prices have declined since 2012. The prices were around EUR 15/tonne of CO2 and have decreased significantly to EUR 0.23/tonne of CO2. In Nepal, AEPC facilitates the process of registering projects to the CDM. According to AEPC, carbon credits in Nepal are purchased by the World Bank, ADB, and KfW.

INCENTIVES FOR DEVELOPERS

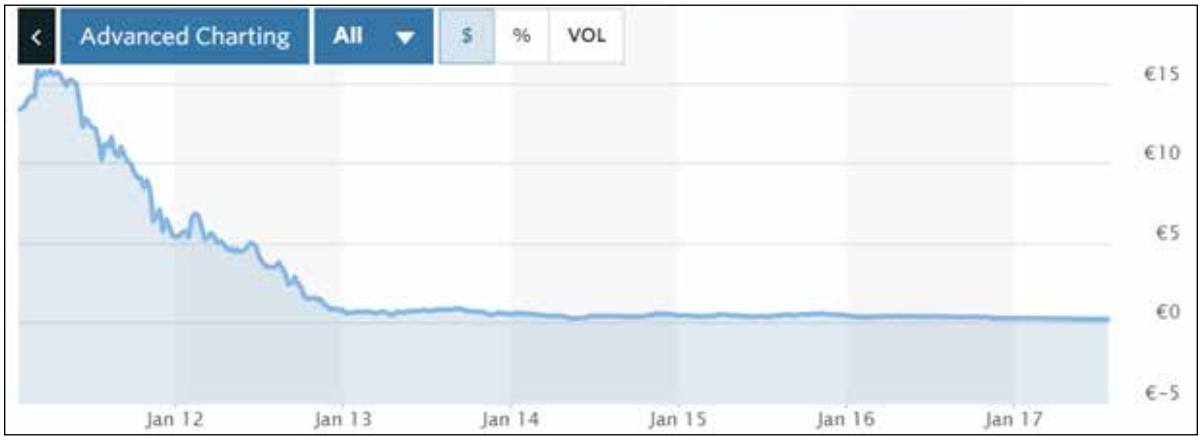
Our conversations with stakeholders in Nepal suggested little confidence in the continued deployment of carbon permits. Projects eligible to subscribe for CERs in Nepal, including Arun 3 and Upper Karnali, have not applied for them, which suggests they do not provide significant incentives.

IS THERE POTENTIAL FOR A CARBON MARKET TO EMERGE IN NEPAL?

Given the ineffective role of CERs in stimulating private developers' confidence, the position of the UNFCCC in encouraging publically managed carbon credits is questionable. It may take a broader market for carbon credits to emerge as a palatable incentive for developers.

A market for carbon credits, also known as an emissions trading scheme (ETS) for carbon, operates by taxing carbon through quotas. While governments may differ on implementation policies, the underlying aim is clear: set a limit on the quantity of total emissions for industries included in the carbon market. Carbon markets are justified based on the theoretical notion

FIGURE 5: ICE ECX CER FUTURES FROM 2012–2017



Source: Marketwatch.com

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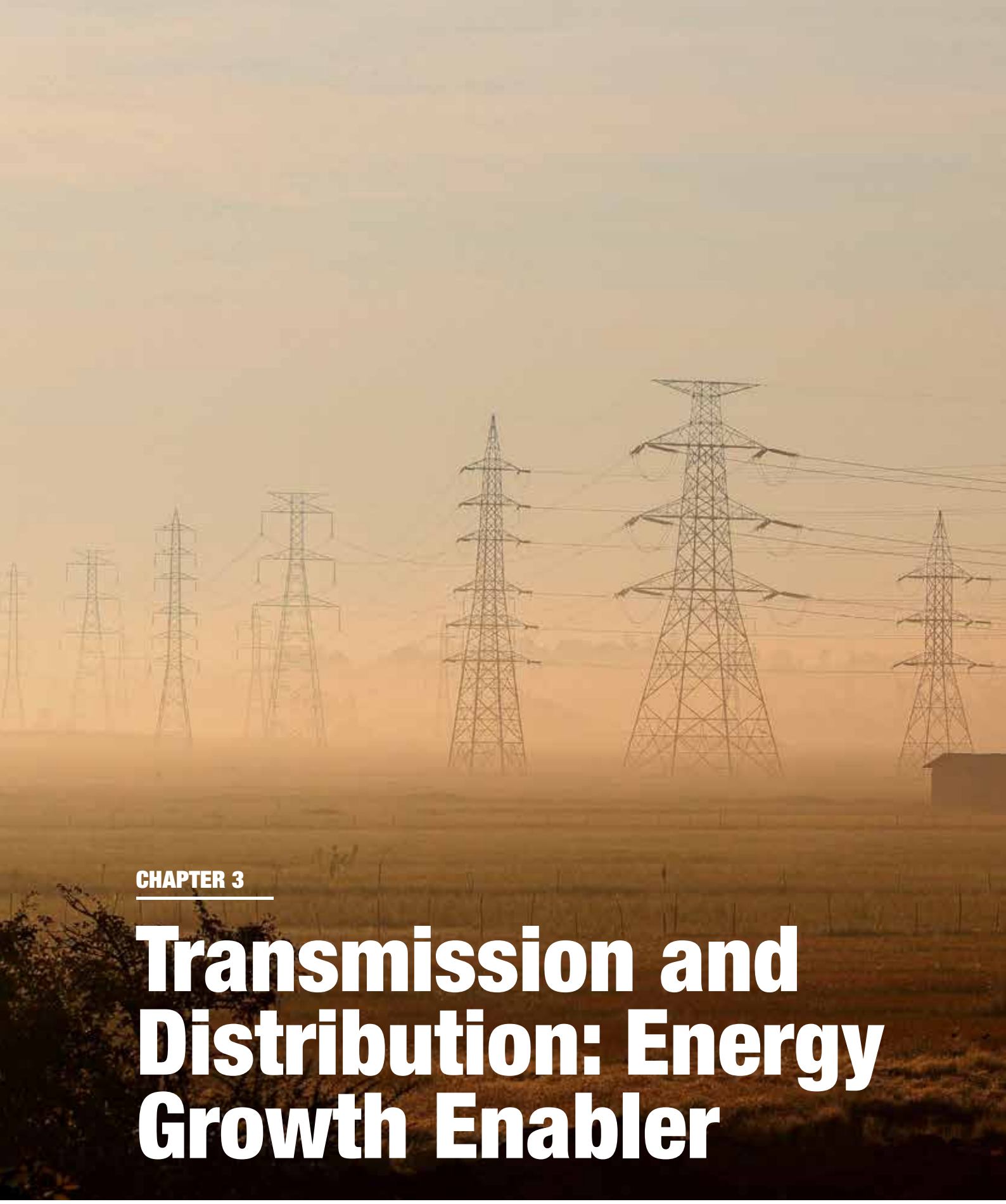
CHAPTER 3

An assessment of key transmission and distribution infrastructure for Nepal's grid, and the opportunities and bottlenecks for up-and-coiming renewable energy projects.



CHAPTER 3

Transmission and Distribution: Energy Growth Enabler

UKaid
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CHAPTER 3

Transmission and Distribution: Energy Growth Enabler

ABBREVIATIONS

FIGURES

ABBREVIATIONS

ADB	ASIAN DEVELOPMENT BANK
AEPC	ALTERNATIVE ENERGY PROMOTION CENTRE
DFI	DEVELOPMENT FINANCIAL INSTITUTION
DOED	DEPARTMENT OF ELECTRICITY DEVELOPMENT
EIB	EUROPEAN INVESTMENT BANK
ESIA	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
ETFC	ELECTRICITY TARIFF FIXATION COMMISSION
GESI	GENDER EQUALITY AND SOCIAL INCLUSION
IBN	INVESTMENT BOARD OF NEPAL
IDA	INTERNATIONAL DEVELOPMENT ASSOCIATION
IFC	INTERNATIONAL FINANCE CORPORATION
IWRM	INTEGRATED WATER RESOURCE MANAGEMENT
JICA	JAPAN INTERNATIONAL COOPERATION AGENCY
KM	KILOMETRES
KV	KILO VOLTS
KW	KILO WATTS
MN	MILLION
MOE	MINISTRY OF ENERGY
MVA	MEGA VOLT AMP
MW	MEGA WATTS
NEA	NEPAL ELECTRICITY AUTHORITY
USD	UNITED STATES DOLLARS
WECS	WATER AND ENERGY COMMISSION SECRETARIAT

1.1 INTRODUCTION

A reliable power network requires a mix of generating sources and a robust transmission and distribution network. Increasing generation capacity has been a pressing need in the Nepalese energy system, mainly due to a history of chronic load shedding (up to 16 hours per day) over the last few years. But equally important is transmission and distribution infrastructure, without which the new generated electricity would go to waste.

SCOPE

In Section 1.2, this document explores the status of transmission structure of the Nepalese electricity grid. The enhancements of the grid and transmission infrastructure is supported by the Development Financial Institutions (DFI), so Section 1.3 lists work currently underway in this space undertaken by regulators, utility, and DFIs. Finally, in section 1.4, the report graphically presents the capacity additions in generation, transmission lines, and substations.

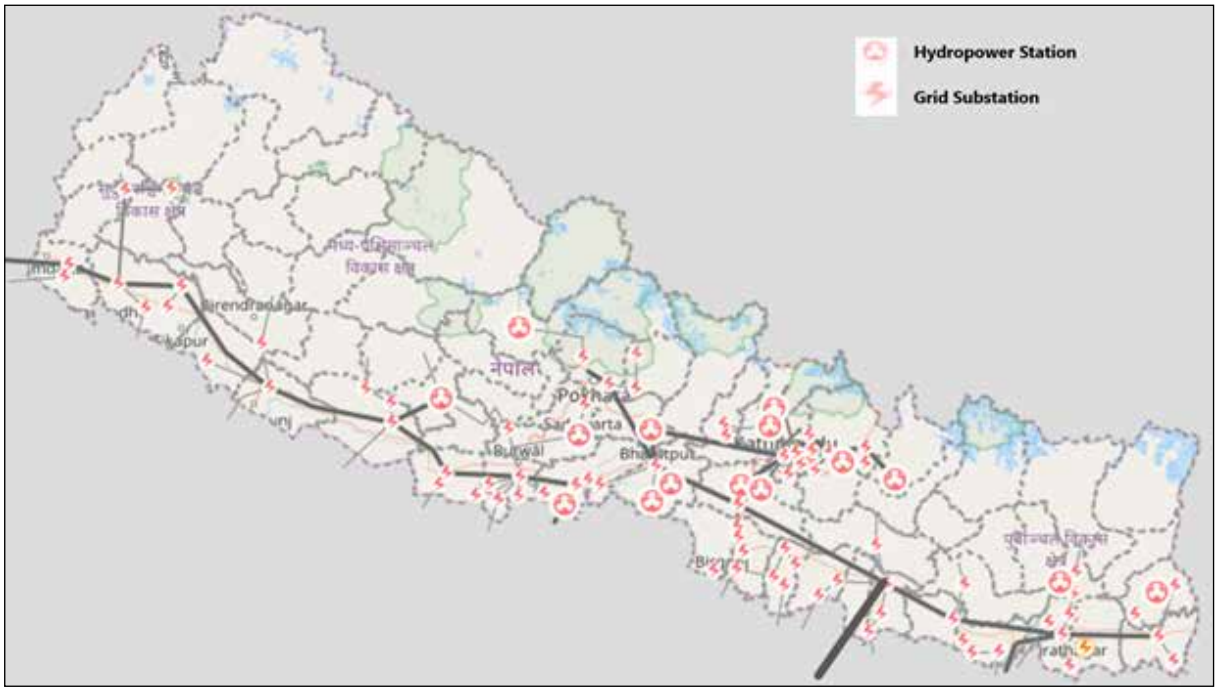
1.2 NEPALESE MARKET SIZE UNDER CURRENT REGULATIONS AND INFRASTRUCTURE CAPACITY

CURRENT TRANSMISSION INFRASTRUCTURE

Nepal uses up to 220 kV voltage lines to evacuate and distribute power internally. A 400 kV (currently charged at 220 kV) cross-border line from Dhalkebar, Nepal, to Muzzafapur, India, was recently commissioned. Figure 1 shows transmission lines in Nepal along with substations and hydropower plants. The transmission lines mainly run east to west along the southern part of the country. Since most hydropower development is in the central region, and Kathmandu is the main load centre, transmission lines and substations are concentrated in and around Kathmandu.

Nepal's existing high voltage transmission network comprises 2,130 circuit km of 132 kV lines and 1,376 MVA of substation capacity at the 132 kV level. Unlike the generation segment of the country, the transmission segment showed significant growth between 2008 and 2012. The 132 kV transmission line network has grown at a rate of 8% over this period. The country also has a 66 kV transmission network comprising 511 circuit km of lines and a transformer capacity of 464 MVA. Nepal's transmission grid is linked with India's via 22 links at the 132 kV, 33 kV, and 11 kV levels. About 80–100 MW of power is exchanged between the two countries in radial mode via these links. Nepal imports up to 500 MW of energy out of which up to 400 MW can be imported through the Dhalkebar–Muzzafapur line.

FIGURE 1: NEPAL TRANSMISSION LINES, SUBSTATIONS, AND HYDROPOWER PLANTS



1.3 REGULATORY REFORMS AND TRANSMISSION AND DISTRIBUTION PROJECTS CURRENTLY UNDERWAY

In February 2016, the Government of Nepal endorsed a National Crisis Reduction and Electricity Development Decade plan, which aims to develop 10,000 MW of electricity in 10 years. There are several regulatory reforms, transmission projects, and distribution projects currently underway to achieve those targets.

Until 1990, the NEA was the sole body for power generation, transmission, and distribution. The Hydropower Development Policy 1992 first envisaged a need to open generation to the private sector.

The Hydropower Development Policy 2001 took a step further to unbundle the NEA into different institutions. It planned to unbundle the NEA into three different bodies handling generation, transmission, and distribution. The ADB helped the Government of Nepal launch the reform process by establishing the National Transmission Grid Company Ltd. The company was finally set up in July 2015. However, the company has not made any significant progress hence and we are yet to see the impact of unbundling.

GOVERNMENT ENERGY INFRASTRUCTURE PLANS UNTIL 2030

Description	Impact	Project name / Institutions involved	Amount
Physical Infrastructure			
Kohalpur–Mahendranagar 132 kV transmission line	Increase transmission capacity in Western Nepal.	Electricity Transmission Expansion and Supply Improvement Project / Asian Development Bank (ADB), Nepal Electricity Authority (NEA), Government of Norway	USD 128.05 mn
Construction of the 220 kV/400 kV Tamakoshi–Kathmandu transmission line	Electricity evacuation from Tamakoshi Hydro project to Kathmandu and other parts of mid-Nepal.		
Expansion of the Chapali grid substation	Increase transmission capability within the Kathmandu valley and increase reliability of national grid.		
Rehabilitation of 12 distribution substations	Increase reliability of supply due to rehabilitation of substations and associated facilities in Gaur, Nijgarh, Chandragadhi, Jare, Belbari, Gorkha, Parasi, Krishnanagar, Taulihawa, Amuwa, Mirmi and new distribution systems along the Khimti–Kathmandu transmission line.		
Rehabilitation of Tinau (1 MW) and Sundarijal (640 kW) hydropower plants	Renovation and modernisation of two old hydroelectric projects – Sundarijal, over 70 years old, and Tinau, over 40 years old.		
Construction of substations at Barhabise, Lapshiphedi, Changunarayan, Chapagaun, Mulpani, and Phutung	A 220/132 kV 160 MVA substation at Barhabise and Laphsiphedi and a 132/11kV 45 MVA substation at Changunarayan are being constructed to complete the Tamakoshi–Kathmandu 220/400 kV Transmission Line Project. This line will provide vital power to Kathmandu from the power-generating stations that are being constructed at Khimti (Tamakoshi) and Barhabise. Another three 132/11 kV 45 MVA substations in Chapagaun, Mulpani, and Phutung will provide the necessary power to Kathmandu Valley.	Power Transmission and Distribution Efficiency Enhancement Project / ADB, NEA	USD 189 mn

Feasibility and detailed engineering studies of key hydropower projects and key transmission lines	Provision of high quality due diligence to support investment to transform the power sector. Studies of the following mega projects: • Sunkoshi 2 (1,110 MW) • Sunkoshi 3 (536 MW) • Dudhkoshi (300 MW) • Second Nepal–India Cross Border Transmission Lines	Project Preparatory Facility for Energy / ADB, NEA, Department of Electricity Development (DoED)	USD 26.25 mn
Construction and augmentation of transmission lines (400kV and 220kV) along Gandaki corridor and Marsyangdi–Kathmandu route	Increased capacity of national power grid by construction/augmentation of 236.5 km of transmission lines and substations along the Kali Gandaki corridor and Marsyangdi–Kathmandu route.	South Asia Sub-regional Economic Cooperation Power System Expansion Project / ADB, European Investment Bank (EIB), Government of Norway, NEA, Alternative Energy Promotion Centre (AEPC)	USD 440 mn
Construction and augmentation of transmission lines (up to 33kV) across the country	Power distribution network improved through construction of 1,135 km of distribution lines and substations across the country.		
Mini-grid based renewable energy system	Increased access to electricity in off-grid areas by installing in selected rural communities up to a total of 4.3 MW of mini hydro-electric power plants and up to a total of 0.5 MW of mini-grid based solar or solar/wind hybrid systems.		
Middle Marsyangdi–Marsyangdi, Dumre–Damauli 132 kV transmission line and related substation work	Construction of a new double circuit transmission line from Dumre to Damauli; string the second circuit of the existing transmission line from Middle-Marshyangdi to Dumre to Marshyangdi.	Energy Access and Efficiency Improvement Project / ADB, NEA	USD 12.72 mn
Tanahun Hydropower project	Access to clean and sustainable energy, increased efficiency, and reliable supply of energy by constructing 140 MW of hydropower plants and 37 km of 220 kV transmission line. Includes rural electrification that covers 17,636 households.	Tanahun Hydropower Projec / ADB; Abu Dhabi Fund for Development; EIB; Japan International Cooperation Agency (JICA); NEA	USD 505 mn
Grid Connected Solar PV Farm	Design, supply, construction, commissioning, O&M of first grid connected solar farms of 25 MWp capacity.	Grid Solar and Energy Efficiency Project – World Bank; NEA	USD 54 mn
Kabeli-A Hydroelectric Project	Construction of a 37.6 MW peaking hydroelectric project.	Kabeli-A, Hydroelectric Project – World Bank, International Finance Corporation (IFC), Canada Climate Change Program	USD 102. 6 mn
Preparation of Hydropower and Transmission Line Investment Projects	The project will prepare two hydropower projects (365 MW) and a priority cross-border high voltage transmission line project. It will finance detailed engineering designs and bid documents, ESIA including a Cumulative Impact Assessment and mitigation studies, and the hiring of a dam safety panel of experts and an environmental and social panel of experts for Upper Arun (335 MW) and Ikhuwa khola (30MW). It will also include a feasibility study and the preparation of a basic design, route survey, ESIA, and bid documents for transmission line projects to be identified	Power Sector Reform and Sustainable Hydropower Development- World Bank (IDA), South Asia Water Initiative; NEA	USD 18 mn
Hetauda–Dhalkebar–Duhabi (H–D–D) Transmission Line and Grid Synchronisation	Design, construction, and operation of approximately 285 km of 400 kV 42 double circuit transmission line and substations for the Hetauda–Dhalkebar–Duhabi segment.	Nepal–India Electricity Transmission And Trade Project, World Bank (IDA)	USD 118.6 mn
Synchronization of Operation of the Nepal and Indian Grids	Installation of properly tuned power system stabilisers in the major power generating stations and other measures in Nepal in order to synchronise its power system with India's	Nepal-India Electricity Transmission And Trade Project, World Bank (IDA)	USD 118.6 mn

Electricity Transmission Project: Construction of 300 km of 400 kV transmission lines and three sub-stations	Increased transmission capacity in central Nepal and construction of cross-border transmission line with India from New Butwal.	Millennium Challenge Corporation	USD 500 mn
Study of 15 hydropower projects in Nepal	Data collection and preliminary study of these projects.	JICA	)

Policy Reforms

Policy reforms			
Economic reform and development programs initiated to achieve the government's vision of double-digit and more inclusive economic growth by 2022	Introduction of institutional and policy reforms in key public entities, such as the NEA, that are critical to improve the investment climate.	Support for formulating an Economic Development Vision – ADB	USD 5.6 mn
Studies and preparation for policy recommendations and sector reform	Support MoE, IBN, DoED, WECS, ETFC, NEA, and AEPC on: • River basin planning with an IWRM approach for selected river basins • Recommendations to improve water resources management and regulations, such as updating the Water Resource Act and capacity building of the WECS • Power System Expansion Plan, including preparation of a Hydropower Generation Master Plan • Establishment and operationalisation of a power trading company • NEA business restructuring to improve management and efficiency, including provision of computerised management tools, installation of smart meters to enhance the distribution business management, and asset evaluations.	Power Sector Reform and Sustainable Hydropower Development – World Bank (IDA), South Asia Water Initiative; NEA	

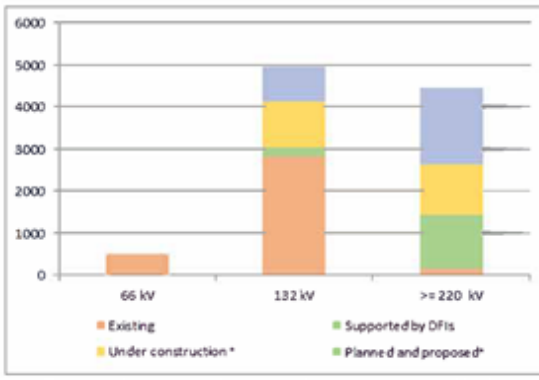
Institutional Reforms

Institutional Reforms			
Enhance operational and financial performance of NEA distribution centres	Single-phase and three-phase smart meters with associated communication facilities that are aligned with modern international practices will be introduced to automate customer metering and reduce nontechnical losses.	Power Transmission and Distribution Efficiency Enhancement Project, ADB; NEA	USD 189 mn
Develop the NEA's capacity to operate and manage advanced distribution system, intelligent network (smart grid) technology with Gender Equality and Social Inclusion (GESI) aspects in electricity access, and end-user awareness	Training and other capacity building activities will be conducted to help NEA staff to plan and execute advanced distribution efficiency projects with special emphasis on gender.	Power Transmission and Distribution Efficiency Enhancement Project, ADB; NEA	USD 189 mn
Distribution System Planning and Loss Reduction	Aid NEA to redress high system losses in the country and enhance the NEA's capacity in distribution system planning and management.	Grid Solar And Energy Efficiency Project - World Bank (IDA)	USD 84 mn
Kabeli Hydroelectric Project	Help IBN (a) conduct additional due diligence and PDA negotiations of large hydropower projects (four projects, totalling 3050 MW) proposed by private investors; (b) supervise the construction of abovementioned projects to ensure compliance with the terms and conditions of the PDAs and sustainability of such projects; (c) build its procurement, financial management, environmental, and social safeguards and technical capacities; and (d) cover incremental operating costs for project implementation.	Kabeli-A, Hydroelectric Project – World Bank, IFC, Canada Climate Change Program	USD 4 mn

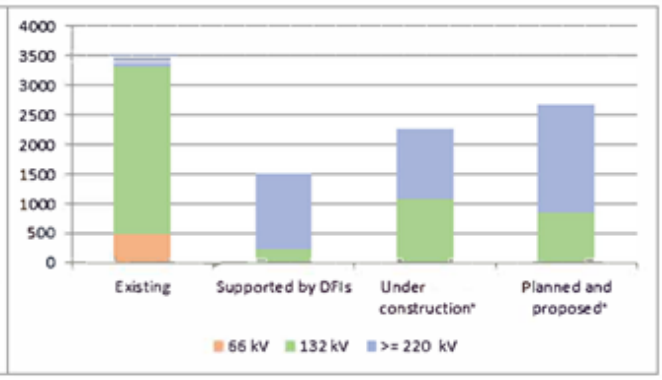
1.4 IMPACT ON MARKET SIZE

Transmission Grid

Transmission grid length (km)	Existing	Supported by DFIs	Under construction*	Planned and proposed*	Total
66 kV	494	-			494
132 kV	2,819	229	1,068	846	4,962
>= 220 kV	153	1,292	1,187	1,820	4,452
Total	3,466	1,521	2,255	2,666	9,908



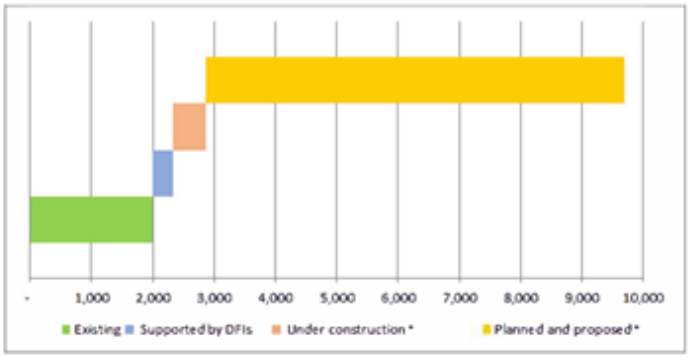
Transmission grid based on capacity (kV)



Existing and planned transmission grids

Substation

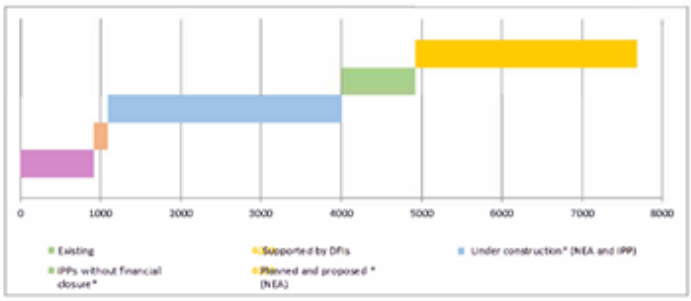
Substation capacity in MVA	66kV	>132kV
Existing	622	1,996
Supported by DFIs		340
Under construction*		533
Planned and proposed*		6,818
Total	622	9,687



Sub station capacity in MVA - Existing and planned

Hydropower Capacity

Total installed capacity on grid in MWs	Hydro
Existing	918
Supported by DFIs	178
Under construction* (NEA and IPP)	2,913
IPPs without financial closure *	910
Planned and proposed* (NEA)	2,770
Total	7,689



Hydropower Installed Capacity in MW - Existing and Planned

Solar Energy
200 MW
(Planned)

Thermal Energy
53 MW
(Existing)

* Without DFI support

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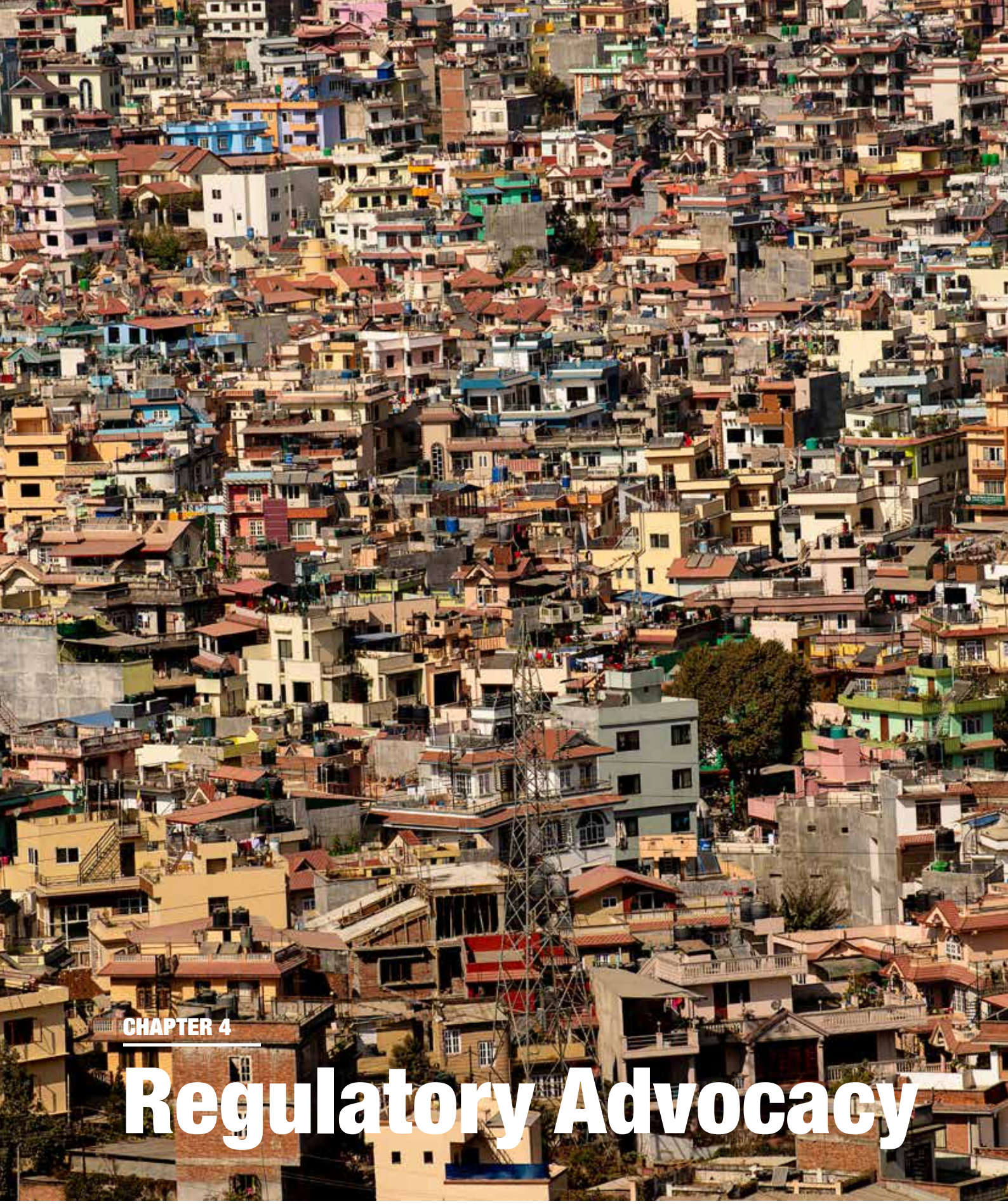
CHAPTER 4

A close look at the existing regulatory framework for Foreign Direct Investment in Nepal and recomendations that would doors to increased investment in the country's renewable energy sector



CHAPTER 4

Regulatory Advocacy

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CHAPTER 4

Regulatory Advocacy

ABBREBIATIONS

TABLES

ABBREVIATIONS

ADB	ASIAN DEVELOPMENT BANK
BOO	BUILD OWN OPERATE
BOOT	BUILD OWN OPERATE TRANSFER
COD	COMMERCIAL OPERATION DATE
CSP	CONCENTRATED SOLAR POWER
DOED	DEPARTMENT OF ELECTRICITY DEPARTMENT
FDI	FOREIGN DIRECT INVESTMENT
GON	GOVERNMENT OF NEPAL
GW	GIGAWATT
HPP	HYDROPOWER PROJECT
IFC	INTERNATIONAL FINANCE CORPORATION
ILO	INTERNATIONAL LABOUR ORGANIZATION
IPP	INDEPENDENT POWER PRODUCER
IRR	INTERNAL RATE OF RETURN
KWH	KILO WATT HOUR
MW	MEGA WATT
NEA	NEPAL ELECTRICITY AUTHORITY
NPR	NEPALI RUPEE
PDA	PROJECT DEVELOPMENT AGREEMENT
PPA	POWER PURCHASE AGREEMENT
PROR	PEAKING RUN OF RIVER
PV	PHOTOVOLTAIC
ROE	RETURN ON EQUITY
SAARC	SOUTH ASIAN ASSOCIATION FOR REGIONAL COOPERATION
UK	UNITED KINGDOM
USA	UNITED STATES OF AMERICA
USD	UNITED STATES DOLLAR

1.1 INTRODUCTION

Over the last five years Nepal has amended and introduced several regulations to facilitate public–private partnership and encourage further private sector investment, both foreign and local, in the energy and infrastructure sector.

The Government of Nepal (GoN) has prioritised the development of energy and infrastructure and allocated financial resources to the development of large energy projects considered "priority". But according to the World Bank's latest insight into planning in the energy sector, it has been erratic: Since 2001, there have been five strategic documents, one every three years on average. Some of the targets over the last 17 years include:

- 2001: The GoN adopted a Water Resource Strategy, which was revised four years later into a National Water Plan.
- 2007: A plan calling for construction of 10,000 MW in 10 years was adopted.
- 2009: The 10,000 MW target was changed to a plan for 25,000 MW in 10 years.
- 2016: In the wake of an earthquake and trade disruptions that affected the import of petroleum, the government revised its plan, calling again for 10,000 MW in 10 years.

These plans are encouraging in that the government set a vision for future energy development, but they lack measures needed to develop a clear and well-regulated enabling environment for Foreign Direct Investment (FDI).

As the World Bank points out, attracting and retaining investment to the tune of tens of billions of dollars requires mechanisms for sharing risk; the provision of common infrastructure, such as transmission corridors and roads; and streamlined procedures in the context of a clear and strong legal and regulatory framework. Simply put, a significant change is required if Nepal wants to add the promised capacity in the next 10 years.

1.2 "QUICK WIN" REGULATORY CHANGES TO NEPAL'S RENEWABLE ENERGY ENABLING ENVIRONMENT

After conversations with stakeholders including donor agencies, national entities, and private industry players, we identified "quick wins" that may be accomplished in the next two years. This document does not suggest that these reforms can all be implemented at once; instead, a combination of them are viable given the right market signals and government cooperation.

QUICK WIN 1: AUTOMATIC ROUTE FOR FOREIGN INVESTMENT

BACKGROUND

- Currently, FDI approval in Nepal is cumbersome at best and damaging at worst. Investors are required to seek approval from a number of government institutions, including the Department of Industries, Nepal Rastra Bank, as well as the Industrial Promotion Board or the Investment Board of Nepal, depending on the investment amount. Based on Dolma Impact Fund's experience, this process can take up to nine months. A nine month delay increases capital costs by 10.5% with current borrowing interest rates of >14%. It also increases the risk of committed investors backing out during the bureaucratic process of FDI approval as project or political conditions change on the ground.
- Adopting an automatic process, in line with India's one-stop-shop for FDI approvals, is a more effective way to attract investment. Such a system would help Nepal attract investment while abiding by essential anti-money laundering (AML) principles it has committed to safeguard.

KEY STAKEHOLDERS

- Nepal Rastra Bank (the central bank)
- Department of Industry
- Ministry of Finance
- Foreign investors in Nepal
- Relevant embassies supporting FDI influx into Nepal (e.g. USA, India, UK, China)

PROGRESS SO FAR

- Limited. There has been some lobbying from private industry players, but the central bank has not so far signalled that it intends to implement an automatic route.

WAY FORWARD

- Increased awareness of benefits.
- Engaging with parliamentary committees and the central bank.
- Assistance from foreign treasury departments.

KEY RISKS

- Ensuring that an automatic route can be implemented without weakening AML compliance.
- Regulatory change that would slow the process for FDI approval.

QUICK WIN 2: FOREIGN CURRENCY PPA

BACKGROUND

- Clearer guidelines required on foreign currency PPA for the foreign debt and equity component, creating an improved picture for investors.

KEY STAKEHOLDERS

- Nepal Electricity Authority
- Ministry of Finance
- Ministry of Energy
- Nepal Rastra Bank (Nepal's central bank)
- IPPs relying on FDI

PROGRESS SO FAR

- Some positive initial steps: in July 2017, the government commissioned a committee to study and provide recommendations on foreign currency-denominated PPAs. The suggestions were as follows:
  - Hydropower projects (HPPs) up to 100 MW shall have PPA rates denominated in Nepali rupees only.
  - HPPs above 100 MW with some portion of debt in foreign currency shall have PPA rates in Nepali rupee and USD, subject to equity that is >20% of total investment. The above provision for PPA up to 10,000 MW.
  - Foreign currency portion of PPA rates for HPPs >100 MW shall be the proportion of foreign currency loan to total investment at COD.
  - Foreign currency portion of PPA rate shall be valid for a maximum of 10 years or the foreign currency loan payback period, whichever is shorter.
  - 3% annual simple escalation for eight years to be applied to base tariff of foreign currency portion.
  - Energy bills would be raised in Nepali rupees. Amount of foreign currency shall be calculated by taking the exchange rate published by Nepal Rastra Bank on the date that the PPA is signed.
- The NEA signed a USD-denominated PPA after the committee's recommendation was published, with 120 MW Rasuwa–Bhotekoshi HPP and 216 MW Upper Trishuli–1 Hydroelectricity Project.

WAY FORWARD

- To start, the GoN might choose to adopt the recommendations mentioned by the study group.
- The recommendations only include hydropower projects. There should be clearer guidelines for other renewable energy classes, such as solar PV/CSP, wind, biomass, etc.
- A developer cannot get USD PPA under current provisions if it is financed through 100% foreign equity with no debt. Under the current guidelines on foreign currency PPAs, the government has, in principle, agreed to index up to 80% of a project's cost for 10 years. A logical extension of this policy would be to extend the coverage to 80% of a project's cost without regard to the capital structure. This would allow investors the flexibility to structure the investment that maximises local currency debt and equity while also providing dollar protection for equity for 10 years without more exposure than they would have under the current policy. The government could be amenable to extend tenure of protection beyond ten years by reducing the dollar portion from 80% to, say, 20% over a further period of 3–5 years.

KEY RISKS

- As mentioned, the committee has only considered HPPs that use foreign currency-denominated debts. This might discourage investors who may wish to bring in foreign equity and use loans from the local banking market.

QUICK WIN 3: RETURN ON EQUITY (ROE)

BACKGROUND

- In line with the GoN's statement from January 2017, investors in HPPs can expect a maximum ROE of 17%. The statement was formalised through a NEA Board decision on 27 April 2017. The board decided that the base rate for run of river projects above 100 MW, all peaking run of river projects and all storage projects, would be scaled down to give an effective return on equity of 17%.

KEY STAKEHOLDERS

- Nepal Electricity Authority
- Department of Electricity Development (DoED)
- Ministry of Energy

PROGRESS SO FAR

- Limited progress to date in challenging the GoN expected ROE rates or investigating how they arrived at this figure.

WAY FORWARD

- The government limits the return on equity by offering a feed-in-tariff for hydropower, solar, and wind projects. The cap on return on equity could be relevant where tariffs are based on some other method, such as cost plus percentage. Good projects with higher risk but potentially higher ROE could suffer if government enacts provisions to limit returns. Hence, the government should consider replacing the provision of a set ROE with a focus on optimising feed-in tariffs only.

KEY RISKS

- The government runs the risk of framing IRR expectations without adequate financial analysis. Besides, required IRR for a project depends on various factors such as investors' risk appetite, engineering and geographical risk, hydrological risks, size and complexity of the project, etc. The arbitrary selection of 17–18% IRR may dissuade investors from entering the Nepalese market.
- IRR and ROE may be computed in several ways and investors could seek to circumvent this restriction.

QUICK WIN 4: SOLAR/WIND TARIFFS

BACKGROUND

- As demonstrated in Chapter 9: Project Design and Engineering, the solar PV potential in Nepal is large.
- Terms for solar PPAs are unattractive to investors without external support such as viability gap funding and subsidised financing.
- Tariffs are not based on the cost of a solar PV project but seem to be benchmarked against hydro tariffs and solar tariffs in other countries that have different implementation costs.

KEY STAKEHOLDERS

- Nepal Electricity Authority
- Ministry of Energy
- Multilateral stakeholders involved in reform process, such as IFC

PROGRESS SO FAR

- In November 2017, the Ministry of Energy approved procedures for grid connected solar PV generation. The relevant highlights of the new procedures are:
  - Tenure of production and generation license: 35 years
  - Principle of PPA: Take or pay
  - Currency of PPA: Nepali rupee
  - PPA rates: NRS. 7.30/kwh
  - Escalation clause: None
  - Tax relief: Same as that for HPPs
  - Land and Transmission lines: To be

arranged by the developer
  - Royalty: None
  - Total capacity of Solar power: 15% of the total installed capacity
- In December 2016, ADB, through the Strategic Climate Fund, provided USD 20 million as grant assistance. The grant assistance will be used to provide viability gap fund under NEA's PPA with private entities generating solar power.

WAY FORWARD

- The Nepal Electricity Authority/Ministry of Energy should consider internationally benchmarking the cost of developing solar PV/wind projects in Nepal as was done by the Central Electricity Regulatory Commission of India. The government should set tariff levels based on this exercise rather than benchmarking tariffs against hydro tariffs.

KEY RISKS

- At the current tariff level, there is a risk that solar/wind projects would not be developed without significant concessional financing.

1.3 FURTHER OPPORTUNITIES FOR REFORM BEYOND SCOPE OF PROJECT

Beyond quick-win regulatory reform, which may conceivably occur within two years, opportunities remain for longer-term regulatory reform in the 2+ years to follow, speculatively listed below. This section highlights positive developments in India that Nepal could adopt.

FURTHER OPPORTUNITY 1: SOVEREIGN CREDIT RATING

Based on Dolma's conversations with commercial institutional investors in Europe and North America, an investment grade sovereign rating (BBB-) is a prerequisite for international investment in Nepal. Some banks in Nepal have lobbied the government to issue a bond to obtain a sovereign rating on the international market. Although Nepal's rating would likely not be investment grade, this move would allow investors to look up Nepal on the international debt market and price sovereign credit risk, possibly hedging the difference between Nepal's rating and investment grade. A handful of sources in Nepal's banking sector confirm that the government is interested in obtaining an initial rating.

The ADB and IFC are attempting to issue local currency bonds. Commercial banks have lobbied for this as well. There is an expectation from the individuals interviewed that should the GoN issue a bond, it would not be rated as investment grade by international rating agencies, but Dolma believes this would be better than no rating at all.

FURTHER OPPORTUNITY 2: COST-PLUS APPROACH

- Cost plus is a mechanism which enables developers to ascertain their PPA rate. This would help to improve the system in place for determining PPA rates in Nepal, which are currently set on fixed posted rates. India has implemented this in the past.

FURTHER OPPORTUNITY 3: COMPETITIVE BIDDING PROCESS

- As we have seen in India, especially in its solar market, a competitive bidding process drives down prices. While it may still be early in Nepal to implement this process, it is a move the NEA or a future regulatory authority should work towards.

FURTHER OPPORTUNITY 4: PROTECTION FOR SEASONALITY

- Indian renewable energy PDAs place a protection mechanism for seasonal changes throughout the year, an incentive for foreign investors to consider projects in India. Nepal currently does not have such a mechanism in place, which could be a deterrent to FDI.

FURTHER OPPORTUNITY 5: BENEFIT SHARING

- The successful benefit sharing in water basins can be a tool for poverty reduction, sustainable development, and long-term political stability.

- Benefit sharing between developers and local people is a crucial issue during the construction of HPPs in Nepal, as local people feel that they have primary right to natural resources in their area. The ILO Convention No 169 gave special rights, though these have not been clearly defined, to indigenous and tribal people for the use of natural resources in their area.
- Clear mechanism of benefit sharing among federal, provincial, and local government should be in place. The National Natural Resources and Fiscal Commission is devising formulas to allocate royalties earned from different natural resources. In the first phase, they plan to collect data and study them to devise a formula to do so.

FURTHER OPPORTUNITY 6: COOPERATION WITH REGIONAL PARTNERS

- The opportunity for regional cooperation is a long-term goal. The prospect of Nepal becoming the "battery" of South Asia and a major energy exporter or trader should open the door to larger investment opportunities. With a fully integrated regional grid, Nepal is expected to increase its installed capacity by 52 GW, mainly for export to its neighbours.
- Member countries have signed the SAARC framework agreement for energy cooperation. This agreement contains broad-ranging provisions for establishing a regional market for electricity, including non-discriminatory access to transmission, market-based pricing of electricity exchanged, and the establishment of a body for coordinating regional power integration and trade. However, India's Ministry of Power has published "Guidelines on Cross Border Trade of Electricity", which prohibits export of power to India from projects developed by non-Indian private sector companies.

1.4 FULL LIST OF REGULATORY BARRIERS AND SUGGESTED ENHANCEMENTS

See below a summary of barriers and suggested enhancements (compared to India).

TABLE 1: LIST OF REGULATORY BARRIERS IN NEPAL

Regulatory Barriers	Suggestions
Quick Wins	
Automatic route for foreign investment	Implement automatic route for foreign investment with a one-stop-shop, or allow funds to be invested in Nepal before approvals and held for 30 days while AML checks are done, as in India. At the least, the automatic route should be implemented in specific sectors including energy and infrastructure.
Foreign-currency PPA	Create clear guidelines for foreign currency-denominated PPAs for all energy asset classes.
Land ownership after tenure	Provide clarity on land ownership after project tenure for wind and solar asset classes.
Return on equity	The maximum ROE stipulated by the government needs to be updated and properly explained.
Solar and wind tariffs	The Ministry of Energy published the solar working procedure, which is a welcome move. However, the current working procedure does not provide enough incentives to large developers and requires revision to make it attractive to solar developers.
Long term changes	
Sovereign credit rating	Nepal needs to obtain a sovereign credit rating. This is a requirement for most large international investors. As the government will honour the PPAs, if rated below investment grade, investors will be able to quantify risk.
Cost plus approach	Create a mechanism by which developers are paid on cost plus percentage basis rather than fixed or increasing feed-in tariffs.
Competitive bidding process	Competitive bidding process should be a long-term target with an independent regulator and a clear market mechanism in place.
Protection for seasonality	Protection should be given to developers in case of changes in resources (hydrological, solar, etc.) due to seasonal changes.
Benefit Sharing	Create clear guidelines to share hydropower benefits among various stakeholders (local government, provincial government, federal government, local people, etc.) through royalty, equity buy-ins, etc.
Cooperation with regional partners	Continue to engage actively at the provincial level to enable policies and frameworks for regional power trading.

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CHAPTER 5

The crux of this report series - a look into the perceived institutionall investor risks of investing in relation to investng in frontier markets, and the risk mitigation tools necessary to attract billions into Nepal's renewable energy sector. Findings based on interviews with some of the world's largest asset managers over an 18-month period.

CHAPTER 5

Institutional Investor Appetite and Landscape

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CHAPTER 5

Institutional Investor Appetite and Landscape

ABBREBIATIONS

TABLES

FIGURES

ABBREVIATIONS

AUM	ASSETS UNDER MANAGEMENT
DFI	DEVELOPMENT FINANCE INSTITUTION
ERAFP	LE RÉGIME DE RETRAITE ADDITIONNELLE DE LA FONCTION PUBLIQUE
FDI	FOREIGN DIRECT INVESTMENT
FMO	DUTCH DEVELOPMENT BANK
FRR	FONDS DE RESERVES POUR LES RETRAITES
GCC	GAS COMBINED CYCLE
GDP	GROSS DOMESTIC PRODUCT
GLOF	GLACIER LAKE OUTBREAK FLOOD
IMF	INTERNATIONAL MONETARY FUND
KFW	GERMAN DEVELOPMENT BANK
LCOE	LEVELISED COST OF ELECTRICITY
LDC	LEAST DEVELOPED COUNTRY
MIGA	MULTILATERAL INVESTMENT GUARANTEE AGENCY
OECD	ORGANISATION FOR ECONOMIC COOPERATION AND DEVELOPMENT
O&M	OPERATION AND MAINTENANCE
PIDG	PRIVATE INFRASTRUCTURE DEVELOPMENT GROUP
PDC	PORTFOLIO DECARBONISATION COALITION
PV	PHOTOVOLTAIC
SDG	SUSTAINABLE DEVELOPMENT GOALS

1.1 INTRODUCTION

The investment opportunities and enabling environment in Nepal was analysed in Deliverable 1: Market Analysis. This document will examine the trends pushing institutional investors towards emerging and frontier markets – specifically, how Nepal's renewable energy sector stands to benefit from these developments.

Institutional investors are recognised as a pillar of the financial system in both developed and developing countries. Responsible for managing retirement savings and insurance premiums, they are expected to invest for the long term, follow market fundamentals, and provide liquidity to countries and companies sometimes overlooked by other actors in financial markets.

The Financial Times defines institutional investors as "a financial institution, such as a bank, pension fund, mutual fund and insurance company that invests large amounts of money in securities, commodities and foreign exchange markets, on its own behalf or on the behalf of its customers" . Institutional investors may be categorised into six groups: pension funds; endowment funds; insurance companies; commercial banks; mutual funds; and hedge funds.

Among them, such investors hold ~USD 100 tn under management – roughly 1,250 times the recorded Global GDP in 2017, and 2,000 times the infrastructure investment requirements in Asia until 2040.

SCOPE

This document will be divided into two sections. The first will highlight institutional investor trends and the catalysts pushing them towards emerging and frontier markets. The second section will cover Dolma's findings based on the last two years of research (as of September 2018). Our team interviewed the world's largest asset managers (see organisations and individuals consulted), aiming to better understand their existing investment strategies, perceived risks, and factors that would attract them to countries such as Nepal.

1.2 GLOBAL INFRASTRUCTURE AND INSTITUTIONAL INVESTOR TRENDS

Infrastructure, or lack thereof, is strongly connected to both economic growth and social progress.1 Weak infrastructure can slow a country's growth and competitiveness; it can also cause death, disease, and diminish overall quality of life. Over the last 20 years, 3.8% of world GDP has been spent on infrastructure, with annual spending trending down from 3.6% of GDP in 1980 to 2.8% in 2015.

According to McKinsey's "Bridging Infrastructure Gaps" report, USD 3.3 tn is needed globally every year until 2030 to support just upkeep of transportation, power, water and telecommunication infrastructure; today, the actual investment amount is some USD 2.5 tn. McKinsey is one amongst many arguing that we are chronically underinvesting in critical areas like power. If these gaps continue to grow, they put at stake countries' future growth potential and productivity.

WHY LDCS NEED INSTITUTIONAL INVESTMENT

The World Bank estimates that Least Developed Countries (LDCs) have an annual investment requirement of ~6.6% of GDP. This figure varies depending on income level, as seen in Table 1.

TABLE 1: INFRASTRUCTURE EXPENDITURE NEEDS (% OF GDP)

Country Income	Investment	Maintenance	Total
Low income	7.0	5.5	12.5
Lower middle income	4.9	3.3	8.2
Upper middle income	1.3	1.0	2.3
Total developing	2.7	4.3	6.6

Infrastructure requirements until 2030 are expected to rise to USD 19.2 tn, with Asia needing USD 15.8 tn.1 Amar Bhattacharya, Senior Global Economy and Development Fellow at the Brookings Institute, finds that 32 developing economies in Asia will need infrastructure investment of USD 8.2 tn until 2025, which breaks down to USD 776 bn worth of national investments annually. The World Bank states that two thirds of the latter is needed for new capacity and one third to maintain and replace existing assets; half of the USD 776 bn should go towards energy.

The World Bank estimates that an infrastructure gap of ~USD 1 tn per annum is projected for developing countries until 2030. This is an alarming figure which should serve as a rallying cry to attract additional investment and mitigate growing gaps highlighted in Figure 1.

WHY NEPAL NEEDS INSTITUTIONAL INVESTMENT

The need for Nepal to attract large amounts of Foreign Direct Investment (FDI) to finance its power needs is well documented. Both the Investment Board of Nepal and the National Planning Commission agree that to meet just domestic demand, over 9,000 MW of additional capacity will be required by 2030. This translates to approximately USD 18 bn required in capital investment (both equity and debt), or USD 1.5 bn annually. Given Nepal's relatively shallow capital markets, the vast majority of this investment must be sought through FDI channels.

The current FDI inflows to Nepal suggests there is still some way to go to fill this gap. According to Nepal Rastra Bank (Nepal's central bank), the total FDI in 2017 was ~USD 120 mn. Clearly, a radical change is required in Nepal's ability to attract capital and move beyond the limited capacity of donors and Development Finance Institutions (DFIs). In summary, the only way to fill the funding gap is to attract institutional investors to LDCs, including Nepal.

PROGRAMMES DESIGNED TO ATTRACT INSTITUTIONAL INVESTORS TO EMERGING AND FRONTIER MARKETS

What initiatives exist to help the world's asset managers invest in emerging and frontier markets? Many groups are working on this; some initiatives are detailed below.

MULTILATERAL PROGRAMMES

A UN-led programme to promote 17 goals, ranging from poverty alleviation to industry, innovation, and infrastructure in developing countries, the Sustainable Development Goals (SDGs) is one of the largest programmes – albeit one not specific to infrastructure – to attract investors to frontier markets.

The World Bank backed the "billions to trillions" programme when the magnitude of funding needed to achieve the SDGs came to light. The most substantial development spending happens at the national level in the form of public resources, while the largest potential is from private sector business, finance, and investment. According to the International Monetary Fund (IMF), this is the trajectory from billions to trillions, which each country and the global community must support together to finance; "Billions to Trillions", the IMF explains, "is shorthand for the realization that achieving the SDGs will require more than money. It needs a global change of mindsets, approaches and accountabilities to reflect and transform the new reality of a developing world with highly varied country contexts."

SMALLER MULTILATERAL

At the regional level, platforms such as the Private Infrastructure Development Group (PIDG), funded by a number of Development Finance Institutions (such as KfW and FMO) and Development Institutions (DFID, Australian Aid, etc.), mobilise private sector investment to assist developing countries in providing infrastructure vital to boost their economic growth and combat poverty. PIDG has thus far committed USD 37 mn in financing for three hydropower projects in Nepal: Lower Solu (82 MW), Kabeli A (36.7 MW), and Lower Manang Marsyangdi (140 MW).

BILATERAL

DFIs are the most known category of investor, with a solid track record of investing in the world's poorest economies. Institutions like FMO, the Dutch development bank, continue to reduce the infrastructure capital deficits in developing countries through direct and intermediary investments in renewable energy.

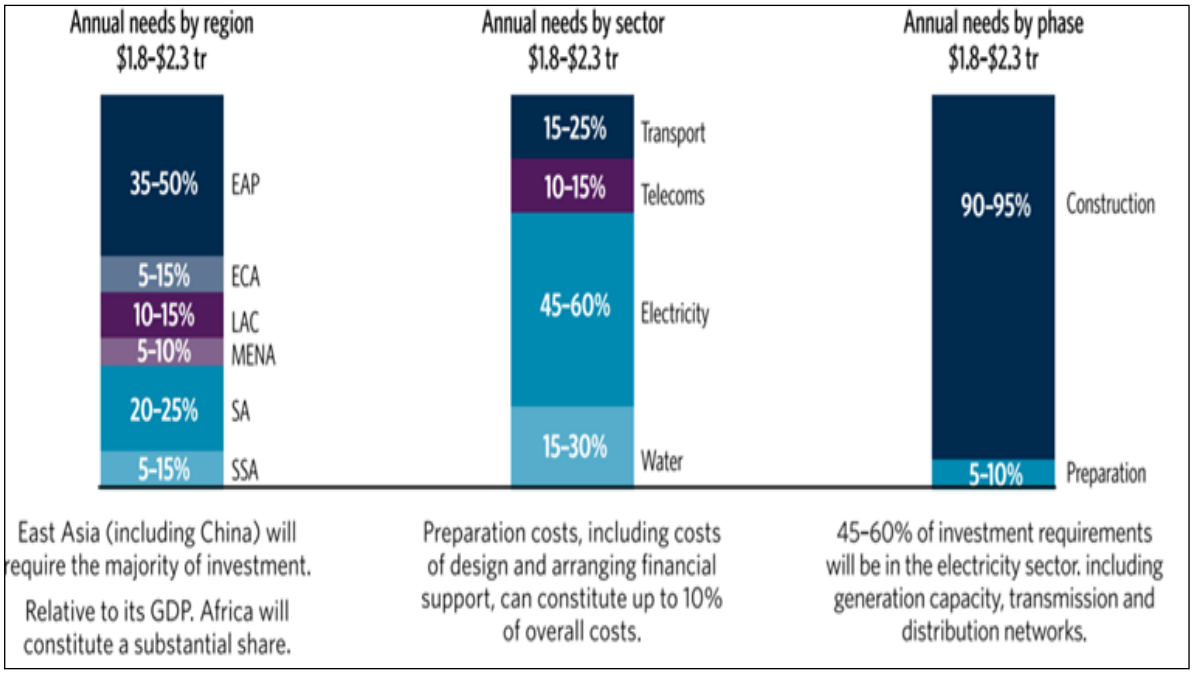
FMO plays an instrumental role in supporting a network of DFI-backed initiatives such as TCX and Climate Investor One, aiming to facilitate investment into previously commercially unviable economies.

TCX is an exotic currency hedging firm that contributes to sustainable development in emerging and frontier markets. Its aim is to develop local capital markets by using financial instruments – swaps and forward contracts – that enable its investors and clients to provide their borrowers with financing in their own currency while shifting risk to TCX. It is the only known currency hedging firm that offers a 20-year forward on the Nepalese rupee.

Climate Investor One is a new approach to funding infrastructure – one through which environmental impact, economic returns, and operating infrastructure will be delivered more quickly and simply. It aims to encourage private sector investment in renewable energy projects in developing countries. Its approach is unique in how it combines three investment funds into one facility to finance renewable energy projects at specific stages (development, construction, and operation) of the project lifecycle.

FMO is also active in running various platforms, like Making Solar Bankable, an annual conference that discusses trends and opportunities in emerging and frontier markets for solar PV development.

FIGURE 1: ESTIMATED INFRASTRUCTURE INVESTMENTS IN DEVELOPING COUNTRIES



1.3 THE CATALYSTS: CHANGING WINDS, TIDES AND UV RAYS

Three independent but converging trends are moving leading institutional investors to evaluate infrastructure investments, including renewable energy, in markets previously considered too risky for their mandates:

1) Low global interest rates, which has led to asset liability mismatch issues for institutional investors, leading in turn to investors increasing allocations to higher yielding asset classes such as Alternative Investments (including private equity) and infrastructure.
2) The commercial viability of renewables compared to conventional alternatives.
3) Heightened public, shareholder, policy-holder and regulatory opinion in favour of "green" investments, which has led institutional investors to mainstream their strategies in favour of renewable energy developments.

LOW GLOBAL INTEREST RATES

Following the global financial crisis, a number of OECD economies (see Figure 2), including the United States, United Kingdom, Germany, and France, witnessed a drop in the interest rates set by their central banks. In Japan, rates went negative in 2016, and have since remained at -0.2%.

As central banks hope to witness more consumer spending and general investment in the real economy, the low interest rate environment poses a risk to the long-term financial viability of pension funds and insurance companies as they seek to generate sufficient returns to meet commitments to policyholders and beneficiaries.

According to the OECD Business and Financial Outlook, lower interest rates will lead to lower returns for pension funds, which invest around 40% or more of their assets in fixed income securities, including lower-yielding government bonds. While the same report advises pension and insurance funds to "remain vigilant to prevent excessive search for yield", preserving existing contracts with their policy holders is crucial.

THE COMMERCIAL VIABILITY OF RENEWABLES

Rapid declines in installation costs and increased capacity factors have improved the economic competitiveness of solar PV, onshore wind, and other renewable energy technologies around the world. The global weighted average levelised cost of energy (LCOE) of utility-scale PV plants is estimated to have fallen by 73% between 2010 and 2017, from around USD 0.36/kWh to USD 0.10/kWh.11

Figure 3 places this declining trend in perspective, highlighting PV utility scale cost trends in several OECD and non-OECD countries. Compared to conventional energy, renewable energy has made significant strides over the last decade. Figure 4 provides an up-to-date snapshot (2017) of how wind and solar PV (both crystalline and thin film) are competitive with gas combined cycle (GCC) and coal on an LCOE basis.

HEIGHTENED PUBLIC, SHAREHOLDER, REGULATORY OPINION

Although the least easily measured catalyst of the three, public outcry over climate change temperatures has been instrumental in pressuring governments and institutional investors across the board towards more renewable sources of energy, and ultimately away from fossil fuels.

While the success of the Paris Climate talks in November 2015 in setting a clear path towards maintaining rising temperatures within a 2 C cap is debatable, it engaged swathes of civil society to collaborate and raise awareness of the potential negative impacts of continued reliance on conventional forms of energy. This has implications for governments and pension funds, which are, after all, representing citizens – whether voters or policy holders.

As a result, it is unsurprising that OECD governments have issued plans in recent years to phase out fossil fuel generation and internal combustion engines. On a similar front, institutional investors are acting: Norway's sovereign wealth fund plans to ditch its oil and gas investments in due course; Britain's Walham Forest and a number of others have already followed suit.

FIGURE 2: COMPARATIVE GLOBAL INTEREST RATES (2008–2018)

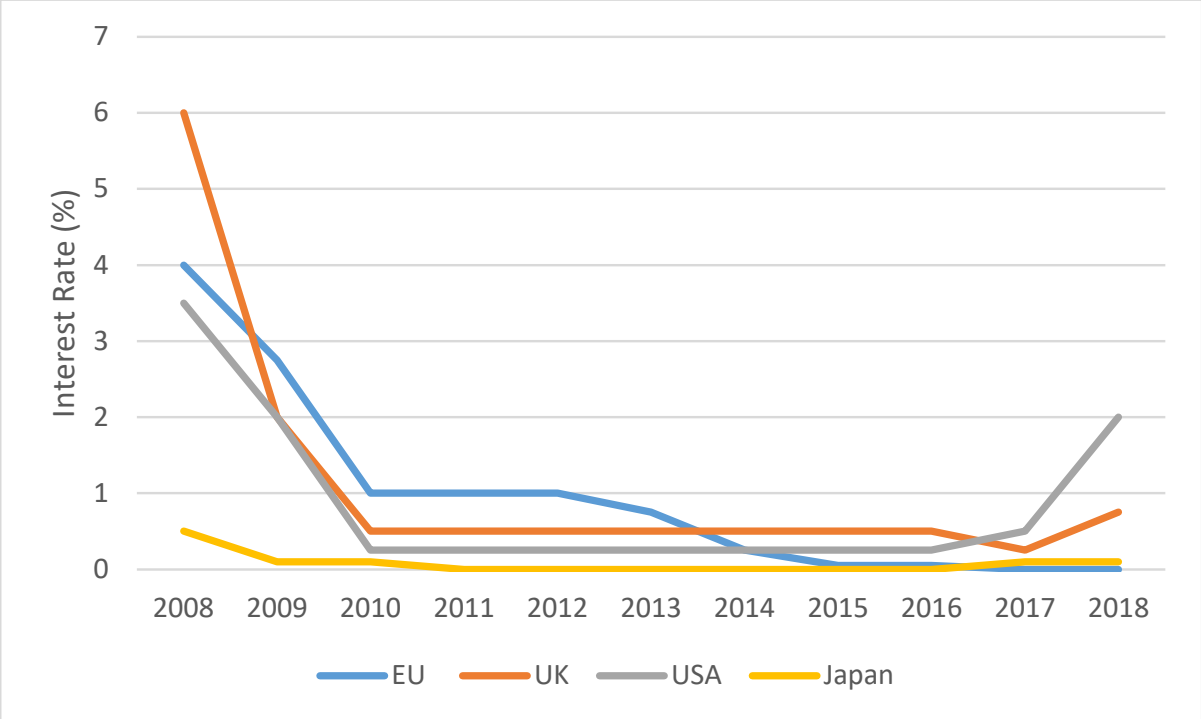


FIGURE 3: UTILITY SCALE SOLAR PV TOTAL INSTALLED COST TRENDS IN SELECTED COUNTRIES, 2010–2017

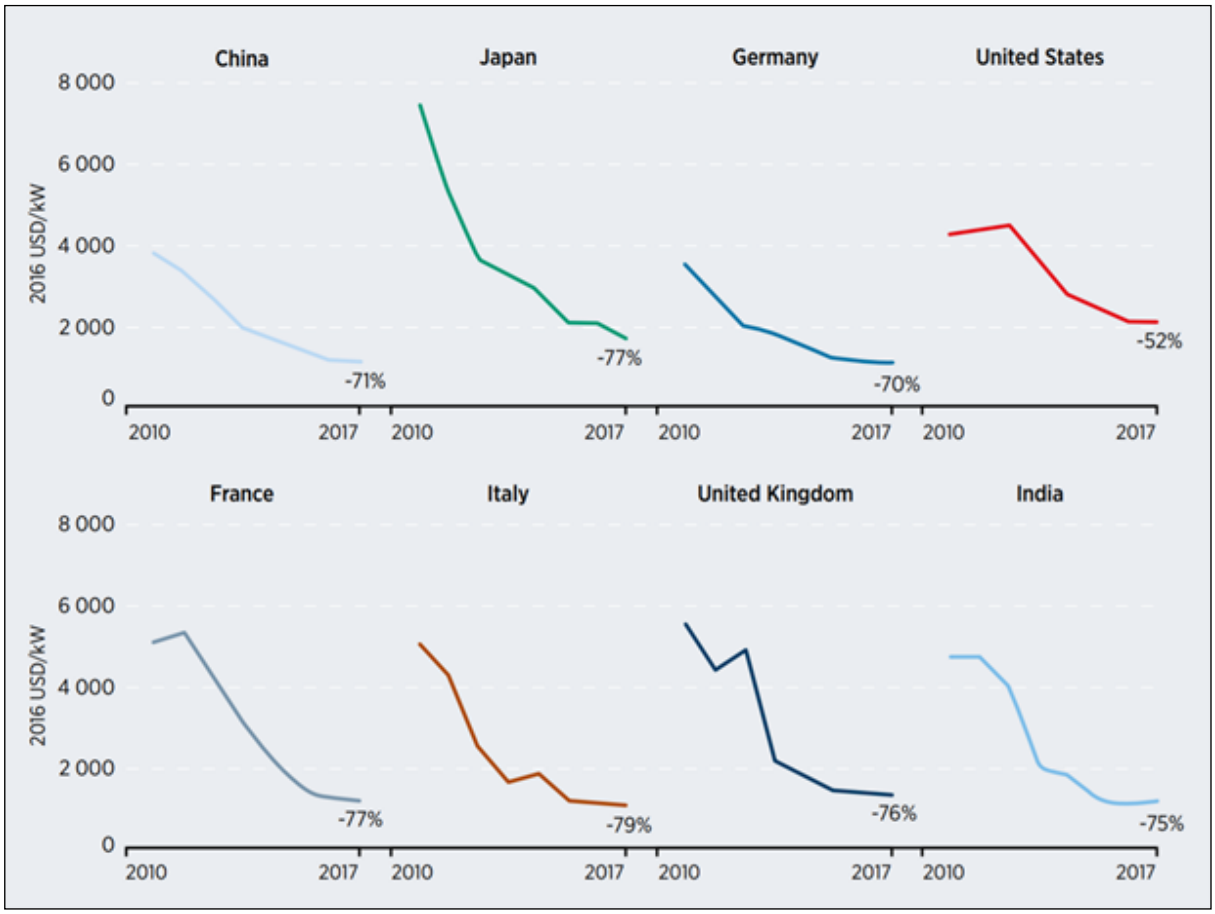
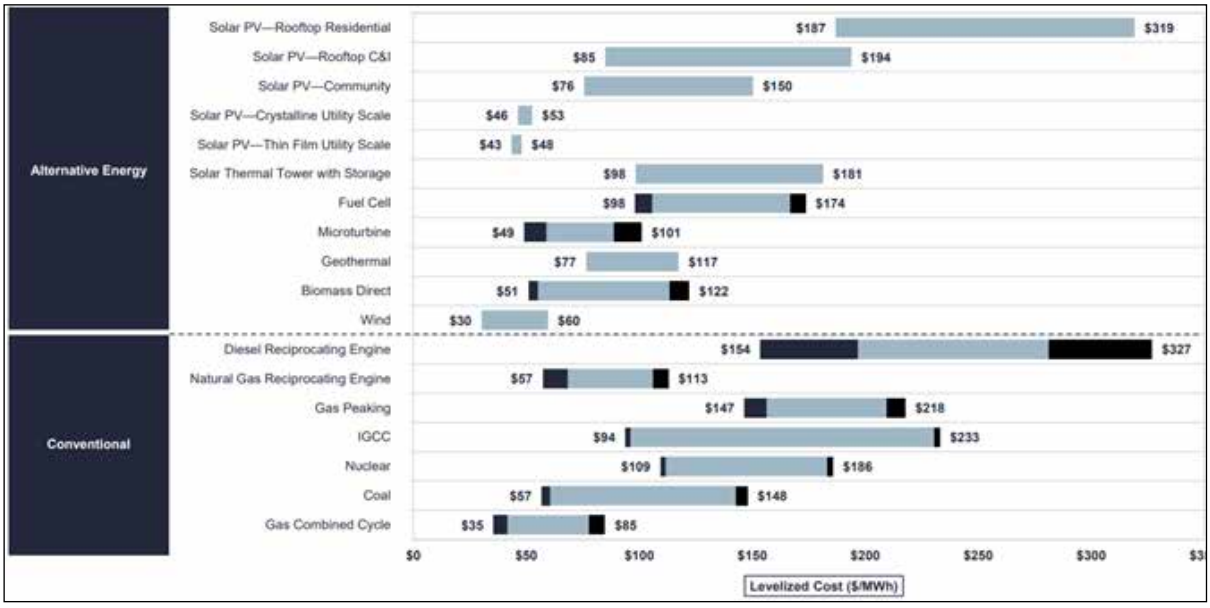


FIGURE 4: UNSUBSIDISED LEVELISED COST OF ENERGY (2017)



1.4 INSTITUTIONAL INVESTOR STRATEGIES

While it may be too early to measure the institutional investor response to the trends mentioned in the previous section, several examples indicate a change. One is the Portfolio Decarbonisation Coalition (PDC), formed in 2014, consist of a group of institutional investors that has pledged to withdraw capital from particularly carbon-intensive companies, projects, and technologies and invest in carbon-efficient alternatives.

In line with the discussion in the previous sub-section, institutional investors are refining their mandates to accommodate increased investments in renewable energy. Table 3 gives examples from a selection of PDC members.

PROJECT EXAMPLES

Though there is ample media coverage of institutional investor pledges to invest in renewable energy outside of OECD countries, this section highlights some of the programmes and projects that have materialised as a result of this response.

TABLE 2: TOP 20 PDC MEMBERS AND AUM

Member	Assets Under Management (AUM), GBP bn
ABP	320
Allianz	734
Ap4	32.8
Caisse des Dépôts	216
Environment Agency Pension Fund	2.1
Fonds de reserves pour les retraites (FRR)	31.6
KLP	40
Le Régime de Retraite additionnelle de la Fonction publique (ERAFP)	17.2
NYS Common Retirement Fund	142.4
Storebrand	56
A Capital	1,200
Amundi Asset Management	1,103
BNP Paribas Investment Partners	1,724
Hermes Investment Management	261
Inflection Point Capital Management	40
Mandatum Life	32
Mirova	2.9
Öhman	7.3
RobecoSAM	68.4
TOTAL	6,030

TABLE 3: EXAMPLES OF TARGETS SET BY SELECTED PDC MEMBERS

Organisation	Targets
A CAPITAL	• Invest 50% of portfolio in carbon negative projects (energy and environment technologies) • Reduce the carbon footprint of portfolio companies by 10% per annum
ABP	• Reduce the carbon footprint per euro invested in ABP's listed equity portfolio by 25% by 2020 compared to a 2014 baseline, with an interim target of 10% reduction by 2017
Allianz	• Double investments in photovoltaic and wind parks across Europe from EUR 3 to 6 bn in the medium term
AP4	• Invest 100% of global equities portfolio in low-carbon strategies by the end of 2020
Caisse des Dépôts	• Allocate EUR 15 bn between 2015 and 2017 to areas such as sustainable city and mobility projects, renewable energy production, storage and smart networks, energy efficiency solutions, and companies operating in green energy and environmental sectors
Environment Agency Pension Fund	• Invest 15% of the fund in low carbon, energy efficient and other climate mitigation opportunities by 2020
Hermes	• Reduce absolute and relative (to area) carbon emissions from real estate portfolio by 40% by 2020 compared to 2006 baseline

TABLE 4: INSTITUTIONAL INVESTOR INVESTMENTS IN DEVELOPING MARKETS SINCE 2016

Organisation	AUM (GBP bn)	Project	Amount (GBP mn)
Caisse de dépôt (Canada)	216	India's renewable energy sector expansion plans in Gujarat (solar PV)	120
Pension Danmark (Denmark)	25.7	Emissions reduction projects in developing countries in Latin America and Asia (unspecified)	176
Santander (Spain); Ontario Teachers Fund; and PSP Investments (Canada)	922.8 (combined)	Cubico Sustainable Investments established to manage and invest in renewable energy and water infrastructure assets in the developing world	2,000
Allianz (Germany); IFC (Multilateral)	736.5 (combined)	"Co-Lending Portfolio Programme" established to co-invest alongside IFC debt financing for infrastructure projects in emerging markets worldwide	400

1.5 OUTCOMES OF DOLMA'S RESEARCH

The Dolma team interviewed some of the world's largest institutional investors, testing the risk and return mandate for Nepal against their current and emerging risk strategies. Interviewees included funds with assets under management from USD 1 bn to 6 tn. Our team did not solicit funds as part of this exercise.

Based on these conversations, some suggested that the required return on equity for construction risk could be up to 20%, provided a Nepal project vehicle can demonstrate equivalency to investment grade status after successfully mitigating the risks listed in Table 5. Given limited resources in Nepal to reach this rate of return, Blended Finance (see Deliverable 6 – Complementary Investors) may be an opportune way to temporarily crowd in institutional investors. As projects are built and the perception of risk reduces, required returns will, hopefully, fall in line with the rates for power that the Nepal Electricity Authority is prepared to pay.

This section will reveal which risk areas were of most concern to our interviewees, and whether their appetite for investing in Nepal was swayed after contemplating risk mitigation tools. Feedback from investors has led us to categorise our sample interviewees as either "leaders" or "followers", based on their risk profile and track record on frontier markets.

INSTITUTIONAL INVESTOR PERCEIVED RISKS

We were eager to better understand how institutional investors might perceive risk in frontier markets like Nepal. Figure 4 is a matrix of the 15 investors we interviewed, listing each investor by their AUM for anonymity.

An analysis of these qualitative outputs reveals a clear negative bias against credit and currency risk. This comes as no surprise: recent reports, including "Expanding Institutional Investment into Emerging Markets via Currency Risk Mitigation" by SARONA and USAID, have picked up on this barrier, arguing that FX risk, real or perceived, prevents perhaps trillions of dollars of institutional investment from flowing to the poorest economies, which "severely inhibits private sector-driven developments and growth".

Our meetings also suggested that a country's credit rating is fundamental to getting an investment proposal through the first step of an investment procedure. On some occasions, Nepal was not taken seriously as it has no sovereign credit rating. This issue has, in the past, been too large a barrier to overcome in our discussions with some investors, who are often restricted to considering countries that are at least investment grade BBB-.

Most investor concerns were about credit and currency risk. Investors were relatively more relaxed about Nepal's political stability. They were understandably cautious when the issue of power execution and evacuation came up, considering Nepal's poor track-record in energy asset classes beyond hydro, or its track record in exporting power to its neighbours.

Most investors recalled the earthquake that struck Nepal in 2015, and while they were not very aware of topographic realities on the ground, they appeared cautious about the execution risk. However, given the focus on solar PV development – which is less affected

FIGURE 5: INSTITUTIONAL INVESTOR RISK MATRIX

No	AUM (bn)	Credit	Currency	Politi-cal	Execu-tion	Power Execu-tion	Power Evacua-tion	Seis-mic	Environ-mental and Social	Climate Change	As-set/O&M
1	585	1	1	3	2	3	3	3	3	3	3
2	734	1	2	4	3	3	3	3	4	5	3
3	1	3	4	5	3	3	3	4	4	4	4
4	70	2	2	2	1	2	3	3	3	4	3
5	13	3	3	4	3	3	3	3	5	5	4
6	60	2	2	3	3	2	2	2	4	4	4
7	6,317	1	2	3	2	2	2	4	4	5	4
8	190	2	2	3	3	3	3	3	4	5	4
9	23	2	2	1	2	1	2	2	2	3	3
10	1,000	1	1	3	2	3	3	4	4	3	4
11	5.3	2	2	2	2	2	2	2	2	2	2
12	78	2	2	3	3	3	3	3	4	4	2
13	740	1	1	2	1	1	2	2	2	2	1
14	102	2	2	2	2	3	3	3	3	3	3
15	300	2	2	2	3	3	2	3	3	3	3

by seismic activity – the earthquake would not be a showstopper.

Given the limited lifespan of solar PV panels, investors were relaxed about the environmental- and climate change-related risks posed by the project. There was less agreement over asset upkeep/O&M as Nepal does not yet have a strong network of experienced engineers capable of addressing technical faults on-site.

RISKS AND MITIGATION APPROACHES

This sub-section explores how perceived risks may be best addressed in the context of Nepal using a combination of efficient project management skills and by purchasing insurance and hedging products. It is noteworthy that investors generally warmed to products that addressed certain key concerns outright – in particular, MIGA's Political Risk Insurance and TCX's 20-year forward on the Nepalese rupee. Table 5 below describes these risks in detail as well as the mitigation tools available.

TABLE 5: RISKS AND MITIGATION METHODS

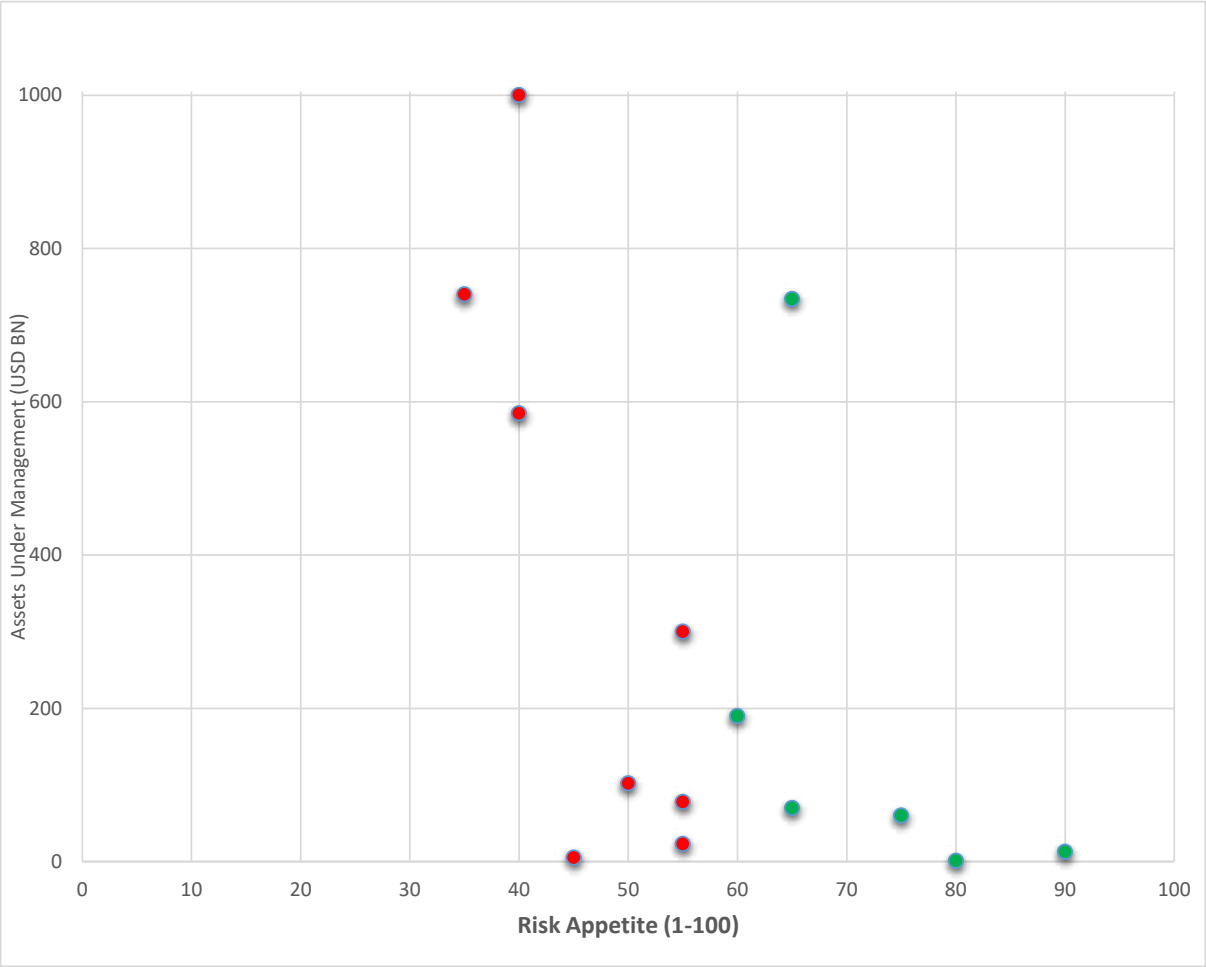
Risk	Description	Mitigation
Credit	Nepal has not issued international sovereign bonds and as such has no rating.	• MIGA (World Bank) Political Risk Insurance (PRI) is available in Nepal subject to project evaluation, wrapping sovereign/PPA credit risk. • Apply liquidity facility to cover claim period.
Currency	• NPR is pegged at fixed rate to INR. INR/USD non-deliverable forwards market has limited horizon, and a break in the peg cannot be hedged.	• Include partial USD PPA available from NEA (for foreign debt tranche) for projects above 100 MW and in certain projects below 100 MW. • NEA has not had an event of default since its inception in the 1990s. • Apply blended finance instruments such as a first loss/guarantee product.
Political	Despite durable peace and new constitution, political risk remains an issue.	• MIGA PRI also covers currency inconvertibility and transfer restriction, expropriation, war, terrorism, and civil disturbance.
Execution	Project execution may carry risks due to difficult and often remote operating locations.	• Create partnership between international and local engineering companies. • Conduct detailed investigation at design phase; sign clear Project Development Agreement (PDA) with Government of Nepal • Sign EPC or Risk-Shared contracts with international contractors.
Power Evacuation	NEA can be slow to deliver transmission capacity to project sites.	• Consider only projects with transmission lines/substations in place, or those planned well in advance of project completion.
Geological/Seismic	Nepal sits on a tectonic fault line and experienced two large earthquakes in 2015.	• Purchase project insurance (available in Nepal) and reinsure abroad. • High level of geological resilience built into engineering design. • (Note: all well-engineered plants survived the 2015 earthquakes.)
Environmental and Social	Hydro (especially storage plants) can involve resettlement costs and significant environmental impact.	• Focus on run-of river/peaking run-of-river (much lower impact). • Detailed assessments, compliance with international standards (e.g. IFC/World Bank Performance Standards.)
Climate Change	Nepal is prone to GLOFs (Glacier Lake Outburst Flood)	• Perform GLOF assessment, mitigation and warning systems. Long-range climate change modelling available at the International Centre for Integrated Mountain Development (ICIMOD)
Asset/ O&M	Damage to/interruption of generation asset during operation.	• Purchase asset and loss of income insurance (available in Nepal) and reinsure abroad.

INSTITUTIONAL INVESTOR SAMPLE: LEADERS AND FOLLOWERS

Having discussed the perceived risks and mitigation options available to institutional investors, we were left with a clear understanding of investors' frontier market risk profile, with Nepal as a case study. The findings leave us with two clear conclusions:

1) There are two groups, the "leaders" and "followers". The former group is willing to take higher risks in search of greater yield; the latter is either unaware or not interested, or interested but restricted by their investment mandate, to seriously consider frontier markets. From our sample of 15 investors, we identified seven leaders and eight followers – this is marked in Figure 5 below (leaders in green, followers in red).
2) There is no clear correlation between AUM and risk profile when it comes to investing in frontier markets. While smaller, dedicated, and arguably more nimble have thus far shown the most interest in Nepal, the country remains on the watch list of larger funds, assuming risks are appropriately mitigated using a cocktail of methods.

FIGURE 6: RISK APPETITE AND AUM FOR SAMPLE OF INVESTORS INTERVIEWED BY DOLMA



Note: the largest investor interviewed is not featured in Figure 5 because its AUM (USD 6.137 trillion) was off the scales. However, based on Dolma's interaction, we would classify it as a "leader".

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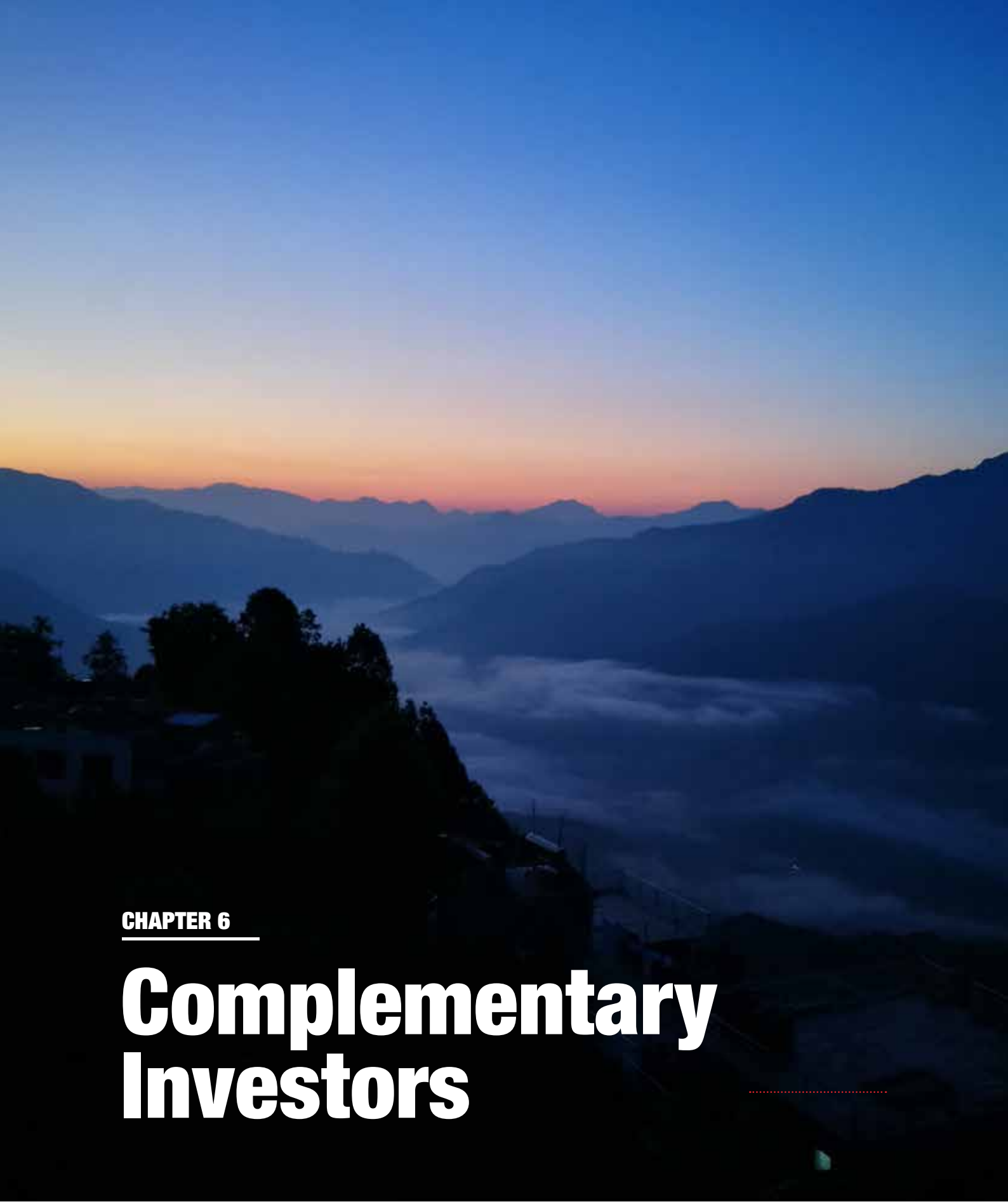
CHAPTER 6

Terms like concessional and blended finance have become second nature in green infrastructure since the Paris Climate talks of 2015 - this chapter breaks down the web of available concessionary capital available to complement renewable energy projects in developing countries.



CHAPTER 6

Complementary Investors

UKaid
from the British people

dolma foundation

CHAPTER 6

Complementary Investors

ABBREBIATIONS

FIGURES

TABLES

ORGANISATIONS AND/OR INDIVIDUALS INTERVIEWED

Those mentioned in this report have agreed to being referenced:

- United Nations Development Programme in Nepal
- NMB Bank Limited, Nepal
- Standard Chartered Bank, Nepal
- Dolma Advisors Private Limited (DAPL), Nepal
- Gregory Paterson Jones

1.1 INTRODUCTION

In recent years, there has been a substantial growth in international attention to the role of blended concessional finance to promote private sector participation in developing countries. More concessional resources for blending have become available, which have provided investors with more possibilities for development impact.

As highlighted in Chapter 5 – Institutional Investor Appetite and Landscape, additional investments of at least USD 700 bn are needed per year to maintain global temperatures beneath 2□C , the role of blended finance will be instrumental to bridge that gap.

According to the Blended Finance Taskforce, the market could double in the next 3–4 years as providers of concessional and other forms of development capital earmark more money for blending and as private investors look to take advantage of this risk cushion. To make this happen, we need to see a dramatic scale-up in the size of blended vehicles and the trial and testing of instruments that are currently available to commercial investors.

SCOPE

This document is divided into two sections. The first will analyse trends of investment in clean energy and the investor categories driving this momentum. The second will cover the blended instruments used globally and the potential for Nepal to take advantage of this growing market.

1.2 SUMMARY OF INVESTMENT INTO RENEWABLE ENERGY

According to the Climate Policy Initiative, many investors committed to combatting the effects of climate change have chosen to channel their capital into renewable energy projects (rather than adaptation initiatives) to achieve this aim. It is useful, therefore, to get a broad picture of which investors are committed to this space.

A handful of reports cited the relative investment decline in renewable energy in 2016, , citing sharp reductions in capital costs for various energy technologies – namely photovoltaics and onshore and offshore wind.

Figure 1 puts this into a 12-year perspective, outlining a global climate finance surge from less than USD 50 bn in 2004 to USD 305 bn in 2015; investment fell 12% to USD 249 bn in 2016. The largest source of investment came from Asset Finance (the use of a company's balance sheet assets, including short term investments, inventory, and accounts receivable in order to borrow money or get a loan), with the figure adjusted for re-invested equity from estimates of undisclosed deals.

In addition to lowering technology capital costs, Bloomberg New Energy Finance (BNEF) cites four further reasons for a relative decline.

1. Lower dollar-denominated costs: The average capital cost for projects starting construction in 2016 was 13% lower than for those in 2015. For onshore wind, the drop was 11.5% and for offshore wind 10%.

2. Timing: A lot of projects in wind and solar were financed in late 2015 and only commissioned in 2016, in which case the investment dollars associated with them were recorded in the earlier year and the GW addition in the later one.

3. Underlying slowdown in activity only set-in in 2016: In particular, the Chinese solar market declined sharply after a hectic first half.

4. Delays in developing-market auctions: Several expected renewable energy projects in the developing world were postponed due to auctioning delays.

FIGURE 1: GLOBAL NEW INVESTMENT IN RENEWABLE ENERGY BY ASSET CLASS, 2004–2016 (USD BN) 1

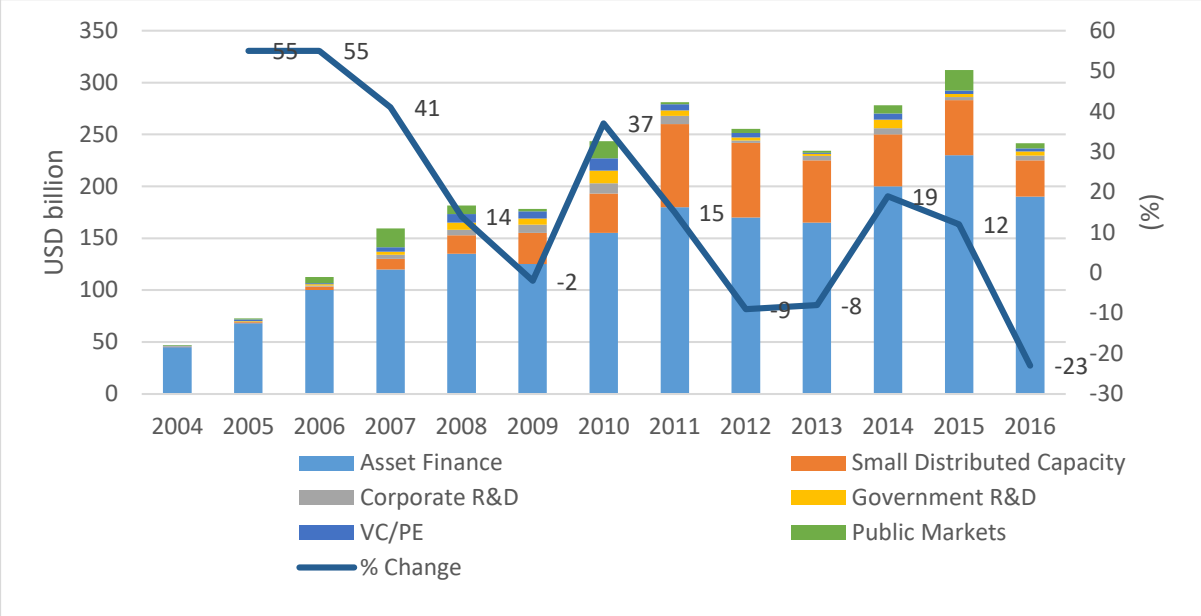
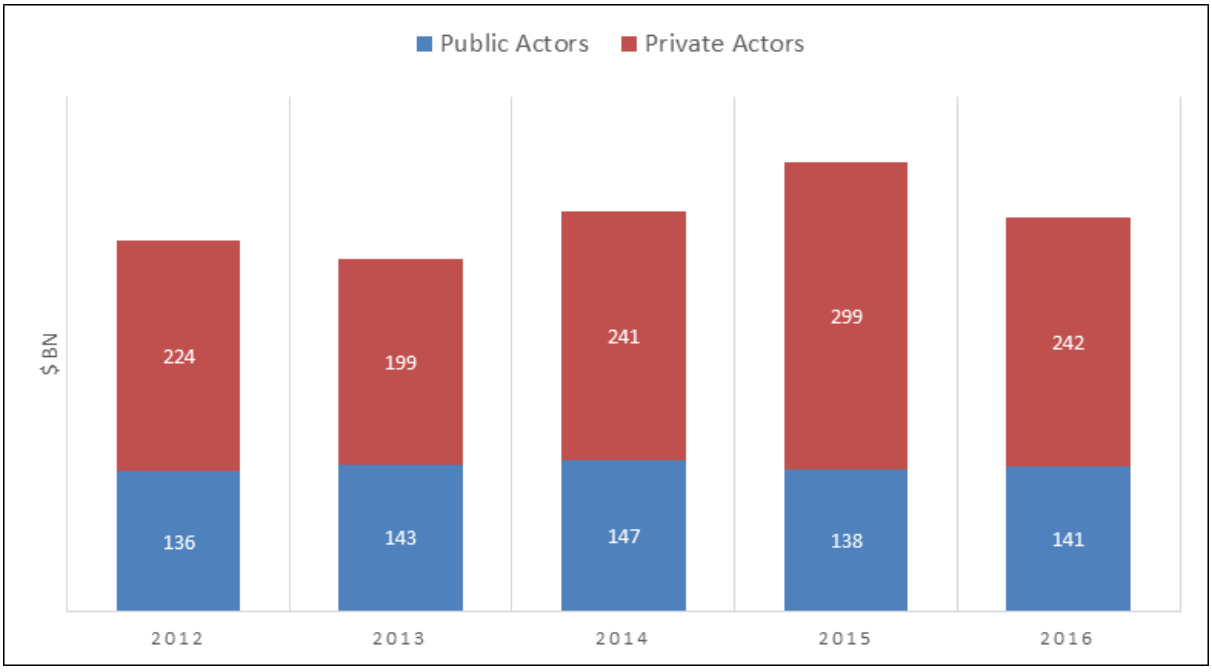


FIGURE 2: CLIMATE FINANCE INFLOWS (USD BN) 2



1.3 ANALYSIS OF OTHER INVESTOR CATEGORIES

There are seven broad investor categories that made a significant impact on the climate finance landscape in 2017. Table 1 below outlines these sources and their aggregate contribution to this space. Similarly, Table 2 outlines how the availability of capital for climate finance was mobilised. Table 3 breaks down recipients clarifying whether CF goes through public or private channels. For more details, refer to Appendix A.

TABLE 1: MAIN SOURCES OF CLIMATE FINANCE

Sources and Intermediaries	Capital Committed (USD bn)
1. Government Budgets	128
2. Commercial Financial Institutions	62
3. Institutional Investors	2
4. Private Equity, Venture Capital, Infrastructure Funds	1
5. Corporate Actors	37
6. Households	31
7. Project Developers	137

TABLE 2: CLIMATE FINANCE INSTRUMENTS

Instruments	Capital Available (USD bn)
Grants	14
Unknown	5
Low-cost Project Debt	42
Project-level Market Rate Debt	142
Project-level Equity	38
Balance Sheet Financing (Equity)	83.5
Balance Sheet Financing (Debt)	83.5

TABLE 3: RECIPIENTS AND USES OF CLIMATE FINANCE IN 20172

Recipients	Capital Received (USD bn)
Public	52
Private NGOs and Foundations	2
Unknown	63
Public/Private	4
Private	288

USES OF CLIMATE FINANCE

Recipients of climate finance fall into two categories: adaptation and mitigation. Table 4 below outlines the major recipients. Mitigation is the largest recipient.

Climate mitigation refers to any action taken to permanently abolish or reduce long-term risk and hazards of climate change, such as building a renewable energy facility with a carbon neutral profile. Climate adaptation, on the other hand, refers to the ability of a system to adjust to moderate potential damage, to take advantage of opportunities, or to cope with the consequences – for example, building resilient flood management systems.

TABLE 4: USES OF CLIMATE FINANCE 2017

Uses	Capital Committed (USD bn)
Adaptation	22
Dual benefits	5
Mitigation	382

1.4 COMPLEMENTARY INVESTOR CATEGORIES

Complementary investors play a central role in attracting institutional investment into Nepal's renewable sector. This category typically includes government-backed funds or funds that are managed by multilateral platforms using pooled government capital.

DEVELOPMENT FINANCE INSTITUTIONS AND OTHER QUASI-COMMERCIAL INVESTORS

National and international DFIs are specialised development banks or subsidiaries set up to support private sector development in developing countries. They are typically majority-owned by national governments and source their capital from international development funds or benefit from government guarantees. This ensures their creditworthiness, which enables them to raise large amounts of money in international capital markets and provide financing on competitive terms, which in turn allows them to take more risks than institutional investors.

Within this category emerges two types: bilateral and multilateral DFIs. The former are either independent institutions or part of larger bilateral development banks, and the latter refer to the private sector arms of international financial institutions (IFIs) established by more than one country.

TABLE 5: EXAMPLES OF MULTILATERAL AND BILATERAL CLIMATE INVESTORS

DFI	Type
ADB (Asian Development Bank)	Multilateral
BIO (Belgium)	Bilateral
CDC (United Kingdom)	Bilateral
EBRD (European Bank for Re-construction and Development)	Multilateral
EBROPIC (United States)	Bilateral
EIB (European Investment Bank)	Multilateral
FMO (Netherlands)	Bilateral
IFC (International Finance Corporation)	Multilateral
IFU (Denmark)	Bilateral
FINNFUND (Finland)	Bilateral
KfW/DEG (Germany)	Bilateral
OEEB (Austria)	Bilateral
PROPARCO (France)	Bilateral

EXAMPLES OF BILATERAL INVESTMENT IN NEPAL

Nepal has attracted DFI investment over the last 10 years primarily in the renewable energy, private equity, and banking sectors. Table 6 outlines some key projects as of January 2018.

TABLE 6: DFI INVESTMENT IN NEPAL

Project	DFI
Dolma Impact Fund	FMO, OEEB, DGGF, FINNFUND
NMB Bank	FMO
Lower Solu Hydropower	FMO
Buddha Air	IFC
Nimbus	IFC
Kabeli A Hydropower Plant	IFC, InfraCo
Country-wide energy efficien-cy; off-grid supply; healthcare (nationwide public health reform programme)	KfW
Transmission; Loan to the Government of Nepal for Upper Seti (EUR 55)	EIB
Upper Trishuli Hydropower Plant	IFC, Korean South East Power Co
Town Development Fund	KfW, ADB

TABLE 7: MULTILATERAL AND BILATERAL CLIMATE FUNDS WITH NEPAL AS A MANDATE

Fund/Type	Implementing Entity	Financing mechanism	Regions	Funding Level (USD)	Sectors	Target
ADB Climate Change Fund/ Multilateral	• Asian Development Bank (ADB)	• Co-financing • Grant • Technical assistance	• Asia	• 50 mn	• Energy • Agriculture • Energy Efficiency • Renewable Energy • Transport	ADB devel;oping member countries
ASEAN Infrastructure Fund/Multilateral	• ADB	• Co-Financing Loan Technical assistance	• Asia	• 485.3 mn	• Energy • Environment • Rural Infrastructure • Water	Sovereign guaranteed national and sub-□ regional projects of ASEAN developing member countries
Canada Climate Change/Multilateral	• International Finance Corporation (IFC)	• Loan, equity, Technical Assistance	• Global	• 276.55 mn	• Energy • Environment • Rural Infrastructure • Water	Sovereign guaranteed national and sub-□ regional projects of ASEAN developing member countries
Canada Climate Fund for the Private Sector in Asia/Multilateral (executed by ADB)	• Asian Development Bank (ADB)	• Concessional financing Grants	• Asia	• 63.22 mn	• All	Low, lower-□middle income and small island developing countries
Climate and Development Knowledge Sector/Multilateral	• Co-financing Grant Technical assistance	• Government of the Netherlands and Government of the United Kingdom	• Latin America • Asia • Africa	• 0.66 mn per project	• Adaptation • Capacity Building	Developing countries
Climate Insurance Fund/ Bilateral	• KfW, BlueOrchard	• Insurance	• Global	• 60 mn (seed investment)	• Adaptation Disaster Risk Reduction	Qualified insurance/ reinsurance companies as well as other entities active in the value chain of insurance based in ODA recipient countries
Climate Public Private Partnership/Bilateral	• Donor governments	• Equity Loan Grant	• Asia	• 283 mn	• Adaptation • Mitigation	Objective is to stimulate the development of climate funds and climate-friendly projects expected to play a key role in accelerating growth of investment in renewable energy and other low-□carbon solutions
Danish Climate Investment Fund/Bilateral	• Investment Fund for Developing Countries (IFU)	• Co-financing Loan Technical assistance Equity	• Developing Countries	• 200 mn	• Energy Efficiency • Renewable Energy	Must be commercially sustainable and employ known climate technology; a Danish company must participate in the project (or it must relate to a Danish economic interest)
GEF Trust Fund/ Multilateral	• GEF	• Grant	• Worldwide	• 3000 mn over 2015–2019	• Climate change • Energy Efficiency • Renewable energy	Countries eligible to receive World Bank financing or UNDP technical assistance through its target for resource assignments

Germany's International Climate Initiative/ Bilateral	• FederalMinistryfor the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), Germany		• Developing countries	• 1085 mn	• Mitigation • Adaptation	Projects in IKI's four areas of support: mitigation, adaptation, conservation of carbon sinks, and biodiversity
Green Climate Fund/Multilateral	• COP (UNFCCC) and Green Climate Fund Board	• Grant, Concessional loan, Guarantees, Equity	• Worldwide	• 100 (bn)	• Adaptation • Mitigation • REDD • Technology transfer • Capacity Building	All developing country parties to the UNFCCC
IFC Partial Credit Guarantees/Multilateral	• IFC	• Loan Guarantee	• Worldwide	• N/A	• Adaptation • Mitigation	In accordance with IFC investment guidelines
IFC Risk Sharing Facility/ Multilateral	• IFC	• RSF	• Worldwide	• N/A	• Adaptation • Mitigation	In accordance with IFC investment guidelines
International Climate Initiative (Germany)/Bilateral	• BMUB, Germany	• Grant Loan	• Worldwide	• 138 mn p.a.	• Adaptation • Mitigation	Climate and biodiversity projects in developing countries and countries in transition
Japan's Fast Start Finance/ Bilateral	• Japanese Ministry of Finance	• Grant Loan ODA Guarantees	• Worldwide. Approximately 50% of Japan's grant aid is focused on adaptation in LDCs	• 15 bn (11 bn public, 4 mn private)	• Agriculture • Energy Efficiency • Renewable Energy	Developing countries that have entered direct bilateral discussions with the Japanese government; some private sector actors may also be considered
KfW Development and Climate Finance/ Bilateral	• KfW	• Grant Loan ODA Structured financing	• Worldwide	• Varying, dependent on project	• Energy • Agriculture • Water • Technology	Public and private entities
Korea Green Growth Trust Fund/Multilateral	• World Bank	• Grant Technical assistance	• Worldwide	• 40 mn (additional funding pending approval)	• Energy • Environment • ICT • Water	IBRD/IDA country members
Least Developed Countries Fund/Multilateral	• GEF	• Grant	• Worldwide	• 32 mn	• All	All LDC parties to UNFCCC
MDB Pilot Project for Climate Resilience/Multilateral	• MDB Climate Investment Funds (CIF)	• Grant • Loan • ODA	• MDB countries	• 1 bn	• Climate Resilience • Energy • Infrastructure • Low-Carbon • Sustainable Land Management • Water	MDB eligibility, in the following countries: Bangladesh; Bolivia; Cambodia; Mozambique; Nepal; Niger; Yemen; Zambia
Nordic Climate Facility/Multilateral	• NEFCO	• Co-financing	• Africa Asia	• 289–578k	• Energy • Sanitation • Water	Applicant must be an active institution holding a registered place of operations in Scandinavia; average turnover of the applicant must be at least double the NFC funding requested
Nordic Environment Finance Corporation Carbon Finance and Funds/Multilateral	• NEFCO	• Grant • Technical Assistance	•Eastern Europe China South Asia SE Asia	• 190 mn	• Energy Efficiency • Fuel Switching • Renewable Energy	Projects should be within the requirements of COP 21

Public-Private Infrastructure Advisory Facility/Multilateral	• World Bank	• Grant Technical assistance	• Worldwide	• 15 mn	• Adaptation • Capacity Building	Developing or transitioning economies in the OECD
US Global Climate Change Initiative/ Bilateral	• USAID	• Grant • Loan • Guarantee	• Developing Countries	• 350 mn p.a.	• Clean Energy • Sustainable Landscape • Resilience	Developing Countries
World Bank Carbon Funds and Facilities	• World Bank	• Carbon finance	• Worldwide	• 2.5 mn	• Energy, Energy Efficiency, Agriculture	World Bank/IDA Countries

QUASI COMMERCIAL

Quasi commercial investors roughly hold the same level of risk as DFIs, although some of them may enjoy a lower return.

HIGH NET WORTH INDIVIDUALS (HNWI)

While investing in conservation and environmental development projects has long been the province of DFIs, High Net Worth Individuals (HNIs) represented USD 60 tn of investable wealth in 2015.

A joint report by Credit Suisse, McKinsey, and the World Wildlife Fund suggested that private capital could fill as much as a USD 422 bn annual gap in funding needed to protect vital ecosystems around the world. The push towards filling this gap has already began on some level. For example, in 2015, 12 individual investors committed USD 15.8 bn to purchase “Nature Conservation Notes” through Credit Suisse, the first major bank to have offered non-institutional clients a conservation investment product that targeted market-rate returns.

FUNDS OF FUNDS

Referred to as a multi manager investment, a fund of funds (FoF) is an investment strategy in which a fund invests in other types of funds. This strategy promotes investment in a portfolio that contains different underlying assets instead of investment directly in bonds, stocks, and other types of securities.

FoFs that invest in renewable energy developments include:

- SARONA (Canada)
- DGGF (Netherlands)
- CDC IMPACT (United Kingdom)
- GEEREF (multilateral, advised by the European Investment Bank Group)

CONCESSIONAL FINANCE

Concessional finance refers to capital that is extended on terms more generous than market loans or investments – in some cases, it is offered as grants to realise otherwise unviable projects for commercial investors.

CLIMATE FINANCE

In the aftermath of COP 21 in November 2015, the trend towards promoting climate finance has been overwhelming for both mitigation and adaptation efforts, particularly in developing countries. Led by the UNFCCC, the largest concessional climate fund is the Green Climate Fund (GCF), launched after COP 21 in 2015, which received commitments of USD 100 bn per year until 2020 from several developed countries upon signing COP 21 in Paris.

In addition to GCF, there are over 20 major multilateral funds dedicated to climate change action, nine of which focus exclusively on mitigation, six on adaptation, and seven on both. In total, these funds account for roughly USD 30 bn.

CONCESSIONAL FINANCE IN NEPAL

In theory, Nepal should be well-positioned to receive funding from GCF: it is a developing country highly susceptible to climate disasters (droughts, flooding, GLOF) and has enormous renewable energy potential. To date, however, no Nepali institution has been granted accreditation. To facilitate access to funds, the GCF designates one ministry from each LDC responsible for managing applications, known as the National Designated Authority, represented by an individual at the Ministry of Finance. In order to implement a project in any country, a buy-in is required from the domestic bureaucracy.

Nepal's National Designated Authority resides with the Ministry of Finance, and the current NDA is a Joint Secretary at the MoF. The NDA's role is instrumental in coordinating with stakeholders interested in accessing GCF funds, and in the selection process when providing his letter of consent to initiate the process of accreditation.

The GCF mobilises its capital using four instruments: equity, concessional debt, guarantees, and grants. The government has selected organisations in each category to become accredited entities. As of April 2018, the Town Development Fund of Nepal (TDF) as well as the Nepal Investment Bank Limited (NIBL) are confirmed to have cleared the initial process of accreditation. They have secured a buy-in from the National Designated Authority to Nepal and await further information. If successful, once an accredited entity of the GCF, they will have the rights to directly source capital from the fund. Other organisations seeking accreditation on the public side include the Alternative Energy Promotion Centre (AEPC) and the National Trust for Nature Conservation (NTNC). Their progress is listed in Table 8.

In addition to the role played by the MoF, the United Nations Development Programme (UNDP) is providing capacity assistance to all local applicants as well as the NDA, and is registered as an International Access Accredited Entity.

TABLE 8: STATUS OF LOCAL ENTITIES SEEKING GCF ACCREDITATION

GCF Instrument	Local Organisation	Status
Equity and Concessional debt	Nepal Investment Bank Limited (NIBL)	Due to present information for next stage
	Town Development Fund (TDF)	Due to present information for next stage
Grant and Guarantees	Alternative Energy Promotion Centre (AEPC)	Application with GCF
	National Trust for Nature Conservation	Application with GCF

1.5 INSTRUMENTS AND MODALITIES PRACTISED TO CATALYSE INSTITUTIONAL INVESTMENT

Typically, there are four instruments used through different modalities and at various stages of the financing cycle: grants, concessional loans, guarantees, and equity investments.

These instruments are designed to "unlock" or crowd in finance for green projects. They are needed to (1) render investments attractive to previously untapped sources of finance (such as institutional investors); and (2) free up resources for traditional sources of climate finance, particularly those on bank balance sheets. This section briefly outlines each instrument before looking at how they are "instrumentalised".

INSTRUMENTS

GRANTS

Resources channelled to fund investments without the expectation that the money be repaid.

CONCESSIONAL LENDING (SOFT LENDING)

Up-front transfer of resources from one party to another with the agreement that the money will be repaid on conditions more favourable than market terms.

GUARANTEES

Some investments have inadequate risk-adjusted returns to investors or governments and fail to attract capital through debt on terms that could ensure the feasibility of a project. Guarantee instruments are commitments in which a guarantor, in exchange for a fee, undertakes to fulfil the obligations of a borrower to a lender in the event of non-performance or default of its obligations by the borrower.

EQUITY INVESTEMENTS

Equity is an investment in a project or asset to leverage debt and achieve better returns. Some projects have significant risks and financial requirements that investors are not necessarily willing to take. In such cases, it is possible to make equity investments, which directly inject capital to grow the operations of a project or a firm. This allows investors to leverage further resources as they mitigate risk for other investors.

MODALITIES

How the instruments in the previous section exercised in practice? The following modalities are used non-exclusively by the Green Climate Fund.

LOANS

ADAPTABLE PROGRAMME LOANS (APL)

A form of concessional lending that provides phased support for long-term development programmes with a long-term perspective in specific sectors.

DEVELOPMENT POLICY LOANS (DPL)

A form of concessional lending that provides non-earmarked financing aimed at helping a borrower achieve programmatic results (such as controlling emissions or increasing climate resilience) through a programme of policy and institutional actions.

SECTOR INVESTMENT LOANS (SIL)

A form of concessional lending that brings sector expenditures, policies, and performance in line with the country's priorities and helps

borrowers develop the institutional capacity to plan, implement, and monitor expenditures or the investment programme.

DEBT SWAPS

Debt swaps occur when an existing debt stock or stream of debt service payments is converted into another obligation or asset type. Usually, a debt swap involves the voluntary exchange of a debt instrument by a creditor with its debtor for cash, another asset, or a new obligation with different repayment terms.

OPPORTUNITIES

Debt swaps have been used for environmental funding through debt-for-nature operations. Such swaps often involve a third party, such as a non-governmental organisation (NGO), which buys the debt for payment in local currency. In exchange, the debtor agrees to fund certain environmental activities. Another swap modality may involve the creditor and debtor swapping bilateral debt. In these cases, the creditor cancels all or a portion of the debt and the debtor agrees to use the cancellation amount to fund environmental activities that are mutually agreed upon.

PERFORMANCE-BASED PAYMENTS

Performance-based payments refer to a grant or concessional loan that is disbursed in tranches against the verified fulfilment of predefined targets that are sometimes classified against quantified emission reductions in a proposed project or programme. Payment depends on measurable actions being undertaken. This kind of financing is aimed at rewarding innovation and successful implementation of a project with clear climate benefits. In many instances, carbon credits or units may be seen as a special type of performance-based payment.

Performance-based finance can be used to promote policy reforms, build capacity, and undertake investment projects.

PUBLIC–PRIVATE PARTNERSHIPS (PPP)

A PPP is a contractual agreement between a public agency and a private sector entity. Through this agreement, the skills and assets of the two sectors are shared to deliver a service or facility. In addition to sharing resources, each party shares the potential risks and rewards of the delivery of the service or facility.

While attempts to mitigate the consequences of climate change will continue to be carried out by governments, the scale of the challenge means that governments cannot act alone as they may not have the adequate funds, skills, or capacity. Also, some interventions may require long periods of implementation if they are delivered as public-only projects. Since public finance will be limited, multiple sources of finance, including private sector finance, can be combined in different ways to provide sustainable solutions. Such hybrid financing schemes are also more appropriate as projects become more complex and not viable purely on private financing structures, which make an innovative partnership between the two sectors desirable.

PPP models could potentially address challenges in adaptation and mitigation efforts in sectors such as housing, communication, infrastructure, health, agriculture, water, and sanitation.

ADVANCED MARKET COMMITMENTS

An advanced market commitment is a mechanism that generates incentives for private sector engagement by ensuring viable market demand. Thus, an advance market commitment

could be aimed at creating a market for future technologies relevant to developing countries that are large and credible enough to stimulate private investment in research and development and manufacturing capacity. In the context of climate change, the end goal would be to accelerate the availability and introduction of climate-friendly technologies to developing countries.

To date, this type of mechanism has been mostly used in the public health sector to encourage the research, development, and production of vaccines against diseases that affect people in developing countries. The principles can be applied to other types of technologies, such as low carbon energy, and could represent an important tool for funding low carbon technology development and transfer.

FIRST LOSS RESERVE (FLR)

In addition to subsidising the cost of loans, guarantees, or equity investments, concessional resources can also be used as risk buffers to cover first losses in waterfall payment mechanisms that assign the payment of revenues to senior risk tranches held by development finance institutions and private investors. Under such a structure, different risk tranches of capital are created, where the first loss may be covered by concessional sources and upper tiers by development finance and commercial investors.

A FLR repayment mechanism assigns the first payment of revenues to the senior tranches and the last to the first-loss tranche. The use of concessional resources under this structure allows additional commercial funds to be leveraged on a large scale for development purposes. The risk buffers of the higher-risk tranches also provide significant comfort to more risk-adverse investors.

CHALLENGES

To be effective, these instruments require sponsors with substantial resources, financial expertise, and a committed green agenda. In addition, the costs and complexity entailed should be contained to make the instrument competitive with investment alternatives and with the cost of the risks they manage. Moreover, unless first-loss protection mechanisms and their underlying objectives appeal to investors and the banking sector, they will not create liquidity on the banks' balance sheets. Nor will they mobilise resources at scale for green infrastructure investments.

First-loss reserve protection mechanisms can create a moral hazard by attracting developers and banks with very risky projects and may conflict with other direct risk mitigation instruments, such as traditional forms of insurance.

Proponents of this instrument should also be wary of timing. First loss protection mechanisms need to be established while there is urgent need and high demand. Moreover, unless specific strategies are adopted to direct the use of proceeds, there is a risk that banks may reallocate capital to a wide range of investment outcomes. Some could lead to funding GHG emitting projects, while others may be unrelated, such as sponsoring hospital construction.

OPPORTUNITIES

First-loss protection mechanisms encourage capital release, in which capital previously committed to commercial or regulatory reasons becomes available for new uses. According to CPI, they can be applied through two different

mechanisms: project finance solutions can be used as an alternative to bank loans (such as project bonds) or as dedicated investment vehicles such as collateralised debt obligations (CLOs).

First loss protection mechanisms, as described above, are a means of dealing with barriers associated with low credit worthiness. As Wilkins puts it, a scholar that focuses on infrastructure in developing markets, "they can overcome the absence of liquid, investment grade asset-backed securities and a small secondary market".

REGIONAL EXAMPLES OF CREDIT ENHANCEMENT MECHANISMS

Traditionally, the types of institutions that would sponsor FLR-type instruments includes development banks and institutions whose agenda includes capital release into financial systems (for example, the IMF, ECB, and the US Federal Reserve). The case below highlights involvement from the Asian Development Bank in India.

1.6 GREEN BONDS

Green bonds are an evolving solution which will continue to underpin institutional investor willingness to commit to climate-related investments. By definition, these are bonds that are ring-fenced to fund eligible climate change mitigation projects with a focus on renewables, energy efficiency, and transport. It is a growing investment opportunity and funding tool for sustainable infrastructure in OECD and non-OECD countries.

As of July 2016, the market had some USD 130 bn of debt. This is just 0.15% of the total global fixed income market. However, the market is growing fast, with an expected $150 bn extra issuances since 2016.

Several green bond indexes exist today. S&P and Moody's have developed green bond ratings methodologies and public bodies are seeking ways to encourage the development of the market.

Moreover, asset managers, including Blackrock, have developed a set of green bond principles that include specifics for the use of proceeds, project evaluation, and impact reporting. Harmonisation and increased standards will be required to make this work. Asset owners, investors, issuers and rating agencies have adopted the principles, as have public entities like the People's Bank of China.

According to Blackrock, asset owners appear to have an appetite for green bonds, especially for issuers who provide thorough impact reporting and have the environmental benefits of their projects rated by outside sources. However, the market cannot yet accommodate large-scale portfolio allocations. Cheaper and wider-spread green bond funding is needed to drive more investment. Governments will have a role to play to facilitate climate finance.

CHALLENGES

Green bonds will play a significant role in financing the estimated $90 tn of global infrastructure needed by 2030 to limit climate change. However, there has been little action from investors despite commitments to dive into this market. According to the OECD, pension fund allocations were stuck around 3.5% of assets in 2011–2015.

As a relatively new instrument in the market, the following challenges have been flagged:

- Regulatory uncertainties and political and currency risks in emerging markets may limit the future of green bonds.
- Keeping integrity in the absence of international regulations.
- Additionality is a big credibility test for the market. The purpose of the green bond market is to mobilise capital to address climate change. There is a gap between the providers of capital and the issuers who take the money but are just refinancing existing projects or doing projects that would have happened anyway.
- Underlying assets being financed through green bonds are mostly renewable energy or energy efficiency projects. There is a need to broaden the range of corporates coming to the market and to open the focus beyond just climate change.

OPPORTUNITIES

In light of some of these challenges, tax incentives and public guarantees could help entice private capital. Examples include using development banks and export credit guarantees to lower financing costs and reduce risk. Creative finance to boost pools of capital is another option.

One suggestion by Blackrock is that a supranational organisation could pool EM bank loans to multiple renewable projects across different countries. This would mitigate project- and country-specific risks, which are major concerns for many investors. A second step would be to create different credit tranches. The supranational organisation would own a junior tranche that would absorb potential first losses – effectively a first-loss cushion for private holders of senior tranches.

GREEN BONDS IN NEPAL?

DOMESTIC MARKET

In Nepal, only two types of bonds are available – corporate debentures issued by commercial banks and government bonds (for example, the Development Bond, National Savings Bond and Citizens Savings Bond). IFC and ADB have planned to issue a local currency bond, but that has not yet happened.

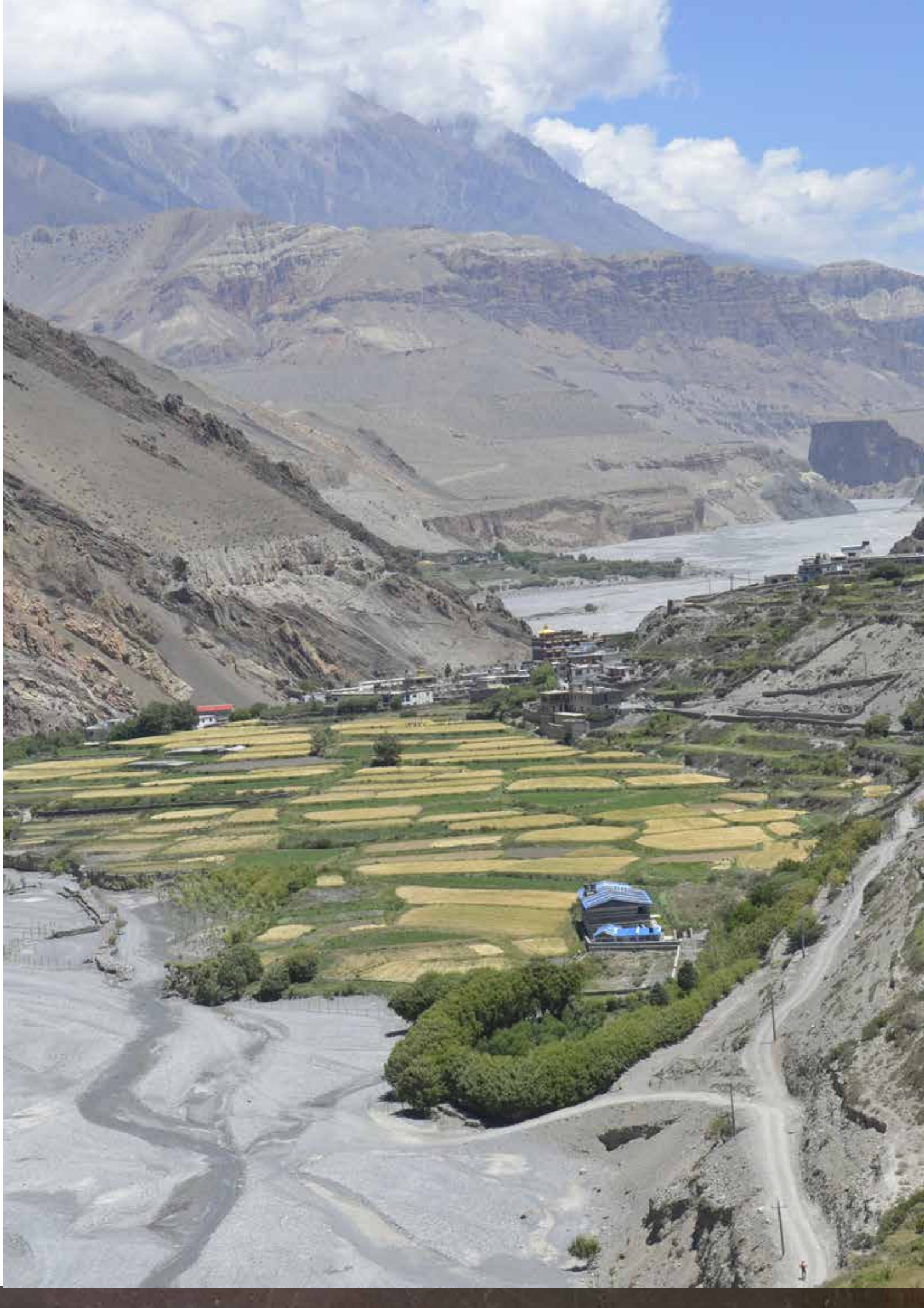
The stock market and bond market is not very liquid, and there are limited fixed income securities, as described above. The depth of instruments available in the stock market is low. An investor can only go long on stocks. There is no short selling, and nor is there a market for options.

The last year has seen fixed deposit rates in Nepal hit highs of ~11–13%. This is in stark contrast to the low interest rate environment a few years ago. The interest rate for borrowing is based on a bank's cost of funds, and with fluctuations in fixed and saving deposit rates, a borrower's cost of borrowing becomes volatile. With no option of fixed interest rate for the tenure of their projects, renewable energy developers face a lot of uncertainty. Hence, a green bond market dedicated to renewables would make sense in Nepal's context.

INTERNATIONAL MARKET

One hurdle preventing Nepal from benefitting from the international bond market is that the country does not yet hold a sovereign rating, and therefore cannot credibly issue a sovereign bond. However, even if it could, interviews the Dolma team held over the last year with institutional investors reveal that they are mandated to only consider BBB-, or investment grade, investments.

Though untested, there is potential for Nepal to benefit from the issuance of international bonds linked to a YieldCo domiciled abroad but with the capital being raised for projects in Nepal. If the project was insured by the World Bank's AAA credit rating through a MIGA product, purchased at the fund or company level, corporate entities in Nepal could benefit.



1.7 BLENDED FINANCE

Blended finance instruments play a crucial role in realising projects in emerging and frontier markets by offering investors products that address the otherwise unavoidable risks inherent in untested markets. This section will draw on findings from the Consultation Paper of the Blended Finance Taskforce to paint a picture of the blended finance market today.

According to the Blended Finance Taskforce, blended finance is best described as:

"The strategic use of public or philanthropic development capital for the mobilisation of additional external private commercial finance for SDG-related investments".

Developments in this space are of crucial importance in the context of Nepal's renewable energy sector, and, indeed, in attracting equity capital to the country. Over the last year, Dolma has reviewed a number of instruments that can be used to mitigate so-called perceived risks.

INVESTOR PERCEIVED RISKS

The perceived risks investors see in investing in Nepal is well documented in previous reports in this series. Here, we intend to simply review these to set the tone for a discussion on the products available in the next section, how they can or have been catalysed, and the structures used. According to the Blended Finance Taskforce, "The use of blended finance vehicles and instruments like guarantees, technical assistance grants, currency hedging and risk insurance are gaining traction with private investors". And developers can use a small amount of development capital to mitigate against a range of risks, as seen in Table 9. This could be enough to tip the scales, enabling investment in new asset classes like infrastructure debt or equity in emerging markets.

GLOBAL PERSPECTIVE

Climatescope, a country-by-country assessment (funded by DFID and Bloomberg New Energy Finance) evaluates the landscape of climate-related investments worldwide on an annual basis. Figure 3 puts frontier and emerging markets in geographical perspective, in this particular case highlighting off-taker risk. Generally, countries facing higher risks are more likely to see blended finance instruments applied.

The majority of blended finance will be needed to make economic infrastructure sustainable, land use more sustainable, and social infrastructure in developing countries more investable. The UN estimates that at least USD 90–100 tn is needed to achieve the SDGs, the largest share in the so-called Global South. By de-risking these investments, blended finance would allow the private sector to participate, capturing over US$ 1 tn in additional annual investment potential.11

MACRO	CREDIT/ COMMER-CIAL	TECHNICAL	FINANCE	INFRA SPECIFIC						
	Country risk	Currency risk	Credit risk	Liquidity risk	Demand risk	Execution risk	Operation risk	Access to cap	Lack of pipeline	Offtake risk
Guarantees			■	■		■	■	■		
Insurance	■			■		■	■	■		
Hedging		■			■					
Subordinated Debt			■	■		■	■	■	■	
Securitisation			■	■						
Contractual Mechanisms					■					■
Results based incentives							■			
Grants								■	■	

FIGURE 3: PERCEIVED RISKS IN EMERGING/FRONTIER MARKETS

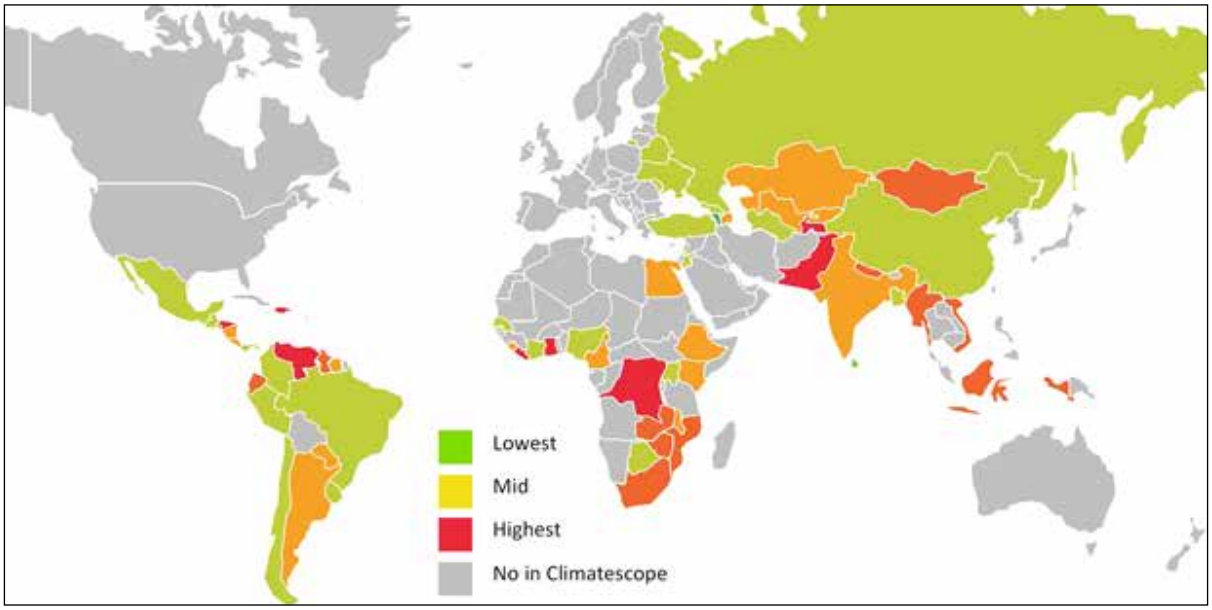


TABLE 9: BLENDED FINANCE INSTRUMENTS 11

Instrument	Description	Risks mitigated	Example provider
Guarantee	A form of credit enhancement. Provides protection to one party if the other party fails to perform. Guarantees are provided by a third party that steps into the shoes of the defaulting party so that the innocent party does not suffer a loss. Guarantees are one of the most catalytic forms of blending. Forms of guarantees include first loss, partial risk, or credit guarantees and trade finance guarantees.	Access to capital; credit/ counterparty risk; off-take risk; construction/ completion/technical risk; demand risk	GuarantCo Guarantees For Development; USAID
Insurance	Provides protection by promising to compensate for a specified loss or damage in return for payment of a specified premium. One of the most common types of insurance is political risk insurance. Insurance provides a more stable environment for investments in developing countries. Along with guarantees, they are one of the most catalytic forms of blending.	Political risk; construction risk; operation and output risks; upstream resource related risks; access to capital	OPIC; MIGA Multilateral Investment Guarantee Agency WORLD BANK GROUP
Hedging	Reduces the risk of adverse current price movements in an asset and its associated earnings stream. Currency hedging reduces or eliminates exposure to the movement of foreign currencies, addressing one of the key risks of investing in emerging markets.	Currency/ Commodity risk	TCX
Subordinated/ Junior Debt	Subordinated or junior debt protects senior investors by taking first losses on the value of the security, i.e. if something goes wrong, the most junior/subordinated tranche will be paid out last. First loss capital takes a position that will stunt the first economic loss if the assets below it lose value or are foreclosed on	Multiple risks including off-take, construction, and reputational risks; access to capital	FMO Entrepreneurial Development Bank; KFW DEG
Securitisation	The process of transforming a pool of illiquid assets into tradable financial instruments.	Liquidity/ time horizon; scale; counterparty/off-take and credit risk	European Investment Bank
Results based incentives	Instruments that provide incentives and disincentives to achieve desired outcomes or results, including social impact bonds and performance-based contracts. This type of financing is aimed at rewarding innovation and successful implementation of a project with clear climate benefits.	Operation and output risks	IFFIm SUPPORTING GAVI; BILL & MELINDA GATES foundation
Contractual mechanisms	Various contractual and project finance arrangements to support the development of bankable infrastructure projects including public and private off-take agreements, subsidies such as feed-in-tariffs, and tax credits. These mechanisms involve an agreement between producers and buyers of a resource to purchase or sell portions of future production. These agreements are to secure financing for a production facility or buy the equipment needed to extract a resource.	Demand risk; financing risk (demonstrate bank revenue stream)	ofgem; Google

Grants	Capital paid without any expected repayment or compensation over a fixed period of time. This could involve money for TA or project preparation to make a project bankable. Grants can be important for pipeline development, especially in less mature sectors and riskier geographies, allowing significant crowding in of private capital.	Access to capital; high transaction costs; operational risks; lack of bankable pipeline; lack of local intermediaries; lack of capacity	THE ROCKEFELLER FOUNDATION Sida

BLENDED FINANCE INSTRUMENTS

A number of blended finance tools are available today, including guarantees, insurance, currency hedging, grants, and subordinate/first loss debt and equity. According to the Blended Finance Taskforce, each instrument mobilises a different amount of private capital relative to the public or philanthropic funds used to provide the instrument, which means some instruments are more catalytic.

BLENDED STRUCTURES

Although the concept of blended finance may remain a new concept for investors and its application may be questioned, Figure 4 shows how blended finance typically works using common investment structures. In these structures, institutions most commonly invest or participate in equity, loans, or bonds.

Transactions incorporating blended finance into their structures are aligned to alternative asset classes such as infrastructure, private equity, and illiquid credit that are familiar to institutional investors. To date, the asset classes relevant to blended finance are estimated to make up around USD 6 tn of alternative investment portfolios around the world.

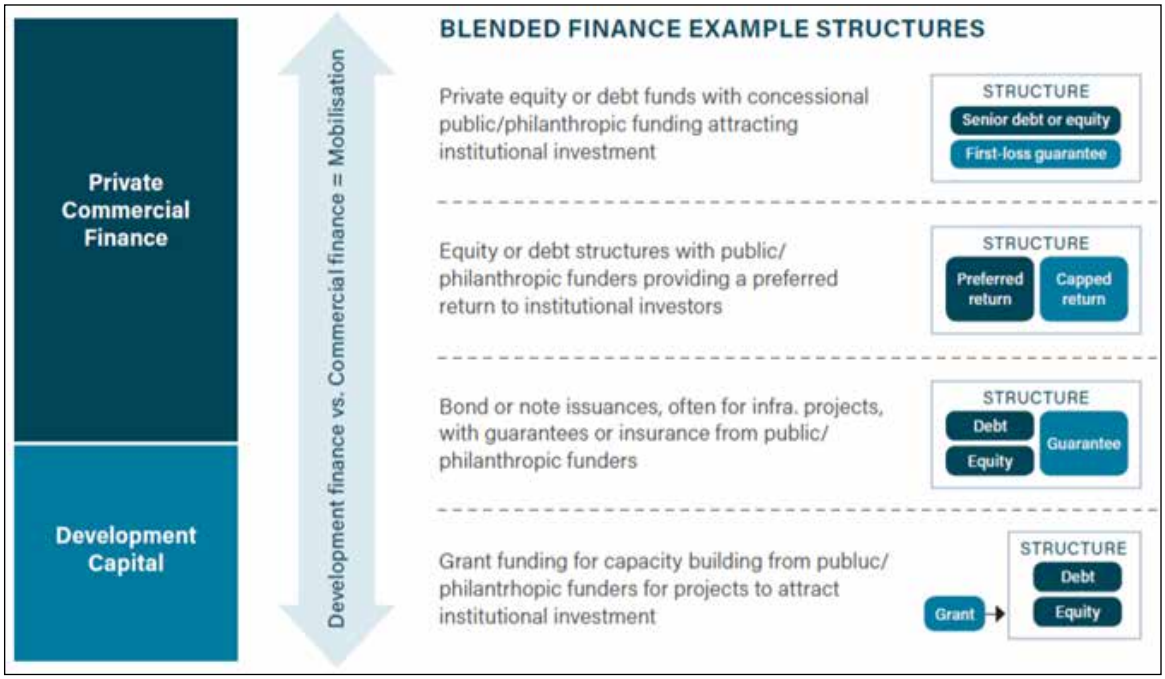
Blending can also occur at different levels – directly into a project, as part of a specific fund, or as part of a facility. It can also take place at the market level. The concept of blending has been around for longer than the term itself – for instance, PPPs may be seen as a form of blending.

According to the Blended Finance Taskforce, "The clean energy finance space also has good examples, with carbon credits, feed-in-tariffs and other renewable energy subsidies providing a decade of learning in programmatic blending at the market level."

TABLE 10: BLENDING FINANCE AT DIFFERENT LEVELS

Project level	Public and private capital blended within a single project or company's financial structure	Example: Elazig Turkey, Lake Turkana Wind Project, & Green, SPCG
Fund level	Public and private investors pool resources to be invested in multiple projects for companies	Example: Climate Investor One (CIO), Danish Climate Investment Fund (KIF), &Green
Fund-of-funds	Funds that in turn invest in other funds	Example: GEEREF I & II, Sarona
Facility (institutional level)	A long-term or permanent institution is set up or modified to blend finance, thereby mainstreaming the use of blended finance	Example: IFC Managed Co-Lending Portfolio Programme (MCPP), GuarantCo
Market level	Market mechanisms which blend public subsidies to encourage private investment	Example: UK and German FiT schemes, Fannie Mae/ Freddie Mac
Project prep support	Public support for project preparation and intermediaries has also been used to mobilise private investment by addressing specific barriers, especially information gaps	Example: ACEF, Aligned Intermediary, CPI's the Lab

FIGURE 4: BLENDED FINANCE STRUCTURES



CONCLUDING REMARKS

The positive momentum building around the blended finance market allows countries like Nepal to reap the benefits in the coming years. However, significant reform is required in the domestic institutional environment to attract investors. While interest for international products is growing from the supply side (investor), the demand side (host governments) will become increasingly competitive for capital.

Dolma's research finds that countries successful in tapping this market were willing to make bold moves within their own domestic political economies. One example is Colombia's Infrastructure Bank (FDN), which catalysed the domestic infrastructure market after selling equity stakes to IFC and the Development Bank of Latin America. Another example is India, which enforced positive institutional and policy settings, and Mexico, which has seen a dramatic scaling up of its wind industry after the government passed a law that required 35% of the country's energy to come from renewables by 2040.11

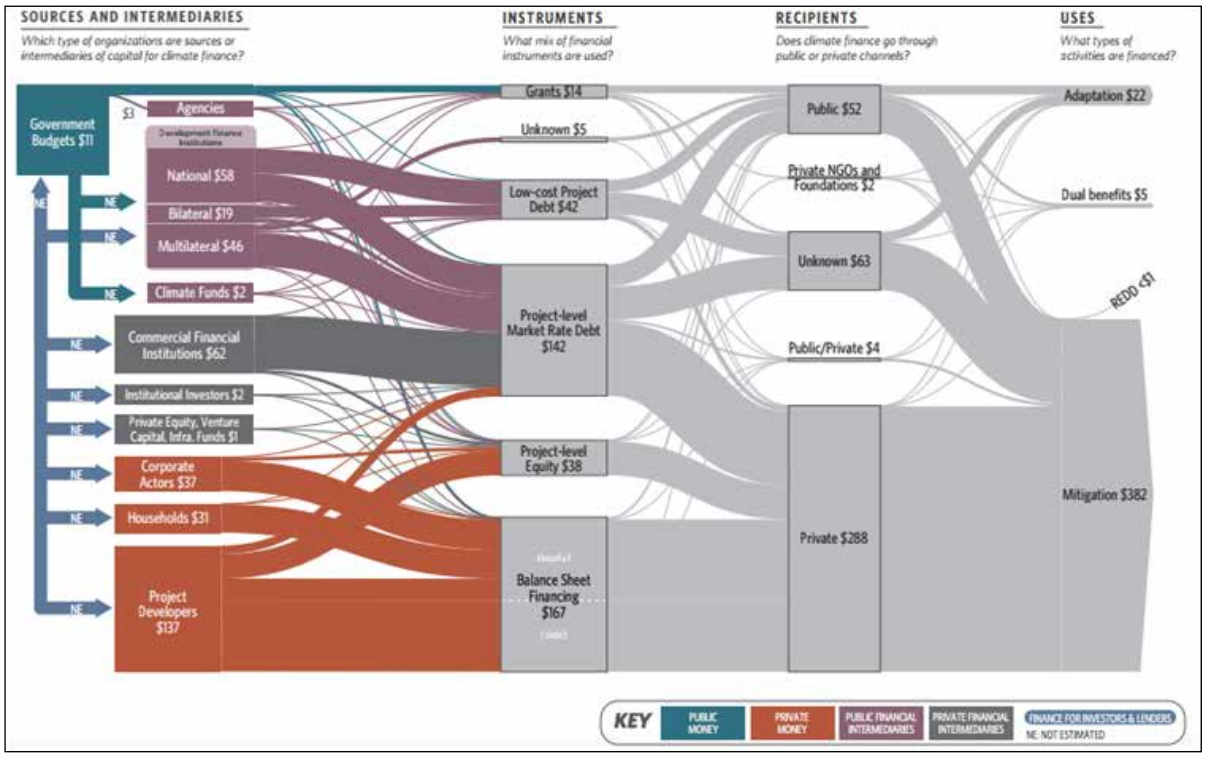
Nepal could follow this path by creating its own government-backed instruments and enacting regulatory reform. Dolma finds that at least two blended finance instruments are required today for institutional investors to begin considering Nepal as an investment option: political risk insurance and a currency hedge. Should the government issue a sovereign bond, thereby generating a sovereign rating from international rating agencies, developers crowding in international investment would have one fewer cost to fret over. The same applies should Nepal Rastra Bank create a Nepalese rupee hedging fund backed by its foreign reserves and potentially donors to ease investor concerns over the future of the pegged currency.

As blended finance models begin to scale alongside other mechanisms, such as green bonds and One Belt One Road (OBOR) initiatives, capital may not be the constraining factor. Countries which have put the right institutions and vehicles in place have been successful in attracting financing because they have the right enabling environment to support the development of a pipeline of investible projects. Large capital flows will systematically go towards those developing countries generating high quality assets, but institutional policy settings need to be welcoming.

1.8 APPENDICES

APPENDIX A

FIGURE 5: CLIMATE FINANCE LANDSCAPE 2017 2



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CHAPTER 7

A breakdown of the legal implications of investing in big infrastructure in Nepal, from preferred entity domiciles to fund structuring. Findings based on pragmatic assessment of available options for Nepal.

CHAPTER 7

Legal Structuring

UKaid
from the British people

dolma foundation

CHAPTER 7

Legal Structuring

ABBREBIATIONS

TABLES

FIGURES

ABBREVIATIONS

BIMSTEC	BAY OF BENGAL INITIATIVE FOR MULTI-SECTORAL TECHNICAL AND ECONOMIC COOPERATION
BIPPA	BILATERAL INVESTMENT PROMOTION AND PROTECTION AGREEMENT
DEVCO	DEVELOPMENT COMPANY
DTA	DOUBLE TAXATION AGREEMENTS
DTAA	DOUBLE TAXATION AVOIDANCE AGREEMENT
DTT	DOUBLE TAXATION TREATY
FDI	FOREIGN DIRECT INVESTMENTS
FSC	FINANCIAL SERVICES COMMISSION
FSI	FINANCIAL SECRECY INDEX
GATS	GENERAL AGREEMENT ON TRADE IN SERVICES
GBL	GLOBAL BUSINESS LICENCE
HOLDCO	HOLDING COMPANY
ICSID	INTERNATIONAL CENTRE FOR SETTLEMENT OF INVESTMENT DISPUTES
ILO	INTERNATIONAL LABOUR ORGANIZATION
ITA	INCOME TAX ACT
LLP	LIMITED LIABILITY PARTNERSHIP
LP	LIMITED PARTNER
MIGA	MULTILATERAL INVESTMENT GUARANTEE AGENCY
SAFTA	SOUTH ASIAN FREE TRADE ACCORD
SPV	SPECIAL PURPOSE VEHICLE
TRIMS	THE AGREEMENT ON TRADE-RELATED INVESTMENT MEASURES
TRIPS	THE AGREEMENT ON TRADE-RELATED ASPECTS OF INTELLECTUAL PROPERTY RIGHTS
UN	UNITED NATIONS
YIELDCO	YIELD COMPANY

1.1 INTRODUCTION

Investing in a Least Developed Country such as Nepal means dealing with a myriad of risks, including political, credit, currency, and environmental/social risks. Investors risk their money on a project, build it, and aim to make commensurate returns based on the risk taken. A strong legal entity structure in Nepal and outside to managethe flow of funds is essential to limit unnecessary liabilities and uncertainties, ensure maximum protection under international treaties, and avoid double or even triple taxation on returns (which could render the project economically unfeasible). All this must be achieved without hurting the interests of the host country.

Deliverable 1: Market Analysis andDeliverable 8: Financial Structuringexamined Nepal's tax law for investors and the benefits available to an investor in the energy sector. This report exploresNepal's international trade, investment, and tax treaties. These treaties could help investorsselect aninternational jurisdiction if their own country does not have such treaties with Nepal or if they are investing pooled funds with other investors and a mutually acceptable jurisdiction is required (see Section 1.3). Section 1.4 outlines the steps to structure entities in both Nepal and international jurisdictions.

1.2 ANALYSIS OF BILATERAL AND MULTILATERAL TRADE, INVESTMENT AND TAX TREATIES WITH NEPAL

BILATERAL TRADE TREATIES

Nepal has bilateral trade treaties with 15 countries. The first was signed with the US in 1947.

Nepal has bilateral trade treaties with India, Pakistan, Sri Lanka, and Bangladesh from South Asia; China, Mongolia, and Korea from the rest of Asia; the Soviet Union, Poland, Romania, Bulgaria, and Czechoslovakia from Europe; Egypt from Africa; and the US from North America.

Table 1 summarizes imports and exports of Nepal in 2015 from and to these countries. It shows that signing a trade treaty is not necessarily a sign of increased trade between the two countries.

TABLE 1: NEPAL'S TRADE (IN 2015) WITH COUNTRIES WITH WHICH IT HAS TRADE TREATIES

S.N.	Country	Export (USD)	% Value	Import (USD)	% Value
1	India	418,516,909	56.5	6,561,869,841	65.2
2	U.S.	82,796,702	11.2	81,988,461	0.8
3	China	22,418,351	3	1,271,409,408	12.6
4	Bangladesh	9,838,683	1.3	38,945,875	0.4
5	Russia	1,766,658	0.2	11,473,450	0.1
6	Korea	1,555,240	0.2	93,170,293	0.9
7	Pakistan	921,416	0.1	11,863,699	0.1
8	Czech Republic	915,055	0.1	11,503,055	0.1
W	Poland	224,593	<0.1	4,154,667	<0.1
10	Egypt	204,625	<0.1	26,000,302	0.3
11	Slovakia	180,777	<0.1	276,382	<0.1
12	Romania	125,816	<0.1	977,417	<0.1
13	Sri Lanka	98,597	<0.1	2,049,213	<0.1
14	Bulgaria	23,229	<0.1	759,642	<0.1

Source: Export-Import Data Bank, Trade and Export Promotion Centre, Government of Nepal (2018)

INVESTMENT TREATIES

Nepal has a Bilateral Investment Promotion and Protection Agreement (BIPPA) with six countries. The first was signed with France in 1983. India, the largest trade partner of Nepal, was the last country to sign a BIPPA with Nepal.

TABLE 2: BILATERAL INVESTMENT TREATIES

Country	Signed Date
France	May 2, 1983
Germany	October 10, 1986
United Kingdom	March 2, 1993
Mauritius	August 3, 1999
Finland	February 3, 2009
India	October 21, 2011

Investment treaties between countries aim to smoothen the transaction costs associated with investments being made across both jurisdictions . Treaties generally cover the following points:

i) Promotion and protection of investments
ii) Treatment of companies of the other country as if they were companies of the host country
iii) Compensation for losses in case of war,

armed conflict, revolution, etc. (compensation payments may be transferred freely)

iv) Prohibition on nationalising or expropriating foreign companies by the host country

v) Compensation of property if the host country seizes a company owned by the other country

vi) Unrestricted repatriation of investment and returns

TABLE 3: OTHER TREATIES WITH INVESTMENT PROVISIONS

No.	Short title	Parties	Date of signature	Date of entry into force
1	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) Framework Agreement	Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, Thailand	08/02/2004	30/06/2004
2	South Asian Free Trade Accord (SAFTA)	Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal Pakistan, Sri Lanka	06/01/2004	01/01/2006
3	EC–Nepal Cooperation Agreement	European Union	20/11/1995	01/06/1996

Besides bilateral treaties and multilateral treaties, Nepal has signed an open-ended category of investment-related instruments (IRIs). These encompass various binding and non-binding instruments and include, for example, model agreements and draft instruments, multilateral conventions on dispute settlement and arbitration rules, and documents adopted by international organisations. For a list of these instruments, please refer toAnnex 1.

TAX TREATIES OF NEPAL

Nepal has entered into Double Taxation Treaties with 10 countries: India, Norway, China, Pakistan, Sri Lanka, Austria, Thailand, Mauritius, Qatar, and the Republic of South Korea.

Section 73(1) of the Income Tax Act 2002 provides that where Nepal has entered into a DTAAtreaty with another country, in the event that an income of a person or company is taxable in Nepal and the same income is also taxable in the other county, beneficial tax provisions (exemption or lower rate of tax) under the DTAAare applicable, subject to the fulfilment of certain conditions as may be provided in the relevant DTAA.

Nepal's DTAAs generally cover the treatment of dividends, royalties, interest, and capital gains.

DIVIDEND

Nepal's income tax act taxes distribution of profits whether it is made as dividends (payments in cash) or as bonus shares (profits capitalized as share capital). Both dividends and bonus shares are taxable at 5% andtax is the final withholding tax.

ROYALTIES

Under the act,a royalty is defined as any payment made under a lease of an intangible assetand includes any payment made for the following purposes:

i) The use of, or the right to use, a copyright, patent, design, model, plan, secret formula or process, or trademark

ii) The supply of know-how

iii) The use of, or right to use, a film, video tape, sound recording, or any other such medium and the supply of information concerning industrial, commercial, or scientific experience

iv) The supply of assistance ancillary to a matter referred to in (i), (ii), or (iii)

v) A total or partial forbearance with respect to a matter referred to in (i), (ii), (iii), or (iv)

A withholding tax of 15% is applicable on any royalty payments from Nepal.

INTEREST

As per Nepal's income tax act,interest refers to the following payments or gains:

i) A payment made or incurred under a debt obligation that is not a repayment of capital
ii) Any gain realized by way of a discount, premium, swap payment, or similar payment under a debt obligation
iii) The portion which is treated as interest in the payments made to a person under an annuity or by a person acquiring an asset under an instalment sale or the use of an asset under a finance lease under Section 32 of the Income Tax Act

A withholding tax of 15% is applicable on any interest payments from Nepal.

CAPITAL GAINS

Theseare not defined under Nepal's tax act. However, net gains from the disposal of business assets or business liabilities of an entity are taxable. Capital gains from disposing of an interest in a resident entity will be withheld at a 10% rate if paid to a resident natural person and at a 15% rate if paid to others.

CURRENT TRADING SCENARIO

Nepal is currently a net importer. As of 2015, Nepal had a negative trade balance of USD 5.7 bn in net imports. Until recently, Nepal was a net importer, but the imbalance between import and export was minimal; in 2006, imports began shooting up rapidly.

In 2017, Nepal exported USD 740 million worth of goods. Textiles, foodstuffs, vegetable products, and metals were its major exports, contributing 39%, 17%, 12%, and 9.8% respectively to total exports. India is Nepal's biggest export destination, receiving over 60% of total exports. The US is the second biggest export destination,making up nearly 10% of total exports. All other destinations combined receive no more than 10% of total exports.

Nepal imported USD 6.61 BNworth of goods comprising mainly of petroleum products, machines and equipment, metals, vehicles, and chemical products. As with exports, India is Nepal's major import partner, with just under 60% of imports coming from India. Imports from China make up around 14% of total imports. Imports from all other countries make up not more than 5% of total imports.

FIGURE 1: COUNTRIES WITH BILATERAL TRADE TREATIES WITH NEPAL

FIGURE 2: NEPAL'S TRADE BALANCE 3

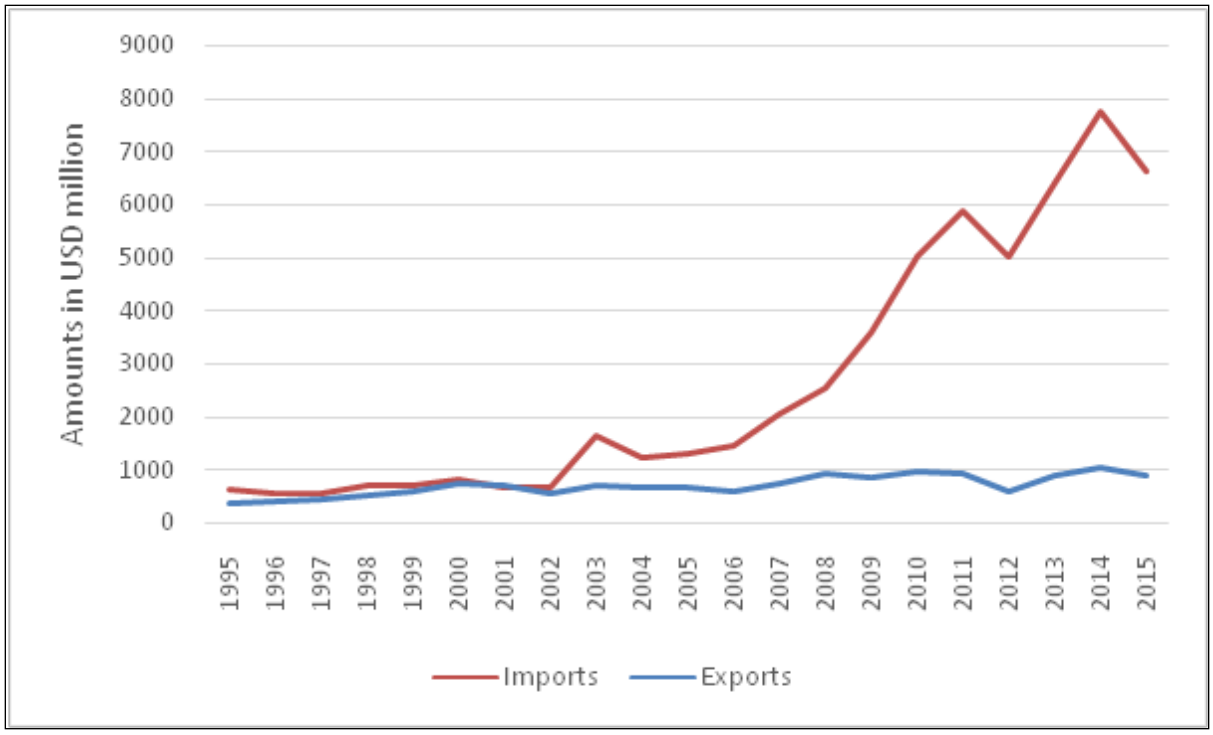


FIGURE 3: TOP COUNTRIES WHERE NEPAL EXPORTS TO

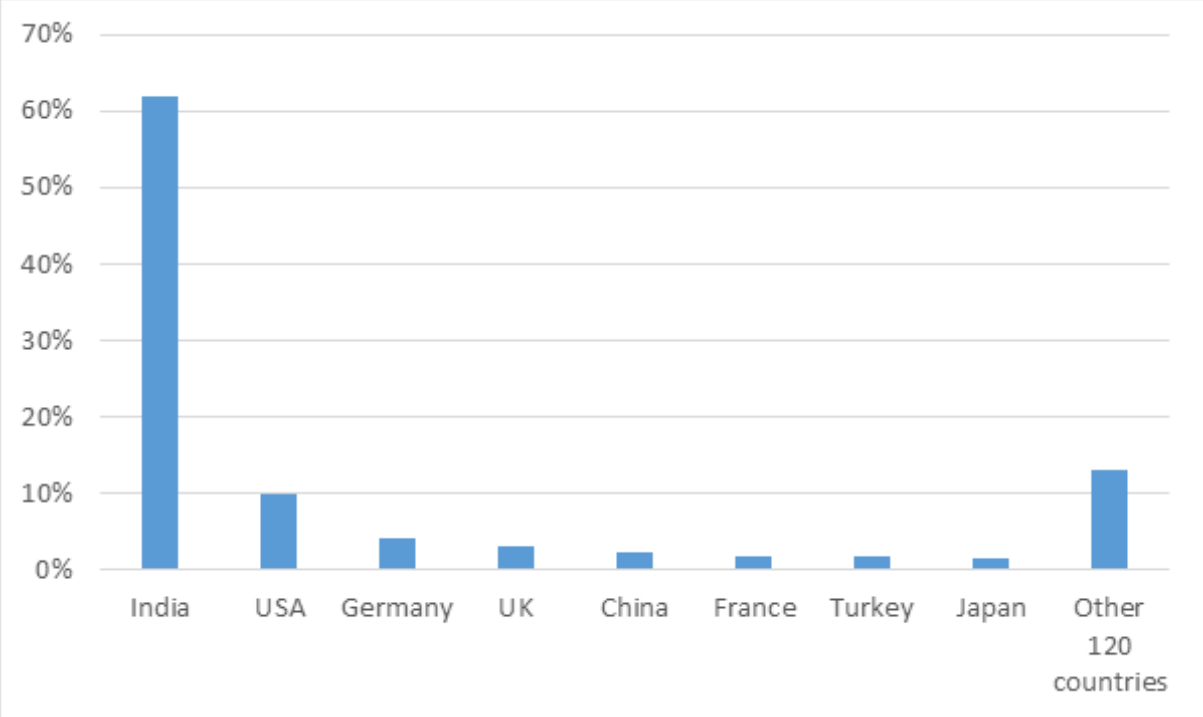
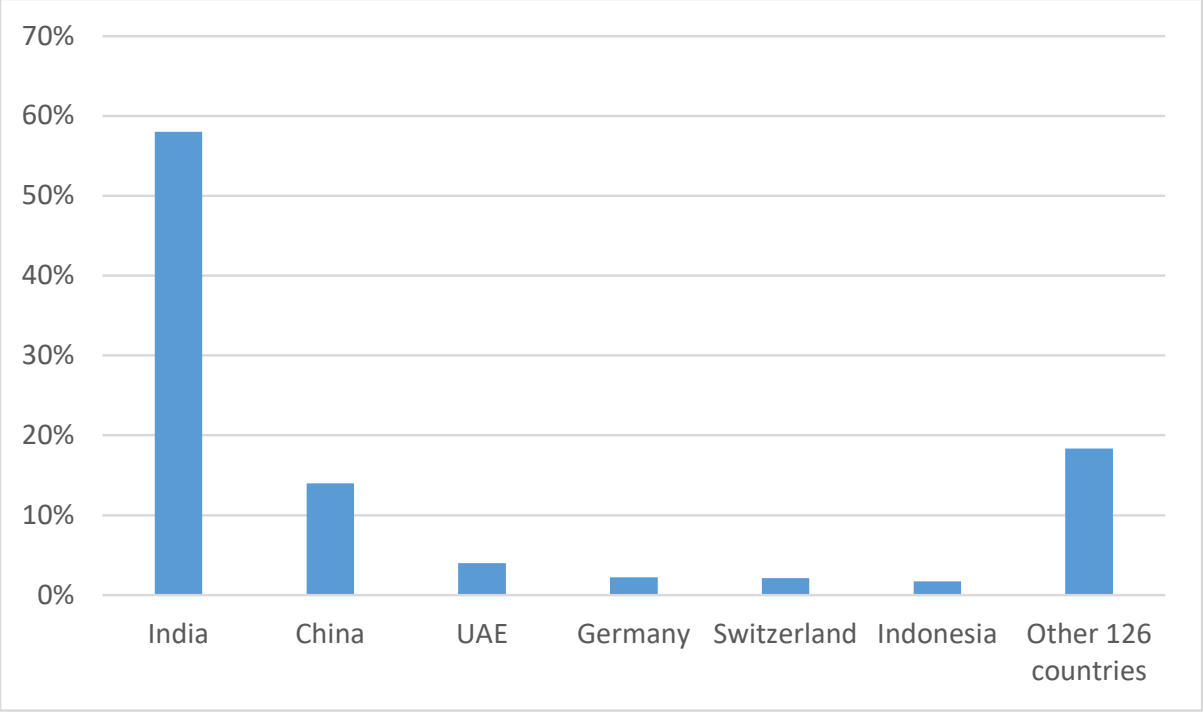


FIGURE 4: TOP COUNTRIES WHERE NEPAL IMPORTS FROM



1.3 POTENTIAL DOMICILES AND LEGAL STRUCTURES

Companies and individuals that wish to establish an offshore vehicle, either individually or jointly (referred to in this report as a "fund"), to invest in Nepal (including in renewable energy) need to plan the vehicle structure. This section sets out, in high-level terms, two example structure options.

Disclaimer: This is in no way intended as advice for specific situations. Each investor or group of investors has unique mandates and tax considerations. Independent professional advice should be sought in each case. The examples below are based on Dolma's research and should not be taken as anything other than examples.

POTENTIAL DOMICILES

OFFSHORE VS ONSHORE

For discussion on offshore vs onshore, refer to Deliverable 8: Financial Structuring.

OFF-SHORE LOCATION CHOICES

If investors opt for an offshore location, it should be credible and efficient in terms of transparency, governance, and taxand be on the "white list", as classified by the OECD on AML practices.Offshore locations may be analysed based on the following criteria.

DOUBLE TAXATION AGREEMENT (DTA) WITH NEPAL

As discussed above, Nepal has double taxation treaties with 10 countries. Hence, the report will analyse the suitability of these 10 countries for foreign investors.

TAX, AML AND INTERNATIONAL COMPLIANCE

The OECD has formulated "white", "grey", and "black" lists for international financial centres. The whitelist contains countries that have implemented international tax standards – i.e. they are not consideredas tax havens. The grey list includes countries which are improving on tax, AML, and other international compliance standards. The blacklist includes countries that arenon-cooperating on the aforementioned standards.Among countries that have signed a DTA with Nepal,no country is on the OECD blacklist.

Similarly, the Global Forum on Transparency and Exchange of Information for Tax Purposes conducts peer reviews on the ability of its member jurisdictions to co-operate with tax administrations in accordance with international standards based on the following criteria:

- Availability of information
  - Legal and beneficial ownership and identity information
  - Accounting records
  - Bank information
- Access to information
  - Competent authority's ability to obtain and provide information
  - Notification requirements, rights, and safeguards
- Exchanging information
  - Exchange of information mechanisms
  - Exchange of information mechanisms with all relevant partners

- Confidentiality
- Rights and safeguards of taxpayers and third parties
- Requesting and providing information in an effective manner

The Global Forum examined the legal and regulatory framework in phase 1 and looked into the implementation of this framework in practice in phase 2. Based on these reviews, each jurisdiction is rated compliant, largely compliant, provisionally largely compliant, partially compliant, provisionally partially compliant,or non-compliant.

TABLE 4: GLOBAL FORUM RATING OF JURISDICTIONS WITH A DTA WITH NEPAL

Jurisdictions	Rating
India	Largely compliant
Norway	Compliant
China	Compliant
Sri Lanka	Not rated
Pakistan	Largely compliant
South Korea	Compliant
Mauritius	Compliant
Austria	Largely compliant
Thailand	Not rated
Qatar	Largely compliant

Likewise, the Financial Secrecy Index of the Tax Justice Network ranks jurisdictions according to their secrecy and the scale of their offshore financial activities. It is a politically neutral ranking and a tool for understanding global financial secrecy, tax havens or secrecy jurisdictions, and illicit financial flows or capital flight. Table 5 shows the 2018 rankings of the 10 jurisdictions. The higher the FSI value, the higher the secrecy of the jurisdiction.

TABLE 5: FINANCIAL SECRECY INDEX (FSI)

Jurisdictions	Ranking	FSI
India	32	316.62
Norway	45	242.84
China	28	372.57
Sri Lanka	Not ranked	Not rated
Pakistan	Not ranked	Not rated
South Korea	33	314.05
Mauritius	49	223.47
Austria	35	310.41
Thailand	15	550.59
Qatar	Not ranked	Not rated

Among the 10 countries, Mauritius comes out best, Thailand is considered the most secretive, while three countries – Sri Lanka, Pakistan, and Qatar –are unrated.

TRACK RECORD OF DOMICILE IN MANAGING FOREIGN CAPITAL

It is important to understand the reputation of territories in terms of compliance, efficiency, and availability of fund management services. Furthermore, the cost of operating the fund, its management, and ease of operations are key factors that need to be considered in order to selectan appropriate domicile. The availability of fund management and administration professionals, the efficiency of the system (both of the private sector and regulators), and the trend being followed in developing or frontier markets are important to domicile selection.

EASE OF DOING BUSINESS

The World Bank ranks countries around the world on their “ease of doing business”. Economies are ranked from 1 to 190 on 10 different topics and overall ranking is based on aggregate rank across these topics. A high ranking for ease of doing business means the regulatory environment is more conducive to starting and operating a local firm.

TABLE 6: THE WORLD BANK'S EASE OF DOING BUSINESS FOR SELECTED COUNTRIES

	Korea, Republic of	Norway	Austria	Mauritius	Thailand	China	Qatar	India	Sri Lanka	Pakistan
Ease of Doing Business Rank	4	8	22	25	26	78	83	100	111	147
Starting a Business	9	19	118	40	36	93	89	156	77	142
Dealing with Construction Permits	28	21	42	9	43	172	19	181	76	141
Getting Electricity	2	23	22	51	13	98	65	29	93	167
Registering Property	39	14	31	35	68	41	26	154	157	170
Getting Credit	55	77	77	55	42	68	133	29	122	105
Protecting Minority Investors	20	10	29	33	16	119	177	4	43	20
Paying Taxes	24	28	39	10	67	130	1	119	158	172
Trading across Borders	33	22	1	70	57	97	90	146	86	171
Enforcing Contracts	1	8	9	27	34	5	123	164	165	156
Resolving Insolvency	5	6	23	36	26	56	116	103	88	82

Korea tops this listwhile South Asian countries are towardsthe bottom. The highlights items in green in each row represent the best-ranked country in each category among the 10 countries.

TAX TREATIES OF THE JURISDICTION WITH OTHER COUNTRIES

It is not only important for the jurisdiction country to have a tax treaty with Nepal, but also for it to have tax treaties with other countries. This suggests that the domicile has more experience in managing and enforcing such treaties. Individual investors may also want to evaluate whether their home country has a treaty with the host country and any implications of this on the legal structuring decisions.

TABLE 7: NUMBER OF TAX TREATIES OF SELECTED JURISDICTION

Jurisdictions	Number of countries with which it has tax treaties
India	96
Norway	50
China	102
Sri Lanka	44
Pakistan	65
South Korea	91
Mauritius	44
Austria	95
Thailand	61
Qatar	68

China has tax treaties with the greatest number of countries (102)and Mauritius and Sri Lanka with the least (44 each).

EXAMPLES OF POTENTIAL LEGAL STRUCTURE

In preparing this section, an international tax consultant analysedhow potential structures could be set up. However, the structures outlined below are broad structures and further detailed technical analysis will be needed on behalf of all parties before a precise structure can be outlined.

Mauritius is generally viewed as the “gateway” to Nepal because of the double tax treaty between the two countries. However, as we saw above, Mauritius offers much more than just tax treaties. It is a compliant country according to the Global Forum on Transparency and Exchange of Information for Tax Purposes, which means that it is a fairly transparent jurisdiction. It also ranks well on the financial services index. Moreover, the country has good fund management and administration services and has USD 659 bn in assets under management through companies with a Global Business License.

However, the choice of domicile is based on the investor’s preference. Based on the criteria above, investors can choose another jurisdiction oropt to invest directly in an onshore company in Nepal or through a holding company in another jurisdiction, such as the UK.

The UK is known as a global financial and services hub with presence of top financial, legal and engineering firms and therefore one of the preferred domiciles for a holding company. From a fundraising perspective, London has an established debt and bond market. Between January and September 2018, investors raised over USD 14.9 bn at the London Stock Exchange (LSE). The LSE is one of the major stock exchanges and has a market capitalisation of USD 4.15 tn, accounting for USD 2.15 tnin debt securities. The UK should also be attractive to prospective investors who choose to invest in countries other than Mauritius.

The example provided here uses an English limited partnership or a UK company as the fund vehicle. This example also includes the option of a separate management company or fund manager as may be the case with private equity funds or a separate renewable energy management company. Here, an English limited liability partnership acts as the Fund Manager. Investors may want an Investment Adviser on the ground in Nepal that provides investment advisory services to the fund manager – meaning that the fund manager would only provide fund management services and research and analysis would be done by the investment adviser.

The UK and the global tax landscape are witnessing rapid and dramatic changes; so while the two examples here factor in the uncertain global tax landscape, significant flexibility has been built in so that any future adverse changes can be successfully navigated.

EXAMPLE STRUCTURE1: ENGLISH LIMITED PARTNERSHIP FUND VEHICLE

Structure 1 proposes the use of an English limited partnership as the fund vehicle with an English limited liability partnership (LLP) Fund Manager (who may be advised by a Nepali Advisor).

An English limited partnership is a common fund vehicle which provides flexibility for fund investors while limiting the liability of a limited partner (LP) to that individual partner's contribution to the partnership. An English limited partnership is treated as "tax transparent" for UK tax purposes, meaning that the fund itself would generally not be subject to UK tax on its income, profits, and gains.

STRUCTURE 2: UK COMPANY FUND VEHICLE

Structure 2 proposes using a UK company, managed by an English limited liability partnership Fund Manager (which may be advised by a Nepali company Investment Advisor), as the Fund vehicle.

The UK is an attractive holding company jurisdiction and a UK holding company provides a suitable Fund vehicle alternative to an English limited partnership, which is more typical. The UK has a good treaty network, EU directive benefits, and a beneficial domestic holding company tax regime.

COMPARISON OF STRUCTURES AND TAX IMPLICATIONS

The two structures are similar. Structure 1 envisions the fund as a UK limited partnership entityand Structure 2 envisions it as a company. A UK limited partnership has more flexibility, no tax at the fund level, and dividends are not taxable at the fund level. A holding company would not have those privilegesbut would be subject to a standard reporting standards which might be attractive to investors.

STEPWISE DESCRIPTION OF STRUCTURING THE FUND

This section details the steps to structure the fund, assuming that:

- Each company in the structure will be managed and controlled and resident for tax purposes solely in its jurisdiction of incorporation.
- This structure proposes using an English limited partnership or an English company as the Fund vehicle with an English limited liability partnership or English company as the Fund Manager,whichwill provide fund management and investment advisory services;if desirable an Investment Adviser who would provide investment advisory services to the Fund Manager may be located on the ground in Nepal.
- All services will be provided, and all transactions will be entered, on arm's length terms.

STEP 1: FORMATION OF THE FUND MANAGER

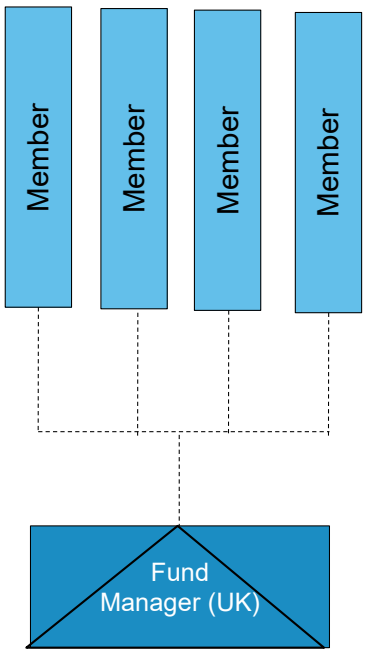


Figure 1: Formation of the Fund Manager

STEPS

The Fund Manager is established. Members identify a suitable existing Fund Manager in the UK or the Fund Manager is established as an English limited liability partnership ("LLP") or an English company.

KEY TAX CONSEQUENCES

UNITED KINGDOM

No adverse tax consequences are anticipated in the UKbecause of the implementation of this step. The Fund Manager, if established as an English LLP, will be "tax transparent" for UK tax purposes, meaning that the Fund Manager will generally not be liable to UK tax on its income, profits, and gains. If it is established as an English company, it will be subject to United Kingdom corporation tax, the rate of which is currently 20%, and will fall to 19% for the financial years starting 1 April 2017, 2018, and 2019, and to 17% for the financial year starting 1 April 2020.

MAURITIUS

No adverse tax consequences are anticipated in Mauritius because of the implementation of this step.

NEPAL

No adverse tax consequences are anticipated in Nepal because of the implementation of this step.

STEP 2: FORMATION OF THE ADVISOR

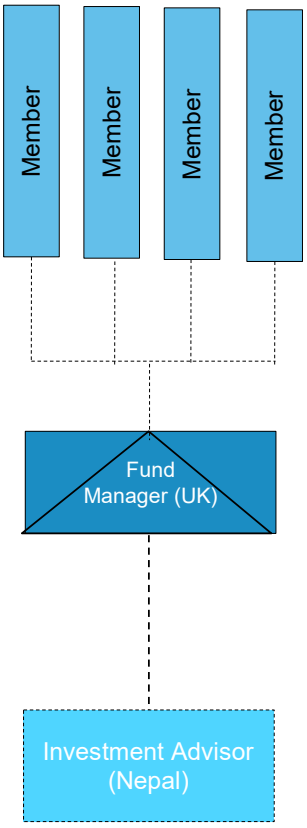


Figure 1: Formation of Investment Advisor

STEPS

If a separate Investment Adviser is required on the ground in Nepal, the Fund Manager can use services of an existing Investment Adviser in Nepal or can incorporate a company in Nepal as the Investment Adviser.

NOTE: If an Investment Adviser in Nepal is not required, then the Fund Manager will provide both fund management and investment advisory services to the Fund.

KEY TAX CONSEQUENCES

UNITED KINGDOM

No adverse tax consequences are anticipated in the United Kingdom because of the implementation of this step.

MAURITIUS

No adverse tax consequences are anticipated in Mauritius because of the implementation of this step.

NEPAL

No adverse tax consequences are anticipated in Nepal because of the implementation of this step.

STEP 3: FORMATION OF THE FUND

STEPS

- The Fund is established. It can be established as an English limited partnership ("LP") or an English company.
- Agreements are entered into between the Fund Manager and the Fund (the "Fund Management Agreement") and between the Investment Adviser and the Fund Manager (the "Investment Advisory Agreement").

KEY TAX CONSEQUENCES

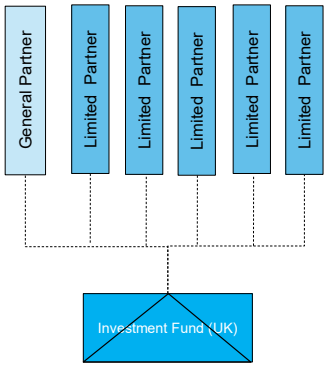


Figure 1: Formation of the Fund

UNITED KINGDOM

No adverse tax consequences are anticipated in the UK because of the implementation of this step. The Fund Manager, if established as an English LLP, will be "tax transparent" for UK tax purposes, meaning that the Fund Manager will generally not be liable to UK tax on its income, profits, and gains. If it is established as an English company, it will be subject to United Kingdom corporation tax, the rate of which is currently 20%, and will fall to 19% for the financial years starting 1 April 2017, 2018, and 2019, and to 17% for the financial year starting 1 April 2020.

MAURITIUS

No adverse tax consequences are anticipated in Mauritius because of the implementation of this step.

NEPAL

No adverse tax consequences are anticipated in Nepal because of the implementation of this step.

FIGURE 5: ENGLISH LIMITED PARTNERSHIP FUND VEHICLE STRUCTURE

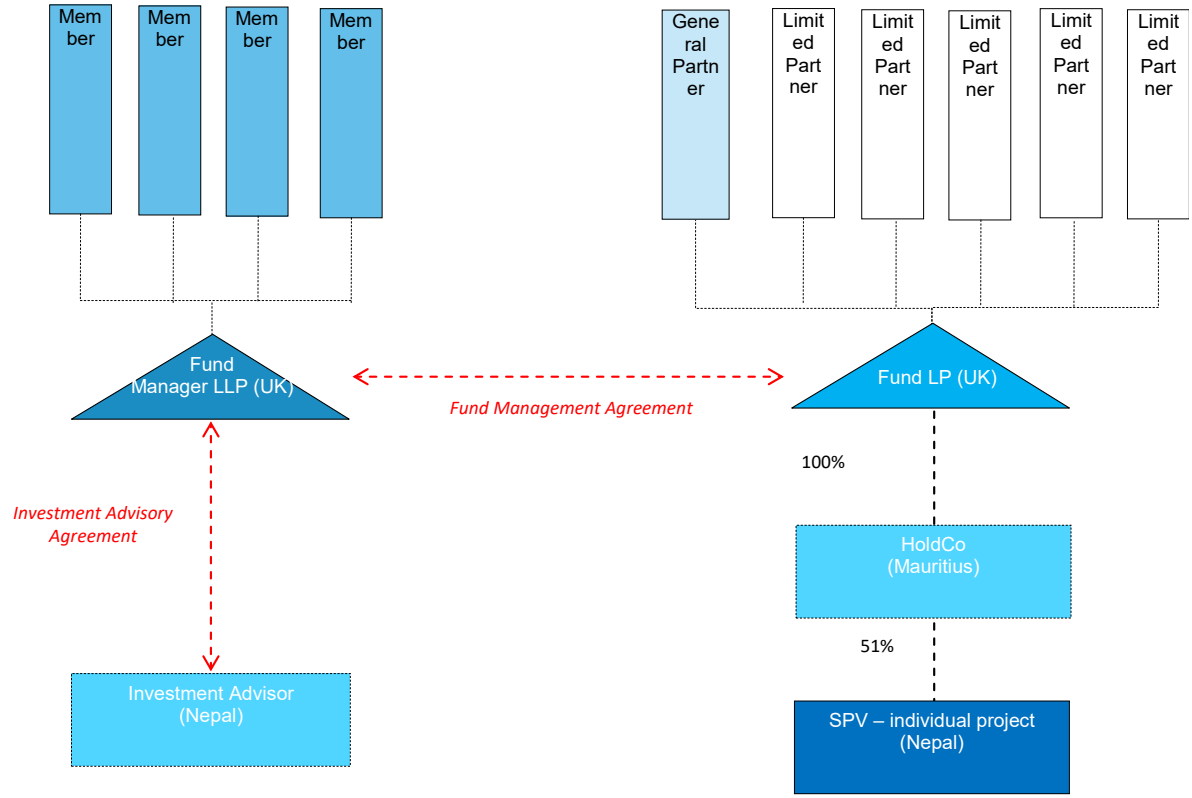
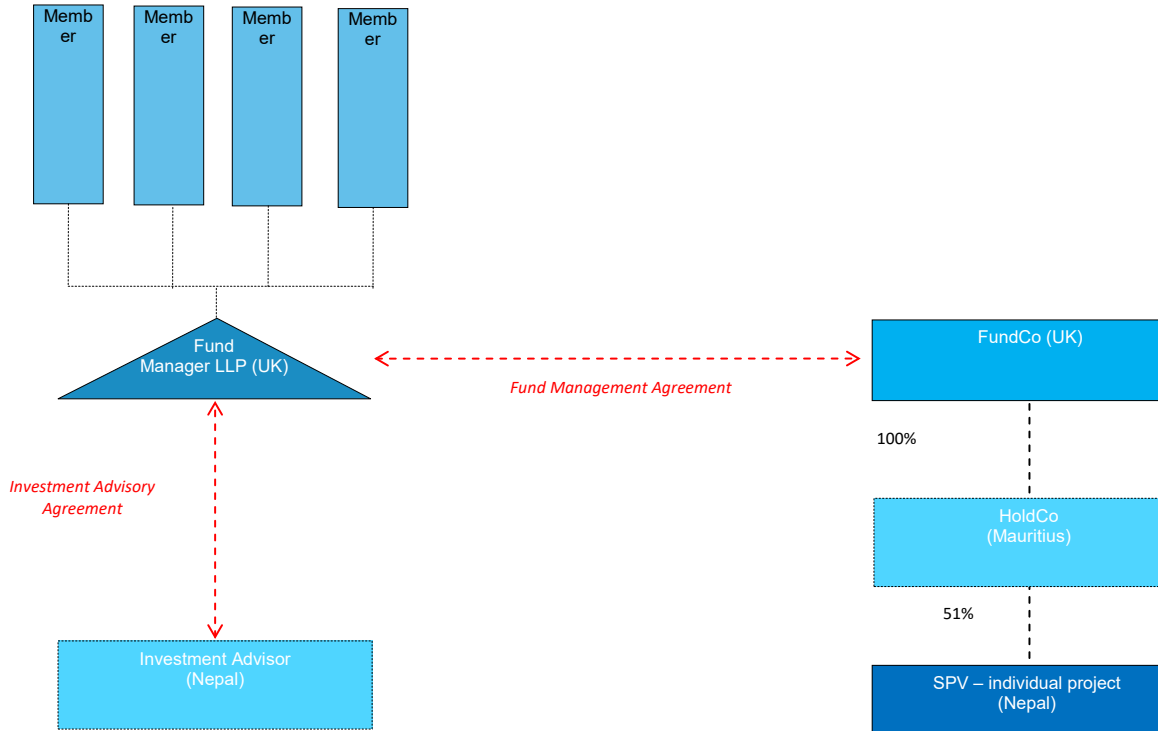


FIGURE 6: UK COMPANY FUND VEHICLE STRUCTURE



STEP 4: FUND INCORPORATES HOLDCO

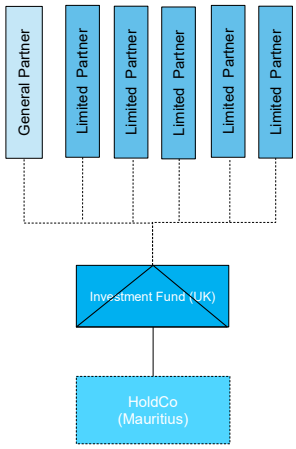


Figure 1: Fund Incorporates Holdco

STEPS

1. The Fund incorporates a company in Mauritius to act broadly as the holding company of the Fund's investments in Nepali assets ("HoldCo").
2. HoldCo applies to the Mauritius Financial Services Commission (the "FSC") for a Category 1 Global Business Licence ("GBL-1").

KEY TAX CONSEQUENCES

UNITED KINGDOM

No adverse tax consequences are anticipated in the United Kingdom because of the implementation of this step.

MAURITIUS

No adverse tax consequences are anticipated in Mauritius because of the implementation of this step.

NEPAL

No adverse tax consequences are anticipated in Nepal because of the implementation of this step.

STEP 5: HOLDCO INCORPORATES DEVCO AND YIELDCO AND ACQUIRES SHARES IN SPV

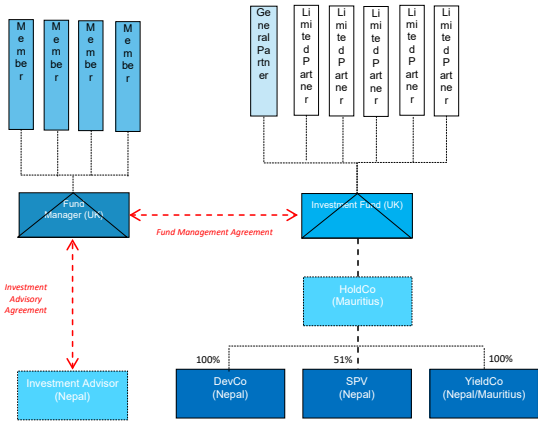


Figure 1: Holdco Incorporates Devcoand Yieldcoand Acquires Shares in SPV

STEPS

- HoldCo incorporates DevCo in Nepal.
- HoldCo incorporates YieldCo in Mauritius/ Nepal (see note below) to hold the renewable energy asset in the long-term.
- HoldCo acquires shares in a Nepali company ("SPV"), thereby entitling it to 51% of SPV. Local investors hold the remaining 49%.
- SPV acquires the rights to the renewable energy project and DevCo enters into construction contracts, procurement contracts etc. to construct and develop the asset.

KEY TAX CONSEQUENCES

UNITED KINGDOM

No adverse tax consequences are anticipated in the United Kingdom because of the implementation of this step.

MAURITIUS

No adverse tax consequences are anticipated in Mauritius because of the implementation of this step.

NEPAL

No adverse tax consequences are anticipated in Nepal because of the implementation of this step.

STEP 6: YIELDCO ISSUES GREEN BONDS

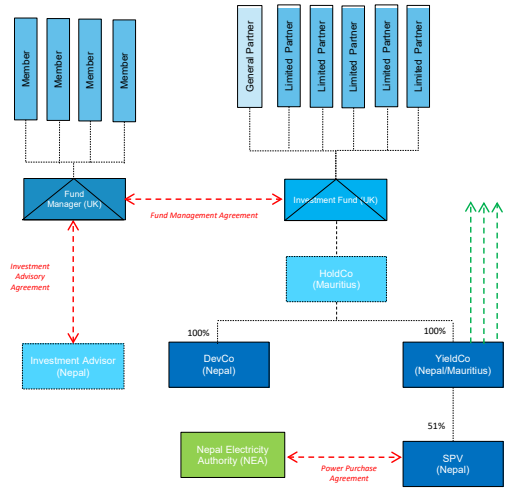


Figure 1: Yieldco Issues Green Bonds

STEPS

1. YieldCo issues green bonds to long-term investors such as pension funds, asset managers, and insurers.
2. YieldCo uses the proceeds to acquire the 51% shareholding in SPV from HoldCo. As a result, YieldCo holds the renewable energy asset.

KEY TAX CONSEQUENCES

UNITED KINGDOM

No adverse tax consequences are anticipated in the United Kingdom because of the implementation of this step.

MAURITIUS

No adverse tax consequences are anticipated in Mauritius because of the implementation of this step.

NEPAL

No adverse tax consequences are anticipated in Nepal because of the implementation of this step.

IMPLICATIONS OF NCELL CAPITAL GAINS CASE

Teliasonera divested holdings in Ncell by selling its 60.4% of Reynold holdings (an offshore entity in Nepal) to Axiata. Nepali tax authorities raised capital gains tax obligations on TeliaSonera. However, TeliaSonera refused to accept the tax obligationsby pointing to Nepal's double taxation agreement with Norway, in which Nepal has waived its right to tax gains from sale of shares owned by a Norwegian entity.

The Ncell caseset a precedent that offshore transactions of Nepali underlying assetsmay be taxable in Nepal. Investors should factor this into their legal structuring. A direct divestment of their interest in a Nepali entity would be far less complicated in terms of tax matters compared to the divestment of their shares in the offshore entity.

Table 8:Investment-Related Instruments

No.	Short title	Date of signing	Level	Type
1	Fifth Protocol to GATS			
1997	Multilateral	Intergovernmental agreements		
2	Fourth Protocol to GATS	1997	Multilateral	Intergovernmental agreements
3	TRIPS			
1994	Multilateral	Intergovernmental agreements		
4	TRIMS			
1994	Multilateral	Intergovernmental agreements		
5	GATS	1994	Multilateral	Intergovernmental agreements
6	MIGA Convention			
1985	Multilateral	Intergovernmental agreements		
7	ICSID Convention			
1965	Multilateral	Intergovernmental agreements		
8	New York Convention	1958	Multilateral	Intergovernmental agreements
9	UN Code of Conduct on Transnational Corporations	1983	Multilateral	Draft instruments
10	UN Guiding Principles on Business and Human Rights	2011	Multilateral	Guidelines, principles, resolutions and similar
11	ILO Tripartite Declaration on Multinational Enterprises	2006	Multilateral	Guidelines, principles, resolutions and similar
12	Doha Declaration	2001	Multilateral	Guidelines, principles, resolutions and similar
13	ILO Tripartite Declaration on Multinational Enterprises	2000	Multilateral	Guidelines, principles, resolutions and similar
14	Singapore Ministerial Declaration	1996	Multilateral	Guidelines, principles, resolutions and similar
15	World Bank Investment Guidelines	1992	Multilateral	Guidelines, principles, resolutions and similar
16	ILO Tripartite Declaration on Multinational Enterprises	1977	Multilateral	Guidelines, principles, resolutions and similar
17	New International Economic Order UN Resolution			
1974	Multilateral	Guidelines, principles, resolutions and similar		
18	Charter of Economic Rights and Duties of States	1974	Multilateral	Guidelines, principles, resolutions and similar
19	Permanent Sovereignty UN Resolution	1962	Multilateral	Guidelines, principles, resolutions and similar

ANNEXURE 1: INVESTMENT-RELATED INSTRUMENTS

Dividends

<table>
<tr><td colspan="11">Taxable also in Nepal if companies from another country directly holds</td></tr>
<tr><td></td><td>Mauritius</td><td>China</td><td>India</td><td>Sri Lanka</td><td>Pakistan</td><td>Korea</td><td>Thailand</td><td>Austria</td><td>Norway</td><td>Qatar</td></tr>
<tr><td>At least 25% of capital/ shares of Nepali entity</td><td rowspan="2">5%</td><td rowspan="4">10% of gross divi-dends</td><td rowspan="4">5%</td><td rowspan="4">15% of gross divi-dends</td><td rowspan="4">10%</td><td>5%</td><td rowspan="2">15%</td><td>5%</td><td>5%</td><td rowspan="4">10% of gross dividends</td></tr>
<tr><td>At least 15% of capital/ shares of Nepali entity</td><td rowspan="2">10%</td><td rowspan="2">10%</td><td rowspan="2">10%</td><td rowspan="2">10%</td></tr>
<tr><td>At least 10% of capital/ shares of Nepal entity</td><td>10%</td><td rowspan="2">Taxable in Nepal</td></tr>
<tr><td>Other case</td><td>15%</td><td>10%</td><td>15%</td><td>15%</td><td>15%</td><td>15%</td></tr>
</table>

Royalties

Rate of tax in Nepal as a percentage of gross amount of royalties										
	Mauritius	China	India	Sri Lanka	Pakistan	Korea	Thailand	Austria	Norway	Qatar
Tax rate	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%

Interest

Maximum rate of taxation as a percentage of interest amount										
	Mauritius	China	India	Sri Lanka	Pakistan	Korea	Thai-land	Austria	Norway	Qatar
Entity is a financial institution (including insurance)	NA	NA	NA	NA	NA	NA	15% of gross amount	NA	NA	NA
Entity is a banking business	NA	NA	NA	10%	NA	NA	NA	10%	10%	NA
Entity in other country is an investment company receiving income from financial investments (in the form of debentures or otherwise)	10%	NA	NA	NA	10%	NA	NA	NA	NA	NA
Any other case	15%	10% of gross amount	10% of gross amount	15% of gross amount	15%	10% of gross amount	10%	15% of gross amount	15% of gross amount	10% of gross amount

Capital Gains

		Mauritius	China	India	SriLanka	Pakistan	Korea	Thailand	Austria	Nor-way	Qatar
A) Are capital gains from the alienation of shares/capital stock of the Nepali entity held by the other entity taxable											
i)	In Nepal only	NA	No	No	No	No	No	NA	NA	No	Yes
ii)	In Nepal but										
	the property of such Nepali entity consists mainly of immovable property	NA	Yes	Yes	NA	Yes	Yes	NA	NA	NA	NA
	Such shares repre-sent 25% or more of the shareholding/ voting rights of the Nepalientity	NA	Yes	NA	Yes	Yes	NA	NA	NA	NA	NA
iii)	Taxable in another country only	NA	Yes	Yes	Yes	Yes	Yes	NA	Yes	Yes	No
B) Are capital gains of an entity based in another country from the alienation of movable property situated in Nepal											
i)	Taxable in Nepal	NA	NA	NA	NA	NA	NA	Yes	NA	NA	NA
II)	Taxable in another country only	Yes	NA	NA	NA	NA	NA	NA	NA	NA	NA

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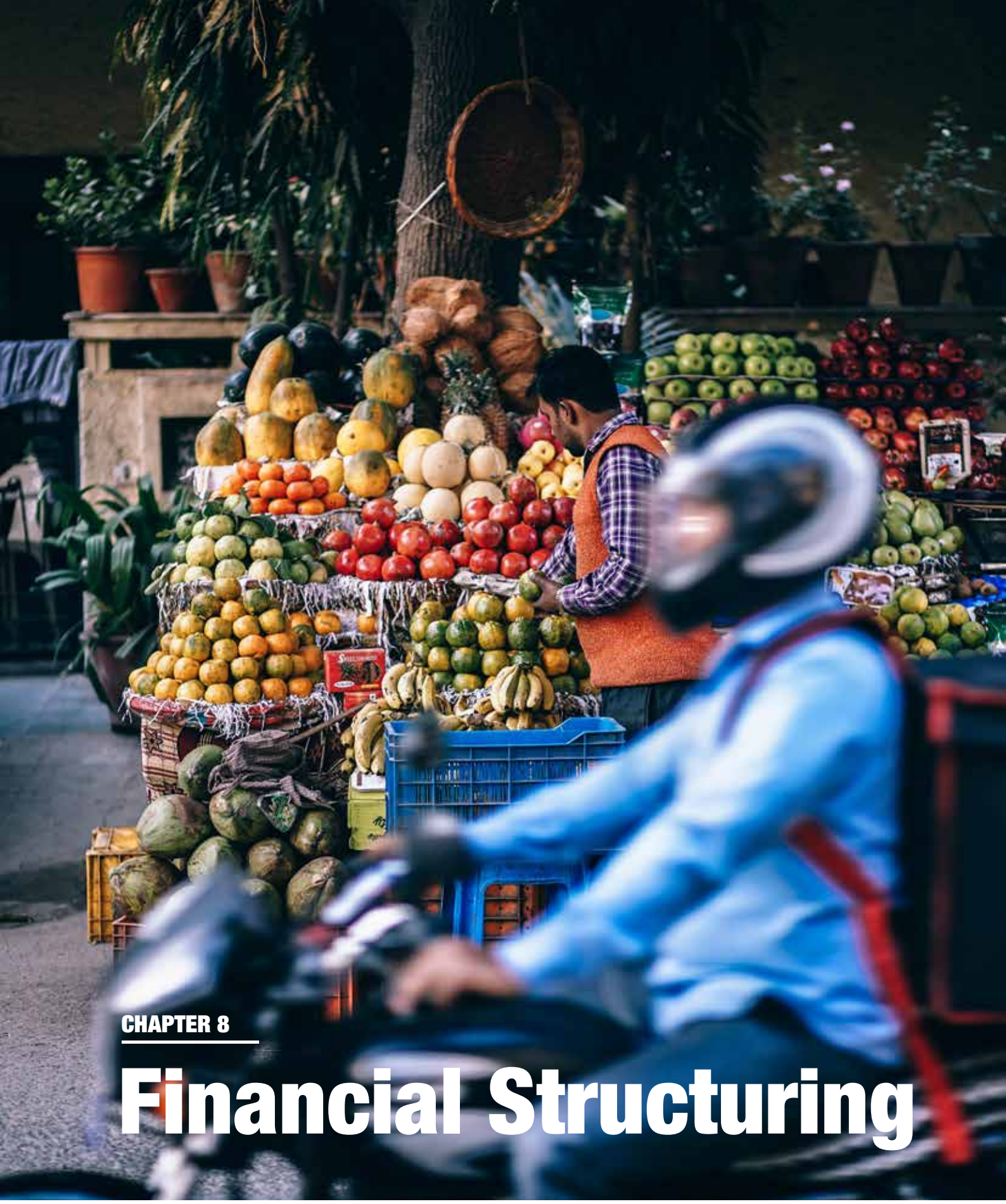
CHAPTER 8

While large-scale renewable energy investments in developing markets make sense in theory, are they financially viable? This chapter take a closer look at institutions that could be a potential source of financing and likely project returns.



CHAPTER 8

Financial Structuring

UKaid
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dolma foundation

CHAPTER 8

Financial Structuring

ABBREBIATIONS

TABLES

FIGURE

ABBREVIATIONS

ADB	ASIAN DEVELOPMENT BANK
BAFIA	BANKS AND FINANCIAL INSTITUTION ACT
BN	BILLIONS
CAD	CANADIAN DOLLAR
CIT	CITIZEN INVESTMENT TRUST
DECC	DEPARTMENT OF ENERGY AND CLIMATE CHANGE
DFID	DEPARTMENT FOR INTERNATIONAL DEVELOPMENT
DIF	DOLMA IMPACT FUND
DOI	DEPARTMENT OF INDUSTRIES
EPF	EMPLOYEES PROVIDENT FUND
EUR	EURO
FDI	FOREIGN DIRECT INVESTMENTS
FITTA	FOREIGN INVESTMENT AND TECHNOLOGY TRANSFER ACT
GEF	GLOBAL ENVIRONMENT FACILITY
GEF	GLOBAL ENVIRONMENT FACILITY
GON	GOVERNMENT OF NEPAL
HIDCL	HYDROELECTRICITY INVESTMENT AND DEVELOPMENT COMPANY LIMITED
IBRD	INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT
IDA	INTERNATIONAL DEVELOPMENT ASSOCIATION
IFC	INTERNATIONAL FINANCE CORPORATION
IPO	INITIAL PUBLIC OFFERING
IRR	INTERNAL RATE OF RETURN
LDC	LEAST DEVELOPED COUNTRIES
LP	LIMITED PARTNER
MDB	MULTILATERAL DEVELOPMENT BANKS
MIGA	MULTILATERAL INVESTMENT GUARANTEE AGENCY
MN	MILLIONS
MW	MEGAWATTS
NEA	NEPAL ELECTRICITY AUTHORITY
NPR	NEPALESE RUPEES
NRB	NEPAL RASTRA BANK
ODA	OFFICIAL DEVELOPMENT ASSISTANCE
OTC	OVER THE COUNTER
PE	PRIVATE EQUITY
PIDG	PRIVATE INFRASTRUCTURE DEVELOPMENT GROUP
PPA	POWER PURCHASE AGREEMENT
REDD	REDUCING EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION
SEBON	SECURITIES BOARD OF NEPAL
SID	SMALL ISLAND DEVELOPING
SIRR	SECURITIES ISSUE AND REGISTRATION RULES
SPV	SPECIAL PURPOSE VEHICLE
TCX	THE CURRENCY EXCHANGE FUND
UNDP	UNITED NATIONS DEVELOPMENT PROGRAM
UNFCC	UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE
USD	UNITED STATES DOLLARS
VAT	VALUE ADDED TAX

1.1 INTRODUCTION

Financial structuring is an important part of setting up an energy project anywhere in the world.It is important to understand the regulatory scene and the financial ecosystem players.This report explores key regulated and non-regulated institutions that could be a potential source of financing for energy projects in Nepal.

As with the development of any energy project, not least in Nepal, there will always be perceived risks held by investors, some of which include: currency fluctuation risk, tax risks and benefits, credit risk of the project and the country, among other things. This reportexamines potential solutions to these key issues in Section 1.3.

1.2 FINANCIAL REGULATORY OVERVIEW OF NEPAL

FINANCIAL REGULATION IN NEPAL

Nepal's central bank, Nepal Rastra Bank (NRB),was established in 1956. Nepal currently has three major bodies thatregulate the financial sector.

TABLE 1: MAJOR REGULATORS IN FINANCIAL SERVICES INDUSTRY

Regulators	Date Established	Role
Nepal Rastra Bank	1956	Formulate monetary and foreign exchange policies; regulate commercial banks, development banks, and finance companies
Insurance Board	1992	Regulate the insurance industry
Securities Board of Nepal (SEBON)	1993	Regulate the securities market and its components (stock exchange, stock brokers, dealers, merchant banks, and fund managers)

PRIVATE EQUITY

Nepal is yet to formulate specific regulatory provisions for onshore private equity funds that invest in private companies. Legal provisions and requirements applicable in the context of settingup, operation, and exits of the PE Funds are found in different laws.

Three different structures can be used to invest PEin Nepal:

a) Offshore PE Funds (funds registered and organised outside of Nepal)
b) Foreign Onshore PE Funds (funds registered in Nepal after obtaining regulatory approvals, including approvals for foreign investments)
c) Domestic Onshore Funds, fully owned by local investors, which can invest in Nepali portfolios and targets after obtaining local approvals and clearing regulatory procedures

TABLE 2: OFFSHORE VS ONSHORE FUND

	Offshore fund	Onshore fund
Requirement of Regulatory Approvals	Regulatory Approval will be required for– (a) each investment in target companies, (b) sale of each investment in target companies, and (c) repatriation of dividend or investment capital.	Regulatory approvals will be required only for the formation of an Onshore Vehicle. No regulatory approvals will be required for investments in target companies. The regulatory approvals will be needed only for – (a) the sale of the interest in the Onshore Vehicle and (b) distribution of dividends by the Onshore Vehicle.
Forms of the Investment in the Target	Investments may be in the form of equity or loans.The loan investment may be subject to regulatory terms such as rate of interest that can be charged and other policy changes from NRB.	Investments can be made only in the shares of target companies. Investments in the form of loans may be prohibited under the 2006 Bank and Financial Institutions Act (BAFIA) as carrying out the financial transaction is reserved for licensed institutions.
Permitted Sectors of Investment	Offshore Vehicles will only be able to invest in target companies open to foreign investors, i.e. businesses/ targets not falling under the negative list of Foreign Investment and Technology Transfer Act (FITTA), 1992, and within the sector cap limit in the particular business.	Technically, investments made by Onshore Funds in target companies should not be considered foreigninvestment. However, there are instances when regulatory authorities have prohibited onshore business vehicles setup under foreign investment from investing in trading and other prohibited sectors

There are several private equity players already investing in renewable energy in Nepal:

INTERNATIONAL FINANCE CORPORATION (IFC)

The IFC (the investment arm of the World Bank) has been active in Nepal since 1956. To date, it has invested over USD 150 MNin Nepal in equity and debt. Its current portfolio stands at USD 40MN.

DOLMA IMPACT FUND (DIF)

Dolma Impact Fund is the first international private equity fund focused on Nepal. Since its launch in 2014, it has funded hydropower developments including Lower Likhu and Suri Khola (28.1 and 6.4 MW respectively). It also has investments in other sectors including healthcare, technology, and manufacturing.

EQUICAP (INFRACO ASIA)

Equicap is the fund manager for InfraCo South Asia and is active in Nepal in a few industries,including hydropower. Equicap holds a 45% stake in Kabeli A (38 MW) and 60% of the tariff for this project is in USD.

OTHERS

Local investors active in the energy sector in Nepal include Tara Management Pvt. Ltd.,which has invested in the Bhote Koshi Hydro Power Company. Hydroelectricity Investment and Development Company Limited (HIDCL) is a government-owned company investing in hydropower companies in Nepal.The company, though technically not a PE fund, was set up by the Government of Nepal (GoN) to invest in either debt or equity of companies involved in the generation, transmission, and distribution of electricity. HIDCL invests only in middle and large hydropower projects. As of July 2016, the company had committed to investing in 11 hydropower companies with a total capacity of 458 MW.

PERMITTED SECTORSFOR FOREIGN DIRECT INVESTMENTS (FDI)

The Foreign Investment and Technology Transfer Act (FITTa) and Industrial Enterprises Act regulate Foreign investment in Nepal. The Department of Industry administers and implements this Act.According to FITTA, all but 21 industries (listed in Annex 1) are open to 100% foreign equity investment. The energy sector is open to 100% foreign ownership.

NEPAL STOCK EXCHANGE

The Nepal Stock Exchange (NEPSE) began trading in 1994. As on July 16, 2018 (end of Nepalese FY 2017-18), there are 210 listed companiescomprising mainly commercial banks, insurance companies, finance companies, and hydropowerprojects/developers. As of July 16, 2018,the market capitalisation of NEPSE stood at ~USD 13.05bn.

As of 31 August 2018, 19 hydropower companies were listed in NEPSE. The total market capitalisation of the hydropower sector was USD 613 MN(NPR 63 BN), trading at an average of USD 3.17 (NPR 320) per share. NEPSE provides concessions that allow hydro projects to raise up to 30% in equity during construction. The stock exchange is a viable exit route for hydro investors.

TABLE 3: LISTED HYDROPOWER DEVELOPERS IN NEPAL

No.	Stock Name	Market cap (USD mn)	Average Returns				P/E ratio
			6 year (2012–18)	4 year (2014–18)	2 year (2016–18)	1 year (2017–18)	
1	Api Power Company Ltd.	29.29			-38%	-43%	75.22
2	Arun Kabeli Power Ltd.	35.47				-36%	<0
3	Arun Valley Hydropower Development Co. Ltd.	12.98	5%	-9%	-33%	-39%	34.36
4	Barun Hydropower Co. Ltd.	3.48			-43%	-37%	20.09
5	Butwal Power Company Limited	75.26	9%	-10%	-16%	-12%	13.51
6	Chhyangdi Hydropower Ltd.	3.22				*	48.55
7	Chilime Hydropower Company Limited	284.92	19%	-15%	-16%	15%	30.03
8	Dibyashwori Hydropower Ltd.	2.59				-52%	(13.52)
9	Himalayan Power Partner Ltd.	27.52				*	Not Available
10	Khanikhola Hydropower Co. Ltd.	4.53				-49%	(3.07)
11	National Hydro Power Company Limited	10.84	8%	-20%	-34%	-35%	726.99
12	Nepal Hydro Developers Ltd.	3.97				*	21.03
13	Ngadi Group Power Ltd.	7.94			-20%	-31%	16.34
14	Radhi Bidyut Company Ltd	9.03				*	19.63
15	Rairang Hydropower Development Company Ltd.	7.54				*	Not Available
16	Ridi Hydropower Development Company Ltd.	5.60		-17%	-39%	-40%	409.41
17	Sanima Mai Hydropower Ltd.	62.95		-8%	-25%	-49%	20.18
18	Synergy Power Development Ltd.	7.90				*	37.84
19	United Modi Hydropower Ltd.	17.99				-50%	28.60

*Does not have a trading history for a full financial year.

TABLE 4: COMPARISON WITH NATIONAL AND INTERNATIONAL COMPANIES ENERGY COMPANIES

No.	Company/Industry	Market Cap (USD mn)	Average Return			P/E ratio
			5 year (2012–18)	3 year (2014–18)	1 year (2016–18)	
	Non-energy companies in Nepal					
1	NABIL Bank/Banking	652.7	12.6%	2.6%	-20.2%	18.3
2	Life Insurance Corporation of Nepal/Insurance	190.8	34.6%	7.3%	2.6%	197.2
3	Nepal Doorsanchar Company Ltd/Telecom	953.0	12.1%	10.3%	15.5%	6.9
4	Oriental Hotels Ltd./ Hotels	42.9	49.0%	11.8%	-5.0%	16.8
5	Nepal Life Insurance Co. Ltd./Insurance	406.8	36.0%	-6.3%	-29.3%	96.3
6	Soaltee Hotel Limited/ Hotels	142.61	27.6%	-1.6%	-20.7%	7.6
	Energy companies in India		2013–18	2015–18	2017–18	
7	TATA Power	3,277.8	-1.3%	3.0%	-11.0%	4.91
8	SJVN	2,005.2	20.1%	19.8%	11.5%	9.08
9	JP Power	440.6	-28.7%	-22.2%	-4.8%	N/A
10	Reliance Power	1,554.1	-10.2%	-13.7%	-24.9%	18.22
11	JSW Energy	1,826.6	8.3%	-14.0%	16.9%	115.15
	Other international energy companies2		2013–17	2015–17	2017	
12	Synex International (TSX, Canada)	18.1	1.78%	1.43%	9.44%	N/A
13	Pattern Energy Group Inc (NASDAQ, USA)	2,111.8	NA	0.28%	25.95%	14.62
14	Terraform Power Inc (NASDAQ, USA)	2,500.4	NA	-22.30%	8.19%	N/A

Year on year returns have been computed for:

- Nepali companies fora Nepali Financial year (starting from mid-July)
- Indian Companies for an Indian Financial year (starting from April)
- Other international companies for a calendar year

PROCESS TO LIST ENERGY COMPANIES IN NEPSE

As per the 2016 Securities Registration and Issue Regulation, companies should comply with certain clauses when they are listed.These clauses can be grouped into five different categories.

Licenses- and permits-related clause	Shares-related clause
All the required licenses and permits should have been obtained	Financial closure of the project is completed
Completed the power purchase agreement with the NEA	Shares taken by promoters should be fully paid up
	Company to agree on a debt to equity ratio of not more than 70:30 during the construction phase of the project

Operations-related clause	Public issues-related clause
Adequate provisions for land and building of office, factory, storage facilities, and other required facilities	Contract with merchant bankers to act as issue managers for the IPO
Process for acquiring plant and equipment for manufacturing facilities should have started (for example bids and tenders for plants, other facilities)	At least 50% of shares to be issued to the public should be underwritten
The company should be in operation for at least a year	

Others
The IPO should make up a minimum of 10% and a maximum of 49% of the issued capital of the company
Audited financial statement and concluded general meeting as per prevailing law

COMMERCIAL BANKS

Deposits in the banking system grew by 19% last yearbetween mid-July 2017and mid-July 2018.With an estimated 20% annual growth in the total deposit in the banking system expected in the coming 10 years, deposits available in the system are estimated to beUSD114.92BN (at the mid-July 2018 exchange rate) from a current amount ofUSD 25.8BN (mid-July 2018). The banking system could add a total credit to the hydropower portfolio of USD 4.46 BNassuming that 5% of total new available lending would be directed to hydropower financing in the next 10 years.

TABLE 5: TOP 5 CLASS A COMMERCIAL BANKS IN NEPAL

S.N	Bank	Deposits (USD mn)
1.	Rastriya Banijya Bank Limited	1,297
2.	Nepal Investment Bank Limited	1,148
3.	Nabil Bank Limited	1,122
4.	Himalayan Bank Limited	890
5.	Everest Bank Limited	899

EMPLOYEES PROVIDENT FUND

The members of the Employees Provident Fund (EPF)are employees of the Government of Nepal, Nepal Army, Nepal Police and Armed Police Force, government schools, and other government institutions. As of July 2016, EPF had a total deposit of ~USD 2.01bn from its members and had a loan portfolio of ~USD 243 mn. The fund provided ~USD 69 mn of debt facilities to upper Tamakoshi, Rasuwagadhi, middle Bhotekoshi, and Syanjen Hydropower.

CITIZEN INVESTMENT TRUST

Citizen Investment Trust (CIT) manages an insurance fund for employees of the Government of Nepal, Nepal Army, Nepal Police and Armed Police Force, government schools, and other government institutions. It also manages pension funds for employees of some private employers. As ofmid-July 2018, CIT had a total ~ USD 945 MN assets under management. Its portfolio includes Nepal government bonds, fixed deposits with banks, loans, and investment in equities. It has invested in the Hydroelectricity

Investment and Development Company Ltd. and the Upper Tamakoshi hydropower project.

KEY EXIT ISSUES FOR INTERNATIONAL INVESTORS

LOCK-IN PERIOD ON IPO ISSUE

As per Security Issue and Registration Rules (SIRR), pre-IPO shares of the promoters are subject to a lock-in period of three years post-IPO. This may not be suitable for institutional investors who may want to exit the market after the initial offering or after the project is commissioned.

VALUATION AT EXIT

Nepal Rastra Bank has issued a circular that requires a non-listed company to determine the value of shares based on a fair value of assets and liabilities pursuant to the Nepal Financial Reporting Standard 3: Business Considerations. This puts a potential cap on the valuation that a non-listed company can seek from potential investors. Moreover, the method to value such companies might not be the most suitable and might be open to interpretation.

TAXATION IN CHANGE OF OWNERSHIP

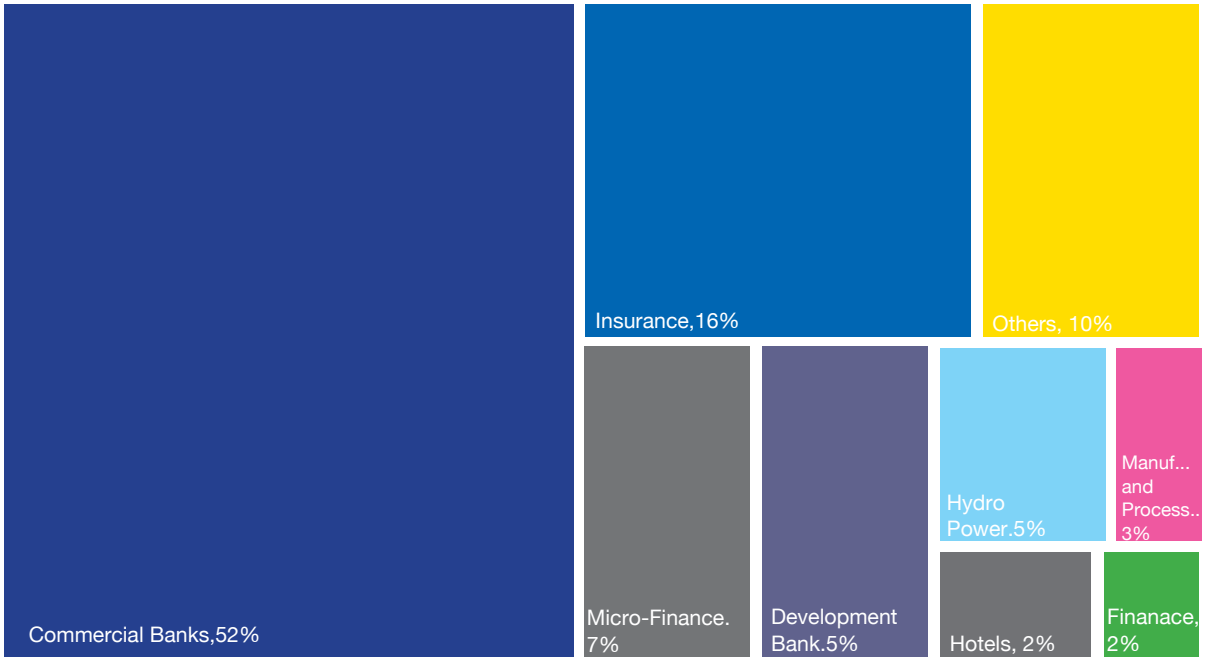
Companies that divest 50% of their shares within a period of three years may be denied tax benefits accumulated prior to divestment such as accumulated loss, accumulated interest expense, carried forward losses from disposal of assets, and other tax benefits. International investors would receive a lower valuation for their companies if such benefits are denied.

REPATRIATION ISSUES

The 1992 Foreign Investment and Technology Transfer Act allows a foreign investor to repatriate investment returns, dividends, principal repayments, and interest income from Nepal. However, practical issues such as submission of various documents, scrutiny at each level, added time, and constant follow-ups to the concerned authorities pose a potential hindrance to international investors. During a symposium on FDI in Nepal organised by the Indian embassy, Abhimanyu Poddar, CEO of Surya Nepal, voiced his concern about excess documentation required by regulatory authorities in Nepal delaying the repatriation process. Other hindrances investors could face include:

- Dual approval from DOI and NRB is required for repatriation but the law does notgive a fixed timeline for the authority to give these approvals. Hence, investors could face a lengthy wait before they receive approval.
- The current rules do not envisage the possibility of an interim dividend being paid. The requirement to submit annual audited financial statements and audit reports for repatriation of dividendsmay be a hindrance in the repatriation of an interim dividend.
- Any amount repatriated must be approved regardless of size. Regular principal and repayments also require approval before they are repatriated.

FIGURE 1: MARKET CAPITALISATION OF EACH SECTOR AS % OF TOTAL NEPALI STOCK MARKET CAPITALISATION

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NYK LOGISTICS

1.3 PROJECT FINANCE

Often, companies use the project finance structure to finance energy projects.Project finance:

- Is structured financing of a Special Purpose Vehicle (SPV or the project company); SPV assets are the only collateral for lenders
- Is created by sponsors
- Providesno recourse to shareholders; lenders consider cash flow the only source of loan repayment

CHALLENGES OF DEBT FINANCING IN ENERGY INFRASTRUCTURE FINANCE IN NEPAL

LIMITED TENOR AND FLOATING INTEREST RATES IN LONG-TERM LOAN

While the concession period of an energy project is generally 30 years from the COD or 35 years from the grant of generation license, the maximum tenor of debts given by the financial institutions in Nepal is 15 years. Similarly, banks collect most of their deposits for short periods of up to one year.Hence, it is very difficult for them to finance a fixed rate for the tenor of the loan. Therefore, infrastructure projects receive a floating interest rate, exposing them to potentially large interest rate volatility.

LIMITED CAPACITY OF BANKS TO LEND

Banks in Nepal do not have the capacity to lend to big energy projects. The Nepali banking system is characterised by highly volatile interest rates. The regulator (NRB) has a cap of 50% of the core capital of banks on single client lending in hydropower sector.

As of April 2018, even if all the Nepali banks were to form a consortium, they would be able to finance only2,000 MWs from a single hydropower developer (assuming 70% leverage and core capital of USD 2.86BN of all Nepali commercial banks as of mid-July 2018). Without a consortium, they would not be able to finance more than 75 MW with a single developer.

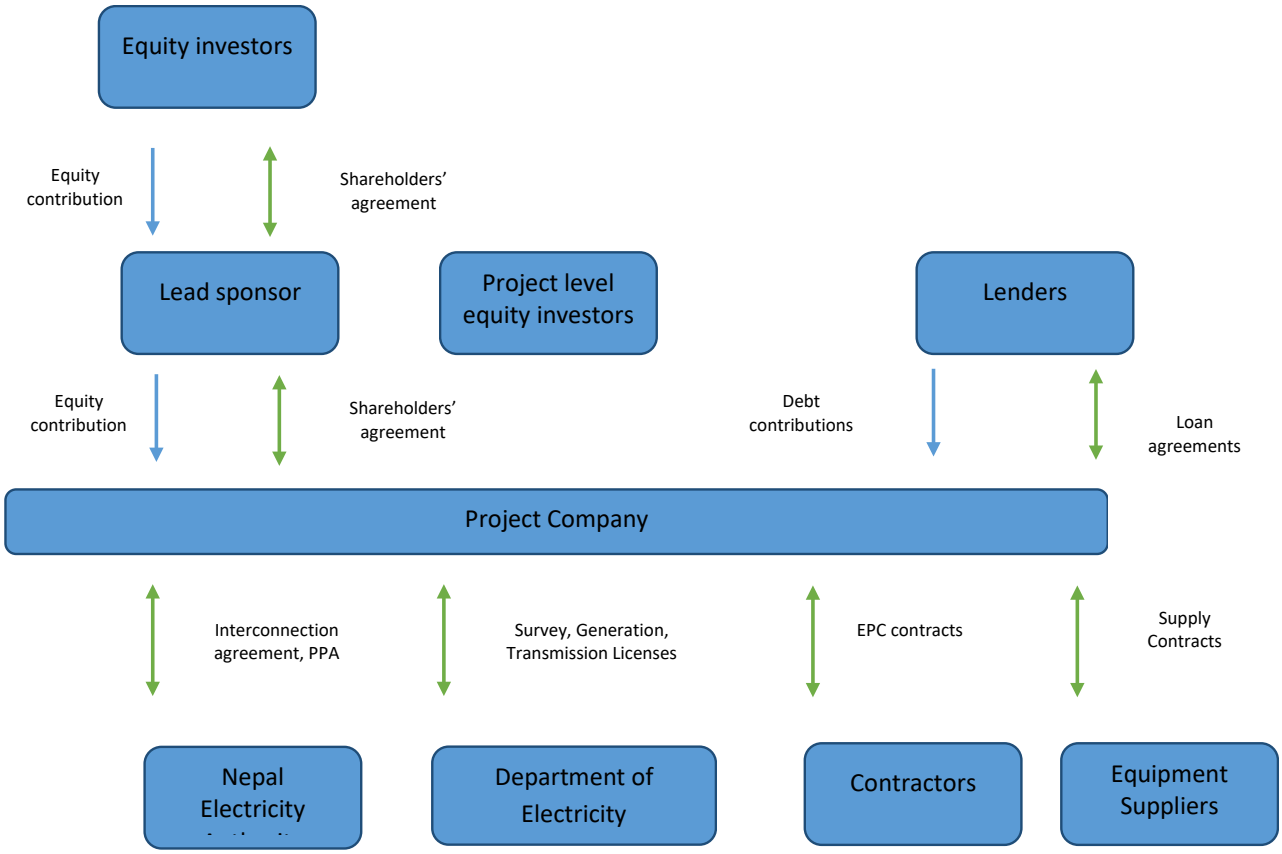
LIMITED SCOPE FOR CORPORATE BONDS

The market for corporate bonds in Nepal is nascent. Currently, only commercial banks have issued bonds with a maximum tenor of 10 years. However, unlike stocks, which are freely traded on the stock exchange, there is no trading mechanism for bonds. If the corporate bonds market develops in the coming years, it would help energy companies raise debt through this market.

PROJECT FINANCE: STRUCTURING OPTIONS FOR AN ENERGY PROJECT

This section evaluates how returns on energy projects change with different financial structures and instruments.Structuring options primarily consider debt and equity in offshore and onshore locations and use a combination of these to evaluate changes in returns. Here, an example energy project (run-of-river) that

FIGURE 2: TYPICAL PROJECT FINANCE STRUCTURE IN ENERGY SECTOR IN NEPAL



exceeds 100 MWis used as a model to analyse both USD and non-USD PPAs.Table 6 lists key assumptions used in the financial model.

TABLE 6: KEY ASSUMPTIONS USED IN FINANCIAL MODEL

Concession period	30 years		Terms of debt	12% for local debt, 8% for USD debt Tenor: 10 years
Construction cost per MW	USD 1.5 mn (~USD 1.6 mn including interest during construction)		O&M Expenses	1% of CAPEX cost
			NPR depreciation rate	3.35%
Financing	Debt equity ratio	70:30		
PPA rates	Wet season: NPR 4.8 Dry season: NPR 8.4 USD PPA for 10 years if financing structure has foreign debt		Escalation rate in PPA	3% p.a. for 8 years

CASE 1: FOREIGN EQUITY AND FOREIGN DEBT

With foreign equity and foreign debt, projects above 100 MW are eligible for a partial USD PPA as per government policy. There is no specific hedge for the equity portion; however, a partial USD PPA would help hedge some equity portions as foreign debt is repaid. Hence, equity IRR in USD terms is around 14%.

CASE 2: FOREIGN EQUITY AND LOCAL DEBT

As there is no foreign debt in the capital structure, this option would not be eligible for USD PPA. Hence, all the revenue would be generated in local currency, so equity returns in USD would be around 9.3% –lower than in Case 1.

Case 1 is characterised by increasing revenue for the first eight years because of an annual escalation clause. There is a sharp dip in revenue after year 10 as all PPAs are paid in local currency after that period. However, in Case 2revenue is decreasing even though it has the same eight years of escalation. This is because it is assumed the local currency willdepreciate at 3.35% per annum, which is more than the PPA escalation of 3% per annum. Hence, in USD terms, revenues gradually decrease over time.

Thus, it is preferable for foreign equity holders to have a foreign debt component in their capital structure to partially hedge equity for a few years.

CASE 3: LOCAL EQUITY AND FOREIGN DEBT

If local equity holders can raise foreign debt, then projectsbigger than 100 MW will be eligible for USD PPA. Unlike in Case 1 and Case 2, where we analysed returns in terms of USD, we will analyse returns for Case 3 and 4 in NPR as only local equity is used in the capital structure.

As in Case 1, the returns are higher in this case as well because of a partial USD PPA for the first 10 years of the concession period. The revenues in NPR show an upward trend because of both the escalation clause and depreciation of NPR against USD. The NPR IRR is around 18% in this case. Similarly, as opposed to Case 1 and 2, the revenues do not decrease rapidly over time as they are represented in local currency.

CASE 4: LOCAL EQUITY AND LOCAL DEBT

Local equity and local debt can entirely finance an energy project. However, these would not

be eligible for USD PPA. Hence, compared to Case 3, we can see that the rate of increase in revenue in year 1–10 is gradual. This is because revenue is affected only by the PPA escalation clause and does not benefit from the appreciation of the USD against NPR. Hence, equity IRR is around 13% for this case, which is lower than in Case 3.

SUMMARY OF RETURNS

	CASE 1: FOREIGN EQUITY AND FOREIGN DEBT	CASE 2: FOREIGN EQUITY AND LOCAL DEBT	CASE 3: LOCAL EQUITY AND FOREIGN DEBT	CASE 4: LOCAL EQUITY AND LOCAL DEBT
USD PPA	YES	NO	YES	NO
IRR	14% – USD	9.3% – USD	18% – NPR	13% – NPR

FIGURE 3: ANNUAL CASHFLOW – FOREIGN EQUITY AND FOREIGN DEBT

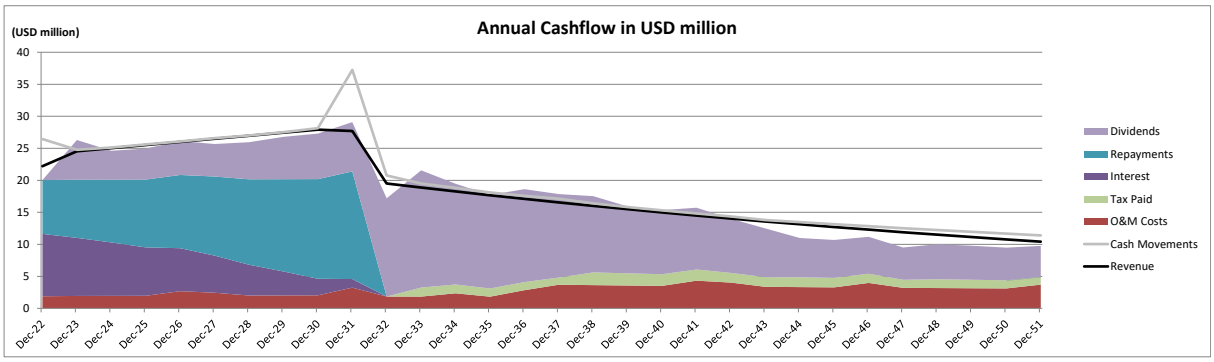


Figure 4: ANNUAL CASHFLOW – FOREIGN EQUITY AND LOCAL DEBT

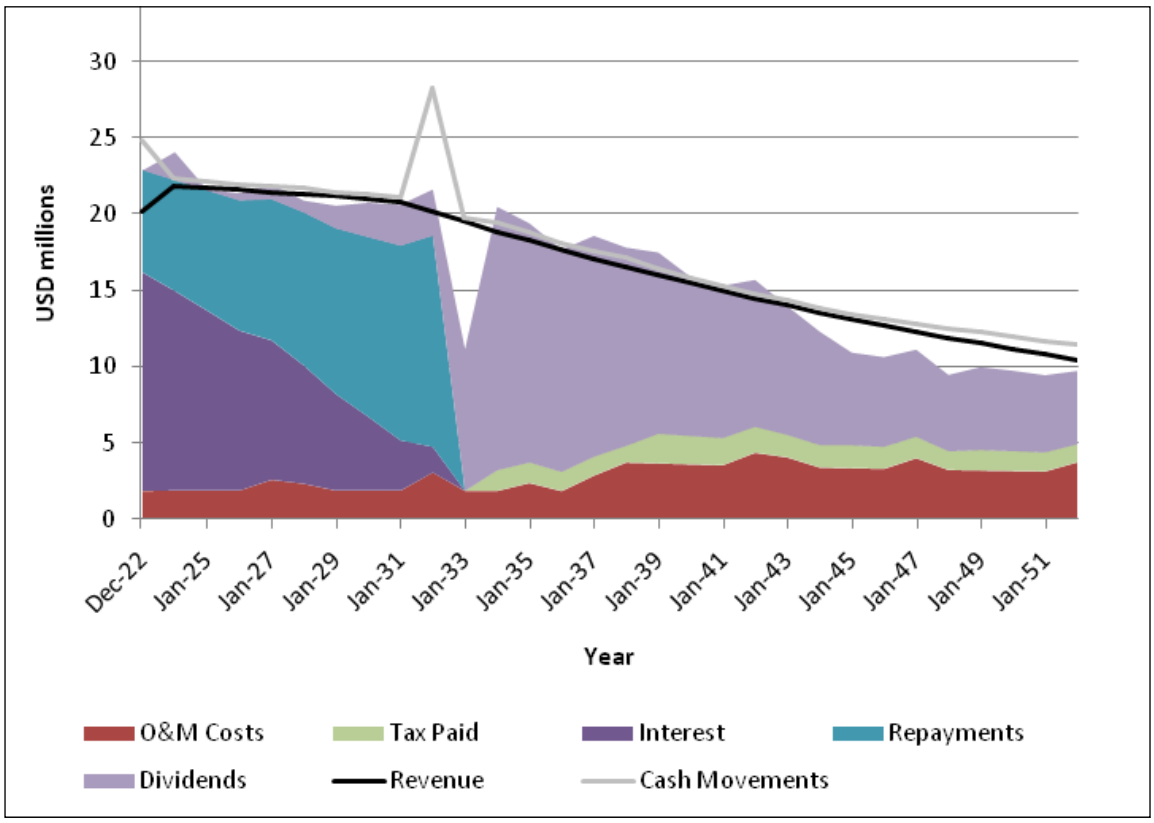


FIGURE 5: ANNUAL CASHFLOW – LOCAL EQUITY AND FOREIGN DEBT

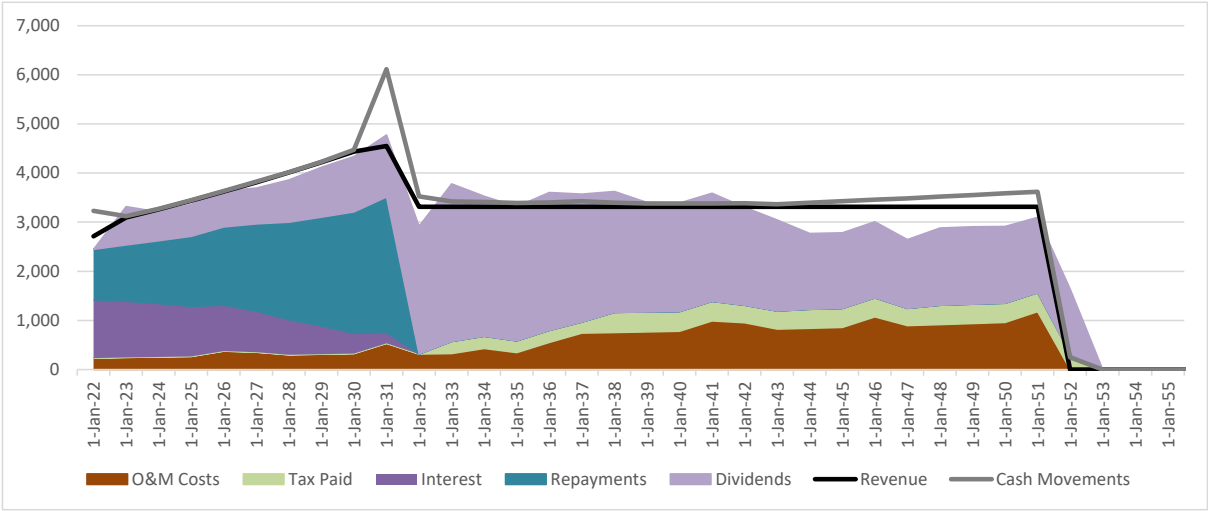
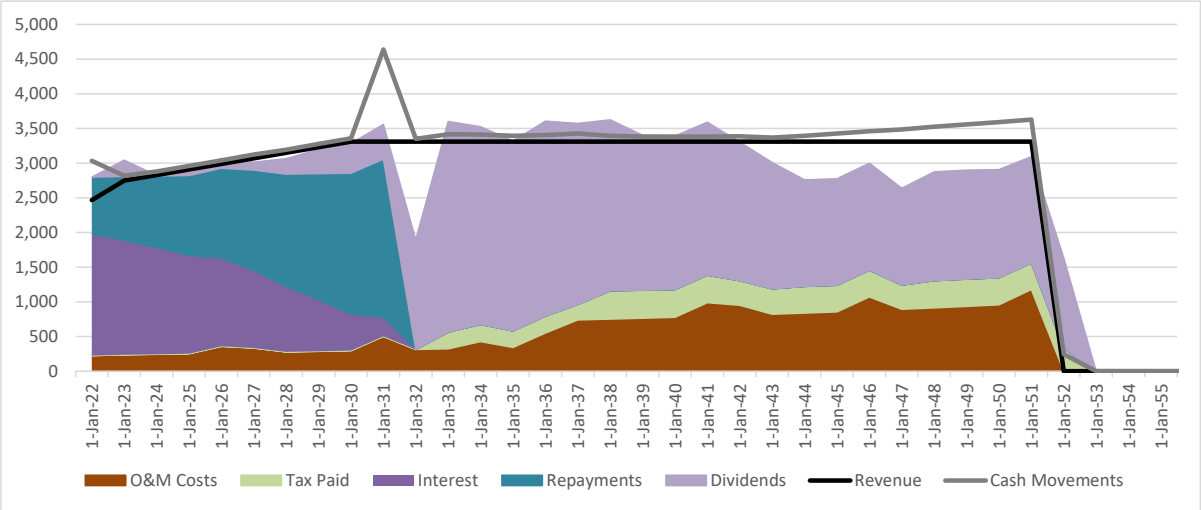


FIGURE 6: ANNUAL CASHFLOW - LOCAL EQUITY AND LOCAL DEBT



1.4 KEY FINANCIAL ISSUES FOR INVESTORS IN ENERGY PROJECTS

CURRENCY RISK AND HEDGING PRODUCTS

The NPR has a fixed exchange rate with the INR at 1 INR = 1.6 NPR. This peg has been in place since 1993. The Government of Nepal has maintained the peg to achieve macroeconomic and price stability as most of Nepal's trade is with India.

Because of the peg, currency fluctuations with respect to other currencies take place because of changes in the Indian economy and hence the INR. Over the last decade, the NPR has depreciated significantly against the USD and it currently trades at 1 USD = NPR 110 (July 2018).

Thus, should international investors invest in Nepal, they face two types of currency risks:

- A general currency fluctuation risk with all currencies
- Risk of changes in the peg level with INR

However, the current peg level has been maintained since 1993 and is not expected to change in the short-or medium-term. Directors of the IMF agree that the peg to the Indian rupee serves as a transparent anchor and monetary policy should be geared towards supporting the peg. Similarly, IMF staff have also suggested tightening monetary policy to support the peg.

MASALA BONDS

Masala bonds are debt instruments to eliminate foreign currency financing risk for projects that generate their revenues in local currency. Such projects can be exposed to a currency mismatch if they borrow in foreign currency and face high potential costs in the face of high volatility of exchange rates. Local currency bond issuance is an option that avoids such risks and can support private investment in productive sectors.

The IFC, in consultation with the Indian government, launched rupee bond programs in both onshore and offshore markets to provide rupee financing sources for IFC projects in India.9 The first of such offshore bonds was launched in 2013 for USD 1 bn, which was settled in dollars offshore. However, the exchange rate risk was assumed by international investors – i.e. dollar returns were determined by the USD–INR exchange rate.

By July 2016, the IFC, EBRD and HDFC Bank raised more than INR 90 bn (~USD 1.4 bn) in the London Stock Exchange. Masala bonds in NPR could be a viable option, whereby investors would bear the exchange rate risk to get a higher yield from these companies. Similarly, masala bonds in INR would be a suitable way to hedge most of theNPR currency risk (besides the INR peg risk).

TCX FUND

The Currency Exchange Fund (TCX) is a special purpose fund that provides OTC derivatives to hedge currency and interest rate mismatches created in cross-border investments between international investors and local borrowers in frontier and less liquid emerging markets. Its shareholders include major development financial institutions including the IFC, FMO, and EBRD.

Typical energy projects in Nepal last for 25–35 years and foreign debt is typically for a tenor of 15 years. Hence, developers need to hedge their foreign currency obligations for a minimum of tenor of the loans, if not for the whole period. However, a long-term hedge for NPR against the USD is not available in the commercial market. This is where TCXcan play a rolethrough their hedging products for currencies and maturities that are not effectively covered by commercial markets.

Through its products, TCX provides synthetic local currency loans. The hedge is structured so that the borrower receives the loan in local currency. Principal repayments and interests are calculated in local currency but paid in foreign currency at the spot rate. Hence, the borrower can hedge both interest and exchange rate risk at the same time. TCX transactions can be hedged by either the borrower (developer) or the lender (bank).

TCX provides a fixed rate cross currency swap for a maximum tenor of 15 years. To pricethe Nepali rupee, it prices the INR first and adds a de-peg risk premium to compensate for the peg risk.

LOCAL CURRENCY BOND

In 2012, the International Finance Corporation and Asian Development Bank had indicated interest to the government in issuingNepali rupee bonds to raise funds and invest in infrastructure projects in Nepal. They had proposed issuing around NPR 30 bn (~USD 291 mn @ USD 1 = NPR 103). The GoN allowed the IFC to issue local currency bonds worth NPR 50 mn in 2014. The IFC can invest money raised from such issues in hydropower, tourism, and agro-business and has until 2018 to issue such bonds.

Similarly, the ADB has also not yet issued local currency bonds. However, itis currently doing a “Capital Market and Infrastructure Capacity Support Project”, which aims to strengthen the regulatory and institutional framework for bond market development and build the capacity of the Securities Board of Nepal.

OTHER STRATEGIES FOR CURRENCY HEDGING

Power developers face a risk of currency fluctuation since most of their revenue is in local currency.Hydropower projects bigger than 100 MW and with some foreign debt in their capital structure can sign USD PPAs with the NEA. The GoN has announced that the tariff would be in part in USD for a maximum of 10 years (less if foreign loans are paid off in less than 10 years) and in Nepalese rupees thereafter.

NEA has signed PPAs in USD with Khimti, Upper Bhotekoshi, Upper Marsyangdi, Kabeli-A, Lower Solu, and Likhu IV projects. The PPA rates range from USD 5.9 cents to USD 6.95 cents, , with annual increments of up to 15 years (for example in Khimti).

Recently, a committee to study and analyse foreign currency denominated PPAs submitted its recommendation to the GoN. Key points included:

1. The Government should clarify the capacity and type of projects eligible for USD PPA: Run of River (RoR), Peaking Run of River (PRoR), and storage-based hydropower projects with capacity >100 MW

2. The Government should implement a currency mix ratio of USD and NPR: The percentage of USD denominated revenue would be proportionate to the percentage of foreign debt in capital structure as of commercial operation date
3. The Government should consider a maximum Tenor for payment in USD: For 10 years or until the foreign loan is paid back, whichever is earlier from the commercial operation date
4. The Government shuold consider an escalation in tariff: Annual simple escalation of 3% for eight years
5. The Government should consider a flexible exchange rate:Exchange rate for calculating USD amount is fixed at the rate published by the Nepal Rastra Bank on the date of signing power purchase agreement
6. The Government should implement standard PPA rates: Separate feed-intariffs for projects under 100 MW, projects above 100 MW with full Nepali currency investment, and projects above 100 MW with some investment in foreign currency

TAX LAWS

The GoN has various incentives to attract investment to the energy sector. Table 7 lists the main provisions and compares them to similar incentives offered by the governments in various countries.

FIGURE 7: TCX CURRENCY SWAP – LENDER HEDGES THE RISK

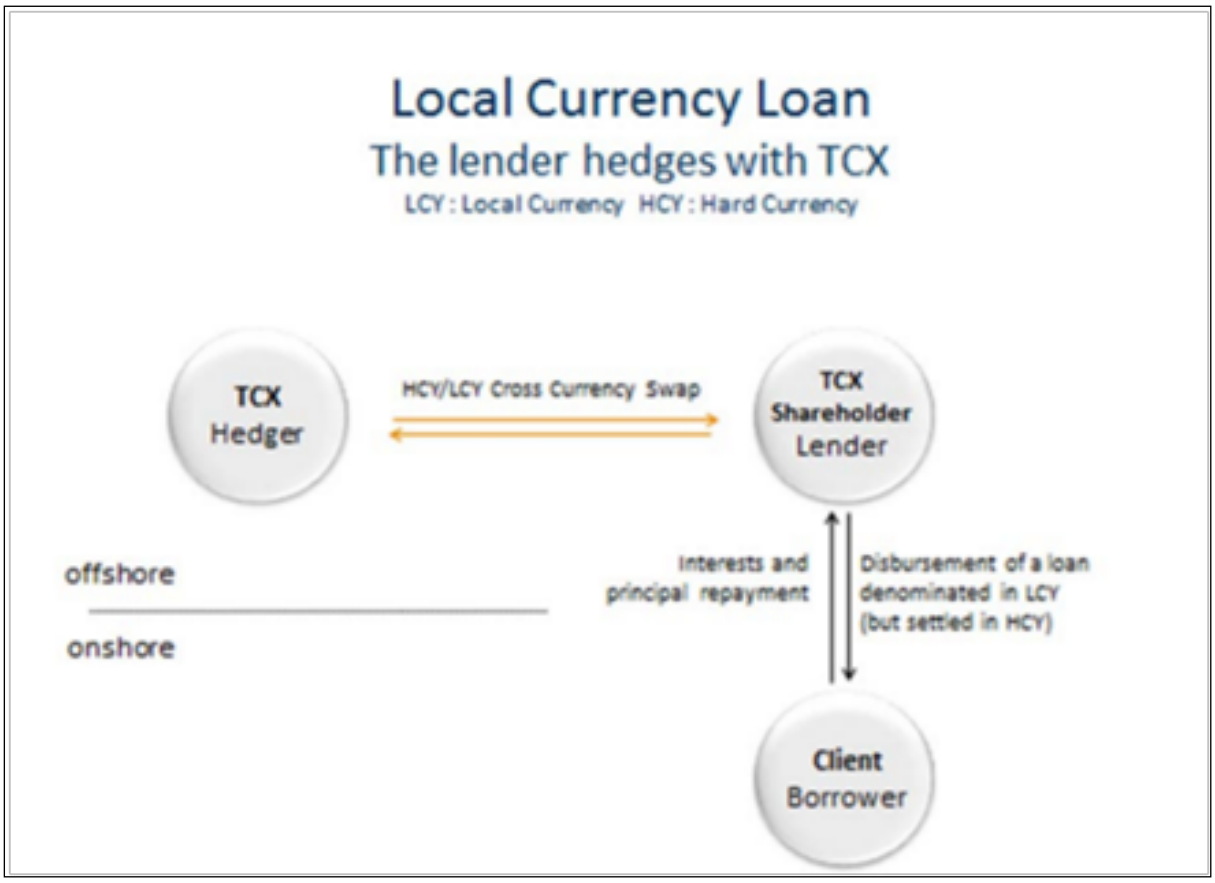


FIGURE 8: TCX CURRENCY SWAP – BORROWER HEDGES THE RISK12

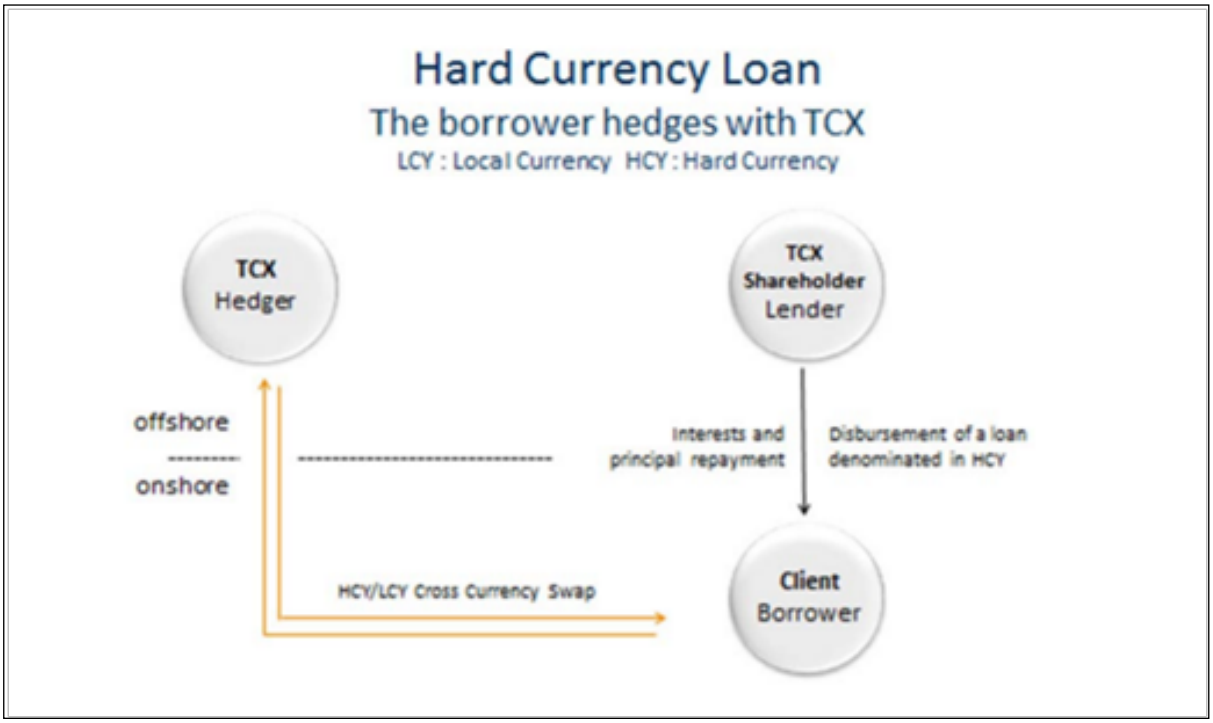


TABLE 7: INCOME TAX BENEFITS FOR ENERGY COMPANIES IN VARIOUS JURISDICTIONS

Country	Income tax rates	Tax holiday	Carry forward of losses	Depreciation	Tax reduction
Nepal	Reduced income tax rate of 20% for hydropower companies	100% exemption for the first 10 years after COD and 50% exemption for the next 5 years	Losses from construction of powerhouse, generation, and transmission of electricity are carried forward 12 years as opposed to the normal provision (7 years)	Accelerated depreciation rates available for projects involved in construction, generation, and transmission of electricity	Listed hydropower companies get a tax reduction of 15%
India	Corporate tax rate of 30%; reduced tax rate of 25% for micro, small, and medium enterprises ,	100% profits exempted for 10 consecutive years out of 15 years. Need to pay Minimum Alternate Tax(MAT) and credit of MAT available for 15 years; , incentive up to March 2017 only	General provision of carry forward of losses up to 8 years	Accelerated depreciation rates available for wind and solar energy	Not available
Bhutan	Normal corporate tax rate of 30%	100% exemption for 10 years from COD	General provision of carry forward of losses up to 3 years	Accelerated depreciation available	General provision of income tax holiday of 5 years to companies going for IPO
Myanmar*	Companies established under Foreign Investment Law taxed at 25% and others at 35%	Tax holiday available for up to 7 years	General provision of carry forward of losses up to 3 years	Accelerated depreciation of certain assets	Tax exemption for profits maintained in a reserve fund and reinvested within one year
Ethiopia	General corporate tax rate is 30%	100% for a period of 4 or 5 years depending on location of investment	Can carry forward losses during tax exempt period for half of the tax exemption period after expiry of such period	Not available	Not available
Mozambique	General corporate tax rate is 32%	80%, 60%, and 25% reduction in corporate tax rate for years 1–5, 6–10, and 11–15 respectively	Tax losses may be carried forward for 5 years	Accelerated depreciation for qualifying assets	Depending on location of investment, tax credit of 5%/10% of total investment is available for 5 years

TABLE 8: CUSTOM DUTY BENEFITS FOR ENERGY COMPANIES IN VARIOUS JURISDICTIONS

Country	Benefits
Nepal	Dutyof 1% on: • Energy generation plant with a capacity of,or exceeding, 10 Kw • Generator parts imported by VAT-registered industries that produce generators • All Alternative energy-based industries
India	Exemption from excise duties and concession on import duties on components and equipment required to set up a solar plant and biomass plant
Bhutan	Exempted from payment of all import duties on plant and equipment
Myanmar*	Customs duty and other internal taxes as relief and/or exemption from certain imports based on application to Myanmar Investment Commission
Ethiopia	Exemption from payment of custom duties on import of capital goods and spare parts of such capital goods worth up to 15% of such capital goods
Mozambique	Exemption from payment of custom duties on qualifying goods

TABLE 9: VALUE-ADDED TAX BENEFITS FOR ENERGY COMPANIES IN VARIOUS JURISDICTIONS

Country	Benefits
Nepal	• Subsidy refund of NPR 5 mn (USD 48,000) for any VAT charged during construction • VAT exemption on the import of machinery, equipment, tools and their spare parts, penstock pipes or iron sheets used in hydropower projects and not produced in Nepal (based on the recommendation of the Alternative Energy Promotion Centre or the Department of Electricity Development) • 0% VAT facility based on a recommendation from AEPC for batteries produced and supplied by Nepali industries for use in solar energy-producing industries • VAT exemption for equipment and machines, tubular batteries, solar lead batteries, required by solar industries (based on recommendation from AEPC)
India	Reduced VAT rate of 5% in some states
Bhutan	Exempted from payment of all Bhutan Sales Tax on import of plant and equipment
Myanmar*	See above in custom duty
Ethiopia	Not available
Mozambique	Exemption from payment of VAT on import of qualifying goods

OTHER TAX PROVISIONS

ROYALTY

In Nepal, there is a separate solar policy according to which royalty is not charged on solar projects, since they do not use local resources, unlike hydropower. Similarly, royalties could be negotiated separately for hydro projects that apply for a project development agreement with the government. Royalties for use of resources has been summarised below for various countries:

Nepal	Internal consumption project	Up to 15 years	After 15 years
	Up to 1 MW	None	None
	1MW to 10MW	NPR 100 per kW & 1.75% per kWh	NPR 1000 per kW & 10% per kWh
	10MW to 100MW	NPR 150 per kW & 1.85% per kWh	NPR 1200 per kW & 10% per kWh
	Above 100 MW	NPR 200 per kW & 2.00% per kWh	NPR 1500 per kW & 10% per kWh
	Export-oriented Project		
	ROR project	NPR 400 per kW & 7.50% per kWh	NPR 1,800 per kW & 12% per kWh
	Storage project	NPR 500 per kW & 10% per kWh	NPR 2000 per kW & 15% per kWh
India	12% free energy to states where hydropower plants are built		
Bhutan	Minimum 12% of electricity generated to be given freely to Bhutanese government for the first 12 years of COD and 18% thereafter		
Myanmar	Generally, 7% of total electricity is given as free energy and 5-–25% of the equity of the project is given to the government as free shares		
Ethiopia	No royalty for renewables		
Mozambique	N/A		

DIVIDENTS

As per the Nepal Income Tax Act, a final withholding tax of 5% is charged on cash or stock dividends paid out. The Indian Income Tax Act requires companies to pay 15% corporate dividend tax on dividend distributions they make.

Nepal	A final withholding tax of 5% is charged on any cash or stock dividends paid out
India	Companies to pay 15% corporate dividend tax on dividend distributions they make
Bhutan	Withholding tax of 10% on payment of dividend income
Myanmar	No withholding tax on dividend income for both residents and non-residents
Ethiopia	Withholding tax on dividends at 10% (final withholding for non-residents)
Mozambique	Generally, withholding rate is 20%; 10% if shares are listed on the Mozambique stock exchange; 0% if dividends are paid to a Mozambique company that has held 20% or more shares in the associated company for at least two years; rates are final withholding rates for non-residents

INTEREST

Nepal Withholding tax of 15% is charged on any interest payment made to institutions outside Nepal

India	For Indian interest income, the withholding rate is 10%
Bhutan	Withholding rate of 10%
Myanmar	Interest to residents withheld at 0% and to non-residents at 15%
Ethiopia	Interest on foreign borrowings is taxed at 10%
Mozambique	Withholding rate of 20%

CAPITAL GAINS TAX

Capital gains for corporate bodies are charged at 25% for gains in Nepal. Short-term capital gains in India are taxed at normal tax rates while long-term capital gains are taxed at 20%. Lower rates of taxation are available for capital gains of securities.

NEPAL CHARGED AT 25% FOR GAINS IN NEPAL

India	Short-term capital gains are taxed at normal tax rates while long-term capital gains are taxed at 20%;lower rates of taxation are available for capital gains of securities
Bhutan	Capital gains are taxed at 30% as part of corporate income
Myanmar	Capital gains are taxed at 10%
Ethiopia	Capital gains on shares of companies are taxed at 30% and on buildings held for a business, factory, or office is taxed at 15%
Mozambique	Capital gains are taxed at a normal rate as part of corporate income

TABLE 10: OTHER INCENTIVES FOR POWER DEVELOPERS IN NEPAL AND IN INDIA

Other Incentives	Nepal	India
Financial Subsidies	Not Available	Subsidy of INR 15 mn (USD 0.23 mn) per MW limited to a maximum of INR 50 mn (USD 0.78 mn);available to hydropower of up to 25 MW
Generation-Based Incentives	Not Available	USD 0.007/unit subject to max ~USD 0.15 mn for wind power projects
Viability Gap Funding (VGF)	Available to utility solar power producers through ADB grant	~USD 0.15 mn/MW available as VGF;implemented by Solar Energy Corporation of India

* For Myanmar, incentives available for companies are registered under Myanmar's Foreign Investment Law

POLITICAL RISK AND MITIGATING IT THROUGH MIGA

The fund as envisioned in "Legal Structuring" could potentially have three classes of shareholders.

Class 1 – Commercial institutional capital

- MIGA insured
- Option to take TCX currency hedging

Class 2 – Development Financial Institutions

- MIGA and TCX not used
- Other rights same as that of Class 1 shareholders

Concessional capital

- First loss reserve capital

MIGA – HOW TO INCORPORATE MIGA INTO FUND STRUCTURE

Multilateral Investment Guarantee Agency (MIGA) is a World Bank member entity formed in 1988 to support economic growth, reduce poverty, and improve people's lives. MIGA's mandate is to promote foreign direct investment (FDI) in developing countries by providing guarantees (political risk insurance and credit enhancement) to investors and lenders.

MIGA promotes cross-border investment from one MIGA (World Bank) member country to another developing member country by providing investment guarantees covering five non-commercial risks.

POLITICAL RISKS

- Currency Inconvertibility and transfer restriction
- Expropriation
- War, terrorism, and civil disturbance

CREDIT RISKS

- Breach of contract
- Breakingfinancial obligations

MIGA can insureequity investments, shareholder loans, and shareholder loan guarantees provided loans have a maturity period of more than one year.

HOW IT COULD WORK AT THE FUND LEVEL

Generally, pricing, duration, amount, and other conditions for MIGA cover is decided on a per-project basis. For a private equity fund or other pooled investment vehicle, MIGA offers a master contract of guarantee that reserves MIGA capacity and provides up-front pricing to the general partners of the fund for a specific period (two to three years).

- Evaluates potential initial portfolio projects
- Prices risk (portfolio basis) – may be region or sub-region specific
- Offers a master contract of guarantee that reserves MIGA capacity and provides up-front pricing for a specific period (2–3 years)
- Carries out due diligence on individual projects and prices remain the same if the project meets broad parameters (i.e. subject to no significant changes in sovereign risk or project parameters)

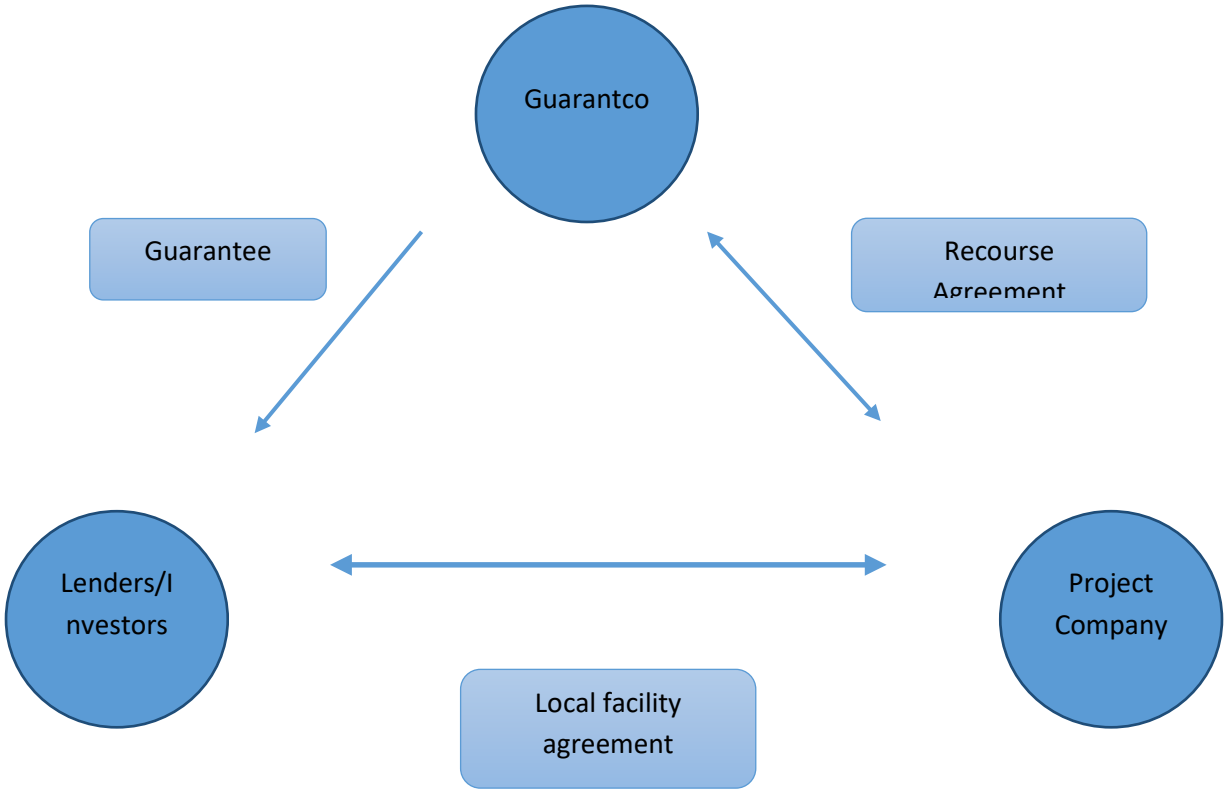
USING GUARANTCO TO REDUCE DEBT RISK

Energy projects are usually levered, during construction or after the COD. Often, companies find it difficult to find the right terms to attract debt. Companies might struggle to find debt with the appropriate tenor or for the appropriate amount. The project company might face exorbitant rates of interest because of the risks involved in energy projects.

Guarantco, sponsored by UK Aid, Australian Aid, FMO, the State Secretariat for Economic Affairs (SECO), SIDA, the Netherlands Ministry of Foreign Affairs, and PIDG, offers guarantees that seek to bridge the gap between the financial requirements of a particular project or corporate entity and the financial terms available from the market.

Guarantco has provided a guarantee of approximately USD 28.2 mn to allow Essel Clean Solu (the developer) to access debt through local markets that might not have been possible without the guarantee.

FIGURE 9: TYPICAL GUARANTCO GUARANTEE STRUCTURE FOR A LOCAL CURRENCY LOAN



CATALYTIC EQUITY TO REDUCE COUNTRY-SPECIFIC AND SECTOR-SPECIFIC RISKS

Traditionally, firms use credit enhancement techniques to improve the creditworthiness of a transaction. Government loan guarantees and bank of letters of credits are some examples of credit enhancement instruments a typical business can use.

Like a business without an established credit history, Nepal poses a dilemma for investors. Institutional investors can usually only invest in investment grade companies (typically BBB- and above) and any companies under the jurisdiction of a country with sovereign ratings less than BBB- are deemed below investment grade. Nepal has no sovereign credit rating as it has not issued any sovereign bonds in international debt markets.

Furthermore, there is a very little track record of investment by international companies and their risk and return profiles. Thus, investing companies would discount cash flows at a high premium to compensate for geological and engineering risks in infrastructure projects, political and economic risk of the Nepali economy, and an additional risk premium because of a lack of information and track record. This high discount rate makes many projects in Nepal financially unfeasible for international institutional investors.

Catalytic equity capital in Nepal's context is equity risk capital that:

- de-risks equity investments in a company

or an equity fund targeting hydro and solar projects

- catalyses private sector capital in the investment vehicle
- catalyses private investment in the equity capital of the fund by a certain factor (typically 1:4)

CHARACTERISTICS OF CATALYTIC EQUITY

It acts as first in/last out equity capital
Has different class of shares in the limited company/partnership
Invests in pre-construction acquisition costs of projects
Co-invests in construction with private sector institutions
Cash flow reserve: delays distribution receipt to build a liquidity buffer for liquidity cover for insured debt
Recoups capital after capital plus CoC is returned to private sector LPs/investors
Limits its return to capital recoupment until private sector target returns are met
Often stapled to a Technical Assistance facility that provides capital to support third-party costs

Refer to Annex 2 for a list of funds that provide grants in the energy sector. Most of these funds are designed for climate change adaptation and hence renewable energy developers in Nepal may be eligible for financing.

PROJECT DEVELOPMENT AGREEMENT – WRAPPING RISKS NOT COVERED BY PPA

While the government of Nepal provides various incentives to energy developers through tax laws, rebates, etc., it also provides other concessions and benefits to large project developers through a project development agreement (PDA). A PDA is an agreement between the government and energy project developers that allocates responsibilities, risks, and reward between the parties, particularly in relation to government approvals andland acquisitions, for a project to move ahead in time. In return for government cooperation, the project developer agrees to share the benefits of projects with thegovernment and locals.

TABLE 11: BENEFITS TO PROJECT DEVELOPERS AGREED IN PROJECT DEVELOPMENT AGREEMENT

Incentives	Description of those incentives	Agreed in PDAs with
Sovereign guarantees	Sovereign guarantees given by the GoN in cases where the NEA fails to make payments to power developers.	Arun 3, Upper Trishuli 1
Fiscal Incentives	50% of the custom duty payable as per prevailing rate on the agreement date will be exempt on import of cement, iron, and steel products.	Upper Karnali, Arun 3
Protection from changes in law (including tax laws)	Companyis entitled to relief from new laws that are more restrictive or onerous than laws as of the agreement date (including changes in tax rates). Relief includes compensation for loss of revenue, increased costs, and increased tax liability due to changes. It also includes extension of timelines for performance obligation of the company until the company complies with such obligationsas well as extensions in the concession period until the company generates additional revenues equivalent to the amount of compensation not paid by the GoN.	Upper Karnali, Arun 3, Upper Trishuli 1
Higher Leverage	Companies can have a maximum debt-equity ratio of 75:25 at financial close and 80:20 at all other times. This is higher than the 70:30 debt-equity ratio as per the Securities Registration and Issues Regulations.	Upper Karnali, Arun 3, Upper Trishuli 1

TABLE 12: BENEFITS TO BE GIVEN BY PROJECT DEVELOPERS

	Arun 3	Upper Karnali	Upper Trishuli
Free Energy/ Free shares	21.9% of monthly energy output	12% of monthly energy output/27% free shares to NEA	Free energy up to 20kWh per month to eligible local households
Shares to locals	Approximately USD 15 MN worth of shares to local people (USD 15 mn)	GoN can transfer NEA's share to local people	10% of all company shares to people affected by the project to be issued at face value

1.5 ANNEXURES

ANNEXURE 1: FDI RESTRICTED SECTORS

TABLE 13: SECTORS WHERE FDI IS NOT PERMITTED ACCORDING TO FITTA

	Industry	Remarks
1.	Cottage industries	
2.	Personal service businesses	
3.	Arms and ammunition industries	
4.	Gunpowder and explosives	
5.	Radioactive material industries	
6.	Real estate business	Excluding construction industries
7.	Film industries	
8.	Security printing	
9.	Banknotes and coins	
10.	International chain retail business (with business in at least two countries)	
11.	Tobacco	Excluding those that export more than 90%
12.	Internal courier service	
13.	Atomic energy	
14.	Poultry	
15.	Fishery	
16.	Beekeeping	
17.	Consultancy services such as management, accounting, engineering, legal services	Maximum 51% foreign investment is allowed
18.	Beauty parlour	
19.	Processing of food grains on rent	
20.	Local catering services	
21.	Rural tourism	

TABLE 14: SECTORS WHERE FDI IS CAPPED AT <100%

Industry	Maximum equity holdings percentage
Aeroplane service	80%
Telephone service	80%
Consultancy service	51%
Casino industry	Requires a local partner

ANNEXURE 2: GRANT FUNDS IN ENERGY SECTOR

TABLE 15: LIST OF FUNDS THAT PROVIDE GRANTS IN THE ENERGY SECTOR

Name of fund	Region of activity	Level of funding	Financing instruments	Implementing agency	Field	Remarks
ADB Climate Change Fund	Asia	USD 50 mn	Co-financing Grant Technical assistance	Asian Development Bank (ADB)	Adaptation Mitigation REDD Disaster risk reduction	Eligible countries: ADB Developing member countries
Canadian Climate Fund for the Private Sector in Asia	Asia – Low and lower-middle income and small island developing countries	CAD 82.39 mn	Concessional financing Grants	Asian Development Bank (ADB)	Clean Energy Adaptation	Eligible countries: Low and lower-middle income ADB developing member countries and small island states
Climate and Development Knowledge Network	Latin America and the Caribbean, Asia and Africa	BPD 0.5 mn per project	Co-financing Grant Technical assistance	Government of Netherlands and Government of United Kingdom	Adaptation Capacity-building	Eligible countries: Developing countries
Climate Public Private Partnership	Asia	USD 283 mn	Equity Loan Grant	Donor governments	Adaptation Mitigation	Objective: To stimulate the development of climate funds and climate-friendly projects and companies which are expected to play a key role in accelerating the growth of investment in renewable energy and other low-carbon solutions
GEF Trust Fund – Climate Change focal area (GEF 6)	Worldwide	USD 3 bn in 2015–2019	Grant	Global Environment Facility (GEF)	Adaptation Mitigation Capacity-building	Eligible countries: Countries eligible to receive World Bank (IBRD and/or IDA) financing or UNDP technical assistance through its target for resource assignments from the core.
Global Climate Change Alliance+	LDCs SIDs	EUR 316 mn	Grant	European Union	Adaptation Mitigation REDD Capacity-building Disaster risk reduction	Eligible countries: 73 LDCs or SIDS that are recipients of official development assistance
Green Climate Fund	Worldwide	USD 10.2 bn (pledged as of June 2015)	Grant Concessional loan Guarantees Equity	COP (UNFCCC) and Green Climate Fund Board	Adaptation Mitigation REDD Technology transfer Capacity-building	Eligible countries: All developing country parties to the UNFCCC
International Climate Fund (UK)	Developing countries	GBP 3.87 bn	Grant Loan Guarantee ODA	DFID, DECC, Defra	Adaptation Mitigation REDD	Eligible countries: ICF will fund projects that display consistency with the DAC definition of ODA and ensure open and transparent project performance; other critical eligibility factors include the choice of instrument and appropriate enabling environment

International Development Association	LDCs Blend countries	N/A	Grant Loan	World Bank	Adaptation Capacity-building Technology transfer	Eligible countries: 77 eligible countries: 59 IDA countries, 18 blend countries
Japan's Fast Start Finance	Worldwide but mostly LDCs	USD 15 bn (11 bn public and 4 bn private)	Grant Loan ODA Guarantees	Japanese Ministry of Finance	Adaptation Mitigation Disaster risk reduction	Eligible countries: Developing countries that have entered into direct, bilateral discussions with the Government of Japan are eligible for FSF, although some private sector actors may also be considered
KfW Development & Climate Finance	Worldwide	Varies depending on the contract	Grant Loan ODA Structured financing	KfW	Adaptation Mitigation Technology transfer	Public and private entities, depending on the contract
Korea Green Growth Trust Fund	Worldwide	USD 40 mn	Grant Technical assistance	World Bank	Adaptation Technical transfer Mitigation Capacity-building	IBRD/IDA country members
Least Developed Countries Fund	Worldwide	USD 932 mn (as of June 2015)	Grant	GEF	Adaptation Capacity-building	Eligible countries: All LDC Parties to the UNFCCC
MDB Pilot Program for Climate Resilience	Selected regions	USD 1 bn	Grant Loan ODA Technical Assistance	MDB Climate Investment Funds (CIF)	Adaptation	Eligible countries: Bangladesh, Bolivia, Cambodia, Mozambique, Nepal, Niger, Tajikistan, Yemen, Zambia; Dominica, Grenada, Haiti, Jamaica, Saint Lucia, Saint Vincent and the Grenadines, Papua New Guinea, Samoa, Tonga
Pilot Program for Climate Resilience	Worldwide	USD 800 mn	Grant Loan	Targeted program of the Strategic Climate Fund (SCF) Climate Investment Funds (CIF) World Bank	Adaptation Capacity-building	Eligible countries: ODA-eligibility (according to OECD/DAC guidelines); and existence of active multilateral development bank (MDB) country programs
Public-Private Infrastructure Advisory Facility	Worldwide	USD 15 mn	Grant Technical Assistance	World Bank	Adaptation Capacity-building	Eligible countries: Developing or transition economies in the Organization for Economic Co-operation and Development (OECD) Development Assistance Committee's (DAC) I to IV Aid recipients are eligible for PPIAF funding
Special Climate Change Fund	Worldwide	USD 345 mn (as of June 2015)	Grant	GEF	Adaptation Mitigation Capacity-building	Eligible countries: All developing countries party to the UNFCCC
UNFCCC Adaptation Fund	Developing countries	USD 262 mn	Grants	UNFCCC	Adaptation	Eligible countries: Developing countries must be party to the Kyoto Protocol and must be particularly vulnerable to the adverse effects of climate change
US Global Climate Change Initiative	Selected Developing countries	USD 350 mn per year	Grant Loan Guarantee	USAID, the US State Department and the US Treasury	Adaptation Mitigation	Eligible countries: Developing countries

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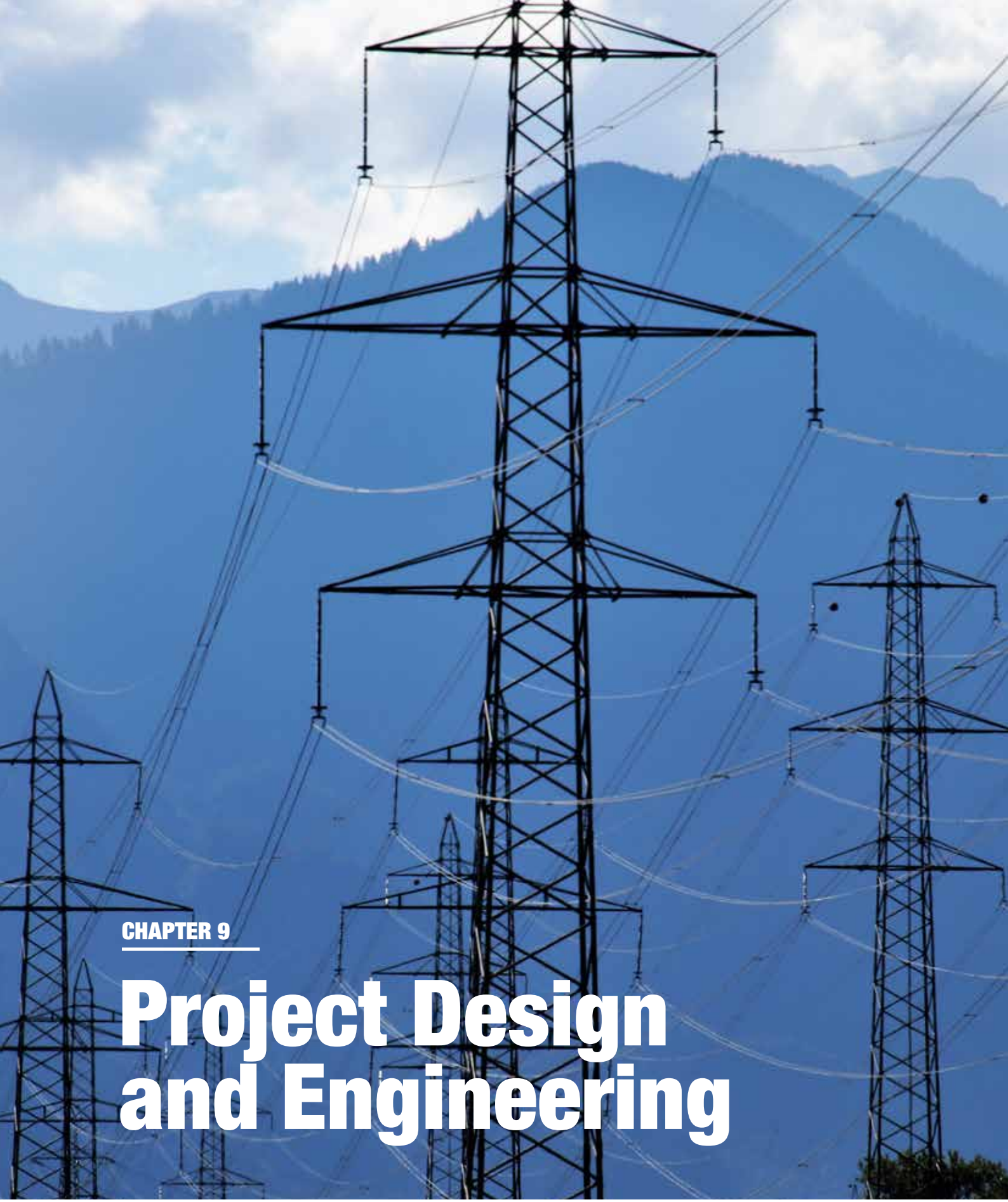
CHAPTER 9

A look into the practical realities of developing large scale sustainable energy projects in Nepal. This chapter looks into engineering risks and cliamate resillience methods.



CHAPTER 9

Project Design and Engineering

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dolma foundation

CHAPTER 9

Project Design and Engineering

LIST OF ACRONYMS

TABLES

FIGURES

ABBREVIATIONS

ADB	ASIAN DEVELOPMENT BANK
CAGR	COMPOUND ANNUAL GROWTH RATE
CAPEX	CAPITAL EXPENDITURE
COD	COMMERCIAL OPERATION DATE
CSP	CONCENTRATED SOLAR POWER
DOED	DEPARTMENT OF ELECTRICITY DEVELOPMENT
EIA	ENERGY INFORMATION ADMINISTRATION
EPC	ENGINEERING PROCUREMENT AND CONSTRUCTION GL
ESIA	ENVIRONMENTAL SOCIAL IMPACT ASSESSMENT
GHI	GLOBAL HORRIZONTAL IRRADIANCE
GON	GOVERNMENT OF NEPAL
IEE	INITIAL ENVIRONMENTAL EXAMINATION
INR	INDIAN RUPEE
IPP	INDEPENDENT POWER PRODUCER
LOI	LETTER OF INTEREST
NEA	NEPAL ELECTRICITY AUTHORITY
NREL	NATIONAL RENEWABLE ENERGY LAB
NPR	NEPALI RUPEE
NRN	NON RESIDENTIAL NEPALI
PPA	PRIVATE POWER AGREEMENT
PV	PHOTOVOLTAICS
RFP	REQUEST FOR APPROVALS
TL	TRANSMISSION LICENSE
UN	UNITED NATIONS
USD	US DOLLAR
VGF	VIABILITY GAP FUNDING

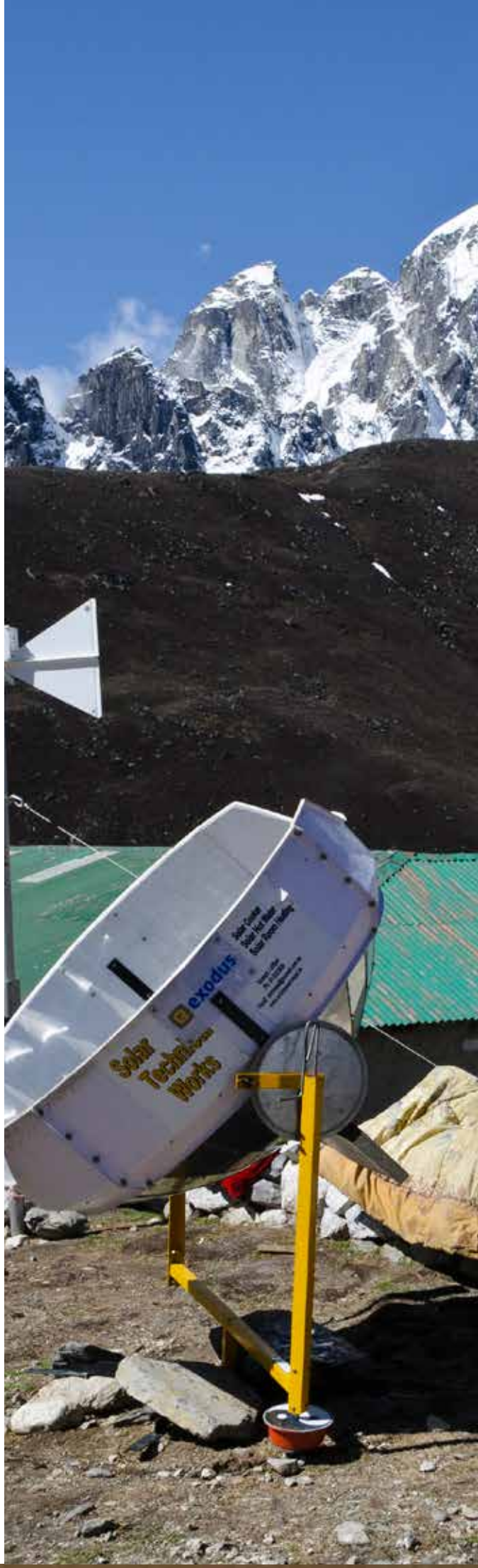
1.1 INTRODUCTION

The majority of our analysis of the institutional investor landscape in this series of reports has not focused on the practical realities of developing renewable energy assets in Nepal. This paper will narrow in on technical details potential developers and investors might want to consider.

Section 1 provides an overview of hydro and solar projects in active development, including analysis from Dolma and Mott MacDonald on a priority hydro run-of-river pipeline. Section 2 analyses market trends in battery technologies and assesses the capacity of local contractors to implement renewable energy projects in Nepal. Section 3 draws on project development risks, focusing particularly on climate change and potential approaches to mitigating its risks.

Findings from this report highlights a recurring theme in this series: the potential of hydro, solar, and batteries (assuming decreasing costs) to grow and stabilise Nepal's electricity grid. Hydro is a mature asset class that is supported through an enabling environment of banks and engineers that understand how to finance, build, and operate its systems. However, those attempting to introduce newer technologies will find the current environment less welcoming and may require more capacity building and planning for their project team.

That said, however, those promoting nascent technologies have reason to be optimistic, as the Government of Nepal has committed to developing ~10-12% of its energy mix through non-hydro renewable technologies.

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1.2 OVERVIEW OF PROJECTS THAT HAVE RECEIVED LICENSES AND ARE NOT UNDER CONSTRUCITON

Market Overview

According to the World Bank, licenses for projects totalling some 7,000 MW have been issued to IPPs (Independent Power Producers), but these projects have not reached sufficient financing to begin construction. As of July 2018, hydro projects totalling 3,000 MW are under construction (including those financed by IPPs and the NEA).

The government has also placed certain licenses that have expired into a basket of projects that may be auctioned in the future.

Table 1 outlines projects in the 100–350 MW range, and Table 5 defines a more specific pipeline that we have refined using a selection criteria developed by the Dolma Foundation and Mott MacDonald.

TABLE 1: LIST OF HYDRO PROJECTS ABOVE 100 MW WITH SURVEY LICENSES

Project	Capacity (MW)	River	Promoter
Dudhkoshi-9 HPP	111	Dudhkoshi	Urja Developers Pvt. Ltd.
Thuli Bheri	121	Thuli Bheri	GAGE Nepal Pvt. Ltd.
Bheri Nadi-8 (BR-8) HEP	125	Bheri	Dugar Brothers and Sons Pvt. Ltd
Tamor Mewa	128	Tamor	Spark Hydroelectric Co. Ltd.
Dadagau Khalanga Bheri Hydropower Project	128	Bheri	Gezhouba Group Power Investment Nepal Pvt. Ltd.
Lower Barun Khola HPP	132	Barun Khola	Ampik Energy Pvt. Ltd.
Super Tamor	155	Tamor	Cristal Power Development Pvt. Ltd.
Ghunsa Khola HPP	155.82	Ghunsa khola	RM Investment Company Pvt. Ltd.
Mugu Karnali HPP	159.62	Mugu Karnali	Butwal Power Company Limited
Kaligandki Gorge	164	Kali Gandaki	NECT-HYM JV
Seti Nadi-3	165	Seti Khola	Chilime Hydropower Company Limited
Upper Budhigandaki HEP	203	Budhi Gandaki	Purnima Developers Group Nepal Pvt. Ltd.
Humla Karnali 1 HPP	235	Humla Karnali	Sichuan Wangping Energy Science and Technology Co. Ltd.
Bheri-2 HEP	256	Bheri	Gezhouba Group Power Investment Nepal Pvt. Ltd.
Budhi Gandaki Kha HEP	260	Budhigandaki	Nilgiri Khola Hydropower Company Limited
Bheri 4	300	Bheri	Bhery Energy Pvt. Ltd.
Jagdulla HEP	307	Bheri	Jagdulla Hydropower Company Limited
Lantang Khola Reservoir Hydropower Project	310	Langtang	Yeti World Investment Pvt. Ltd.
Humla Karnali 2 HPP	335	Humla Karnali	Sichuan Wangping Energy Science and Technology Co. Ltd.
Budhi Gandaki Hydropower Project	341	Budhi Gandaki	Times Enery Pvt. Ltd
Surke Dudhkoshi HEP	350	Dudhkoshi	Yeti World Investment Pvt. Ltd.

Despite the 25 MW PV project funded by the World Bank, there are no commercial, pure PV projects under construction. There are, however,

a number of projects that have applied for survey/generation licenses, as can be seen in Table 2.

TABLE 2: LIST OF SOLAR PV PROJECTS WITH SURVEY LICENSES ABOVE 5 MW

Project	Capacity (MW)	Promoter
KTM Energy Solar Hybrid Power Project, Rangeli, Biratnagar	5	KTM Energy Pvt. Ltd.
Bel Chautara Solar Farm Project	5	Solar Farm Pvt. Ltd.
Bhadrapur Solar PV Project	5	Rairang Hydropower Development Company Ltd.
Block No 1 Solar Farms Project	5.1	Nepal Electricity Authority
Solar PV Project, Dang	5.3	O.Tech Pvt. Ltd.
Solar PV Project, Dhading	5.49	Otech Pvt. Ltd.
Parkland Solar PV Power Plant	5.9	Parkland Agrotourism Pvt. Ltd
Grid-Connected Solar Power Project,Parwanipur, 11kV S/S	8	Api Power Company Ltd.
Grid-Connected Solar Power Project, Duhabi, 33 kV S/S	8	Global Energy & Construction Pvt. Ltd.
Block No 4 Solar Farms Project	8.1	Nepal Electricity Authority
Block No 2 Solar Farms Project	8.3	Nepal Electricity Authority
Grid-Connected Solar Power Project, Butwal , 33 kV S/S	8.5	Ridi Hydropower Development Company Ltd.
Bhrikuti Solar Power Project	9	First Solar Developers Nepal Pvt. Ltd.
KTM Energy Solar Hybrid Power Project, Rani, Biratnagar	10	KTM Energy Pvt. Ltd.
KTM Energy Solar Hybrid Power Project, Tankusuwari, Biratnag	10	KTM Energy Pvt. Ltd.
Mithila Solar PV Power Project, Dhanusa	10	Eco Power Development Pvt. Ltd.
Lamki Solar Energy	10	Api Power Company Pvt. Ltd.
Attariya Solar Energy	10	Api Power Company Pvt. Ltd.
Utility Scale Solar PV	10	G I Solar Pvt. Ltd.
Mithila 2 Solar PV Project,Dhanusa	10	Nabin Kumar Singh
Solar Power Plant, Dang	20	Country Development Company Pvt. Ltd.

Project Preparation Process

Prior to December 2017, the project preparation process for both hydropower and solar followed an identical process from a licensing perspective. Figure 1 outlines this process. But processing the licensing for solar takes less than half the time as it does for hydro.

FIGURE 1: PROJECT PREPARATION PROCESS (HYDRO VS SOLAR)

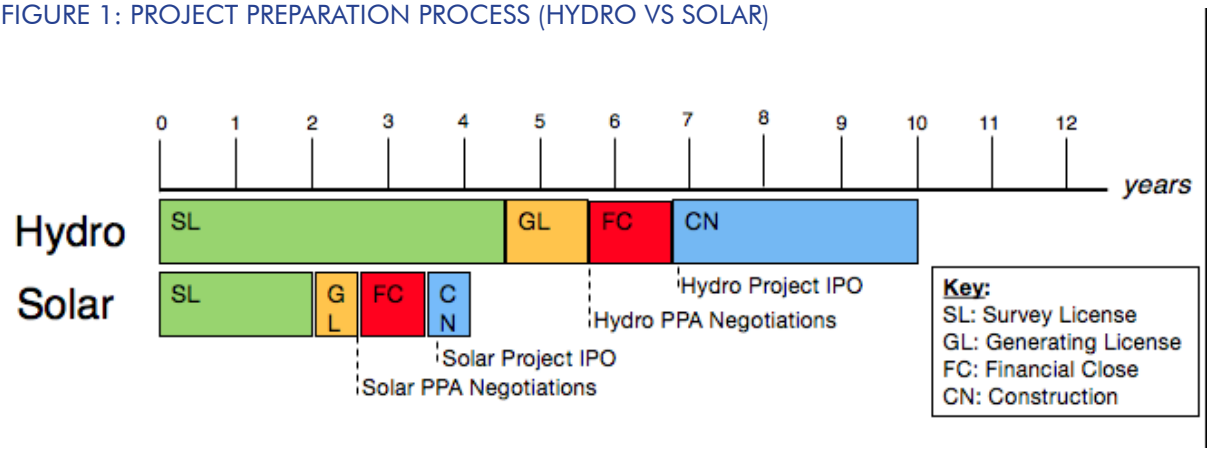
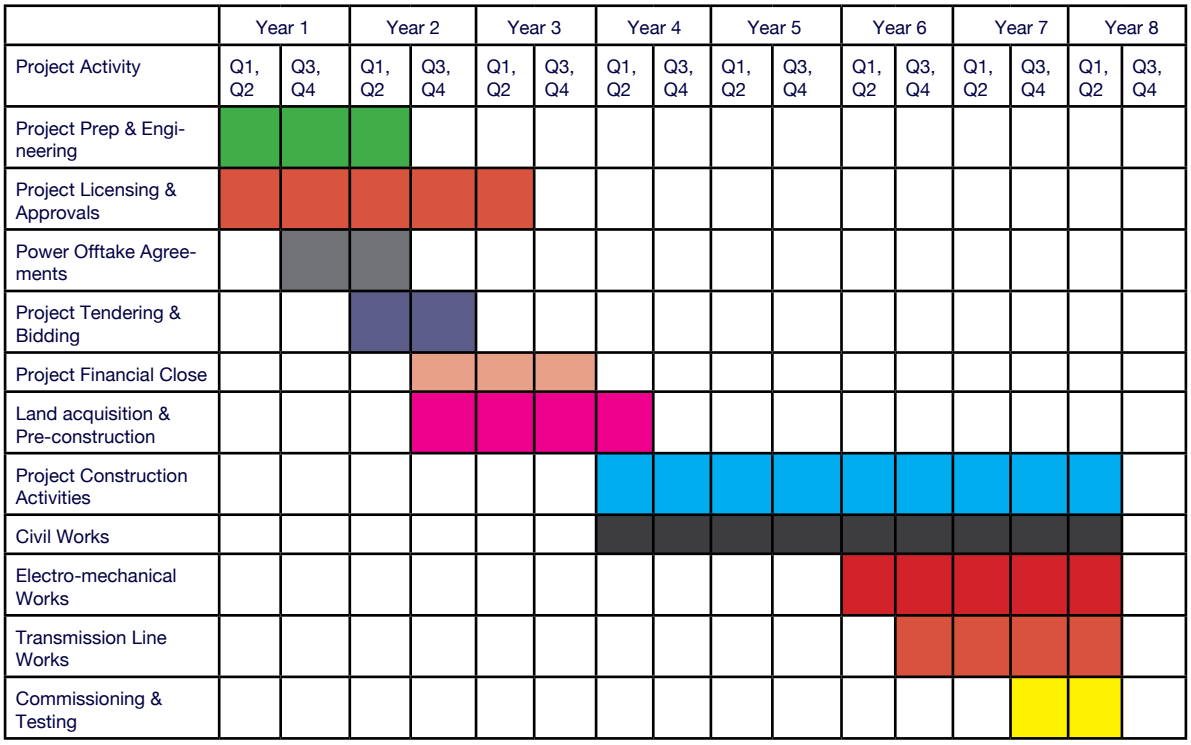


FIGURE 2: TYPICAL TIMELINE OF A SOLAR PV PLANT

	Year 1		Year 2				Year 3				Year 4	
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Registration												
Survey License												
LOI from NEA												
Feasibility Study												
IEE/EIA												
PPA Application												
Generation License												
Grid Impact Study												
Connection Agreement												
PPA Complete												
Financial Closure												
Land Acquisition												
Construction												

FIGURE 3: TYPICAL TIMELINE OF A HYDRO RUN-OF-RIVER PLANT



Naturally, construction timelines for run-of-river hydro and solar PV are different, with solar PV taking roughly half as long. 3

Filtering the Project Pipeline

Dolma Foundation, in collaboration with Mott MacDonald, created the following criteria to filter potentially attractive projects from Table 1 in the range of 100–300 MW. The set of criteria are an example and will vary depending on the preferences of individual investors and developers.

TABLE 4: PRIORITY PIPELINE CRITERIA

•Peaking feasibility	•Installed capacity 100–300 MW
•CAPEX requirement of USD 200–600 mn	•Applied for Generation License
•Sufficient information available	•Evacuation facility
•Limited environmental issues	•Limited settlement concerns
•Developer capacity	

Filtering by the above criteria results in the following project list:

TABLE 5: PRIORITY PIPELINE

Project	Super Trishuli	Upper Tamor	Budhi Gandaki "Kha"	Budi Gandaki "Ka"	Lower Manang Marsyandgi
Estimated Capex Requirement (USD mn)	200	570	520	260	252
Installed Capacity (MW)	100	285	260	130	140 MW with Q40 (optimized capacity) 210 MW (survey license)
Type	Run-of-river (dam-toe powerhouse scheme)	Run-of-river (peaking possibility)	PRoR (Day Pond)	RoR (cascade of Kha)	RoR
Status	GL applied/PPA negotiations		GL applied; resizing to meet Q40 criteria. Expected COD: 2016. EIA approved	GL applied; resizing to meet Q40 criteria. Expected COD: 2016. EIA approved	GL applied; the applications for PPA & Generation License have been submitted to concern authorities
Catchment Area (km2)	11,659	1,850			
Gross Head (m)	15	490			325
Design Discharge (m3/s)	850 (Q26.5%)	7.8 73 (Q40%)			38
Access Road	Good				Power house site is 90 km away from Dumre
Dam type	Barrage	Crest Elevation: 12 m			
Crest Length: 37 m					
Transmission Lines	New Bharatpu	64 km (Basantapur) 220 kV double circuit			Inter-connection will be made to the Marsyangdi Corridor 220 kV Transmission line planned by NEA at Manang Hub

1.3 SOLAR POTENTIAL, ASSOCIATED TARIFFS, TRANSMISSION AND REGULATIONS

Market Analysis

The solar potential of the Himalayan region is immense, according to NREL, a renewable energy research center. The region boasts a raw potential of 648,115 MW. Given its favourable topography, Nepal has an unspecified potential that likely exceeds the estimated potential of commercially viable hydro, which is 43,000 MW. Despite this, the UN, through the Green Environmental Facility, conducted a study in 2008 that placed Nepal's combined Solar PV and CSP potential at 4,000 MW.

Associated Tariffs

Interest in solar in Nepal is beginning to increase and the NEA has responded with new targets to have 2,000 MW of its portfolio made up of renewables. Despite the growing global popularity of wind energy, it is arguably the least developed energy renewable class in Nepal.

To date there have been two notable tenders in the solar space. The first is the World Bank-funded USD 138 mn, 25 MW project that was first approved in December 2014 by the NEA. Risen Energy from China secured the right to build the project after a tender was issued by the NEA in April 2015. The second tender is the recent RFP from the NEA to select IPPs for the construction of solar PV across Nepal. Selected projects will be granted a 25-year PPA, while the NEA (backed by ADB support) will provide incentives in the form of viability gap funding (VGF) of up to USD 20 mn. When it was first conceived of in 2016, the project envisioned installing at least 25 MW of solar power by 2018, but due to delays, this goal is likely to be achieved only by 2020.

NEPAL SOLAR TARIFFS

The posted government tariffs for solar PV in Nepal as of October 2018 is NPR 7.3/USD 0.63 per unit (kWh/m2). However, Dolma expects rates to fall in due course, recent solar PPA's were recorded at NPR 6.35/ USD 0.55 per unit. In India, solar tariffs have plunged to a new low of INR 2.44/USD 0.033 per unit. Table 7 details 200 MW of a 500 MW project in Bhadla Phase II, Solar Park, Rajasthan, highlighting the type of aggressive bidding prevalent in the Indian solar market.

TABLE 7: BIDDING FOR 200 MW SOLAR PLANT IN RAJASTHAN

Date	Entity	Bid (INR/kWh)
November 2015	SunEdison, USA	4.63
January 2016	Fotum Energy, Finland	4.34
April 2017	Solairedirect SA, France	3.15
May 2017	Phelan Energy, South Africa	2.62
May 2017	Softbank Foxconn, Bharti	2.45
May 2017	Acme Solar, India	2.44

Transmission Regulation

There are two key steps required to satisfy transmission requirements under the local regulations before a project is commissioned:

(1) a transmission line survey license and (2) transmission license.

(1) TRANSMISSION LINE SURVEY LICENSES

Developers are required to submit six monthly progress reports as per Rule 21(2) of Electricity Regulation, 2050. Upon completion of the survey, developers need to submit a Feasibility Study Report, which includes:

- IEE – if transmission voltage level of project is between 33 and 66 kilovolts (kV) or if the project falls under categories mentioned in Schedule 1 of the Environment Protection Rules, 2054
- EIA – if transmission voltage level of the project is greater than 66 kV

(2) TRANSMISSION LICENSE (TL)

A TL is required to construct and operate a transmission facility upon completion of the survey. An application fee is required to be paid equal to one third of the license fee to the DOED, along with the application as prescribed in Schedule 11, Rule 24 of Electricity Regulation, 2050. The TL is issued within 120 days of a complete and adequate application package being received.

Global Market Developments

Battery storage has been coined by industry commentators such as McKinsey as the next disruptive technology in the global power market. According to IHS Markit, a global energy consultancy firm, “the global grid-connected storage market could reach a total installed capacity of 28 GW by 2022, from just 3 GW in 2016”. These developments are made possible due to the falling price of lithium-ion storage: module prices are expected to go below USD 200 per kWh by 2019.

Storage Battery Technologies

There are various technology options within the battery market that are appealing for use with on-grid solar. The most relevant are below, selected based on their declining capital cost outlook and technical applicability. This subsection draws heavily on findings from Lazard’s Levelisted cost of storage analysis 2.0 (2018) and McKinsey’s report Battery storage: The next disruptive technology in the power sector (2017).

1. Lead acid
2. Lithium-ion
3. Flow batteries
4. Sodium

LEAD ACID

This technology has been employed in renewable energy projects worldwide since the 19th century and is a first source for off-grid power systems. It is known as a dependable option that has been tried and tested. Until recently it was the only realistic battery technology for storing solar electricity. However, it is rapidly being eclipsed by other technologies with longer warranties and cheaper pricing as solar storage becomes increasingly popular.

Lead acid is low-cost and adaptable (it uses include electric vehicles, off-grid power systems, and uninterruptible power supplies). Advanced lead-acid battery technologies combine a standard lead-acid battery with ultra-capacitors,

increasing efficiency and battery life and improving partial state-of-charge. These have a lifespan of about 5–10 years.

TABLE 8: LEAD CAPITAL COST OUTLOOK, LOW TO HIGH

Low	Average	High	
Compound Annual Growth Rate (CAGR)	15%	15%	17%
5-Year	48%	49%	52%

Lead has a high rate of decline based, due to improving lead carbon technology. With an evolving role of carbon, this will be integrated into new and existing products, which will improve lifespan and range of operation.6

LITHIUM-ION

These batteries have come the furthest in recent years in terms of their appeal for energy storage projects. Their popularity has grown with the development of electric cars, and they feature in new devices like the Tesla Powerwall, as well as mobile phones and laptops.

Lithium-ion systems are designed for efficiency and longer life at slower discharges, and faster charging and discharging rates, which requires extra capital equipment.

Lithium-ion batteries have a longer lifespan than lead-acid batteries, providing, on average, around 4,000–6,000 cycles at 80% discharge – a lifespan of up to 18 years. To date, their main drawback is that they are 50% more expensive than lead-acid batteries for the same storage capacity. However, this is expected to change in the next five years, as Figure 5 shows.

TABLE 9: LITHIUM-ION CAPITAL COST OUTLOOK, LOW TO HIGH

Low	Average	High	
Compound Annual Growth Rate (CAGR)	7%	11%	8%
5-Year	26%	38%	29%

In summary, due to the growing econoimes of scale that lithium-ion will witness over the next five years, manufacturing costs will decrease. Moreover, design improvements will lower high cost component input requirements which, along with chemistry improvements, will increase the capability of this battery technology.6

FLOW BATTERIES

Flow batteries are considered a new entrant to the battery storage market, although the technology has been around for some time. They contain a water-based solution of zinc-bromide. Currently, they have limited applications for the residential market and are mainly seen in developed countries.7

Subcategories of flow batteries are defined by the chemical composition of the electrolyte solution; the most common solutions are vanadium and zinc-bromide.

TABLE 10: FLOW BATTERY CAPITAL COST OUTLOOK, LOW TO HIGH6

	Low	Average	High
Compound Annual Growth Rate (CAGR)	4%	7%	10%
5-year	13%	24%	35%

Costs are decreasing because of improved design and manufacturing scale, extending

operating range to eight-hour discharge, and integration time for manufacturing.6

SODIUM

"High temperature"/"liquid-electrolyte-flow" sodium batteries have high power and energy density and are designed for large commercial and utility-scale projects. "Low temperature" batteries are designed for residential and small commercial applications.

TABLE 11: SODIUM BATTERY CAPITAL COST OUTLOOK LOW-HIGH

	Low	Average	High
Compound Annual Growth Rate (CAGR)	10%	11%	11%
5-Year	34%	37%	37%

SUMMARY

Table 9 outlines the comparative disadvantages and advantages of these battery technologies.

TABLE 12: SELECTED TECHNOLOGY COMPARATIVE ADVANTAGES/DISADVANTAGES

Technology	Comparative Advantages	Comparative Disadvantages
Lead Acid	• Advanced lead-acid technologies leverage existing technologies Mature technology with established recycling infrastructure	Poor ability to operate in a partially discharged state Relatively poor depth of discharge and short lifespan
Lithium-ion	• Multiple chemistries available Rapidly expanding manufacturing base leading to cost reductions Efficient power and energy density	Remains relatively expensive Safety issues from overheating Requires advanced manufacturing capabilities to achieve high performance
Flow Battery	• Power energy profiles highly and independently scalable (for technologies other than zinc-bromine) Designed in fixed modular blocks for system design (for zinc-bromine technology) No degradation in energy storage capacity	Power and energy rating scaled in a fixed manner for zinc-bromine technology Relatively high balance of system costs Reduced poor depth of discharge and short lifespan
Sodium	• High temperature technology; relatively mature technology (commercially available); high energy capacity and long duration Low temperature technology; smaller scale design; emerging technology and low cost potential; safer	Although mature, inherently higher costs – low temperature batteries currently have a higher cost with lower efficiency Potential flammability issues for high-temperature batteries

Analysis: Applicability for Nepal

There has been a growth in the number of solar facilities running in conjunction with storage and without subsidies around the world, including in both the UK and India. This subsection will explore which battery technology is most suitable for Nepal's solar market and identify potential obstacles for the expansion of solar storage projects in the Himalayan region.

Table 13 cross-analyses key indicators using Lazard and McKinsey analyses.

TABLE 13: BATTERY TECHNOLOGY CROSS ANALYSIS

Lead acid	Lithium-ion	Flow batteries	Sodium	
Affordability	Arguably the cheapest battery option available in global market due to established recycling infrastructure	Still expensive but costs may fall	Currently economical but no major reductions in capital costs expected over next 15 years	Although a mature technology, inherently high costs
Dependability	Not reliable in partially charged state and has poor depth of discharge	Known to be reliable, despite concerns about flammability	Positive record and limited degradation over time	Potential flammability issues for high temperature batteries used in utility-scale sites
Warranty	No	Yes	Yes	Yes
Applicability for Nepal	Despite economic appeal, not a reliable solution given lack of warranty and remote grid locations for future PV in Nepal	Suitable battery for Nepal's on-grid storage prospects; but high costs for the next five years may be a roadblock	Popular in Western Europe and North America but limited knowledge in the South Asian solar space; but as market proliferates it may be worth consideration	A good solution for lower temperature batteries, but may not be suitable for large-scale utility use

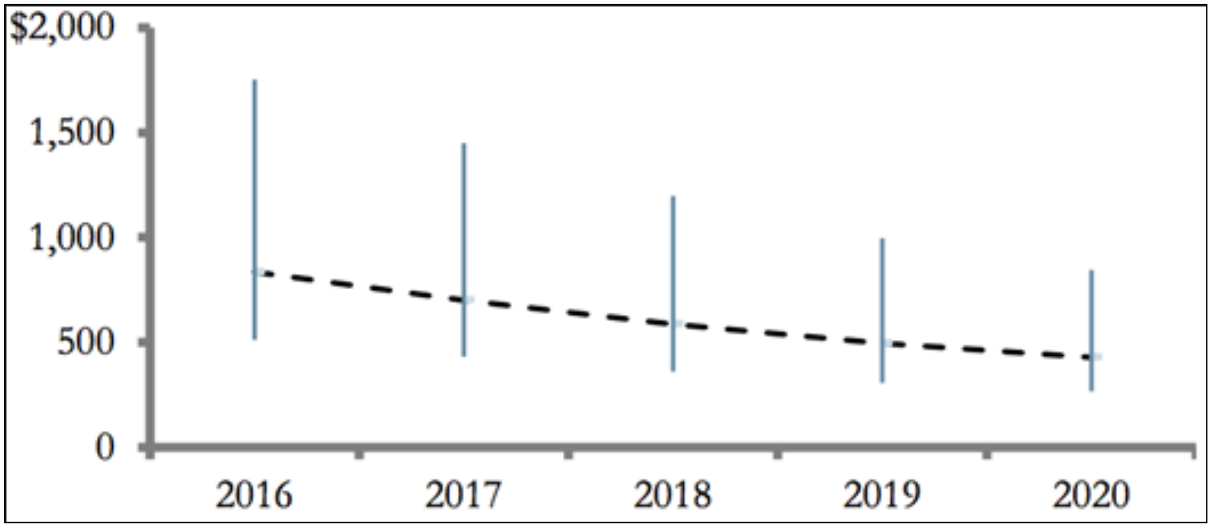
Regulatory changes have been instrumental in the proliferation of storage products in many markets, as McKinsey argues. "The idea of combining solar with storage to enable households to make and consume their own power on-demand, instead of exporting power to the grid, is beginning to be an attractive opportunity for customers."4

While most energy storage analyses have considered only North America and Europe, policy circles hold that the GoN may introduce net-metering.

Storage could almost certainly serve as a major asset to the NEA as it would help address low generation in the dry months (November–February) and help it operate the grid in markets where loads are expected to be flat or falling. In order to accommodate this new market, the NEA has begun to explore how low-cost storage might be of use to its grid. Two broad categories of action for Nepal to consider are:

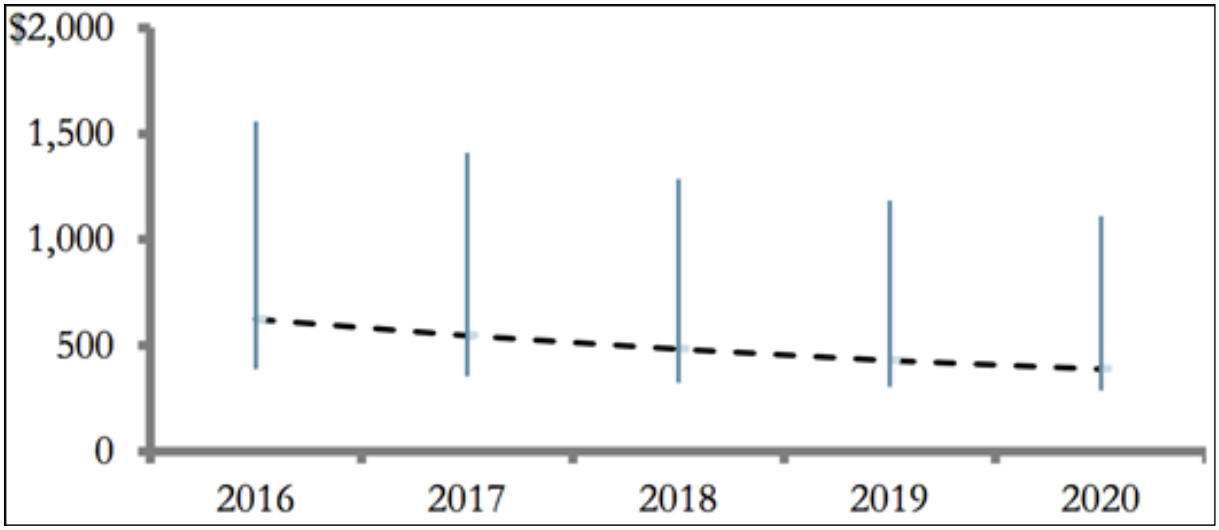
- Redesign compensation structures for solar/storage PPA structures
- Rethink grid system planning

FIGURE 4: LEAD ACID CAPITAL COST OUTLOOK (USD/KWH)6



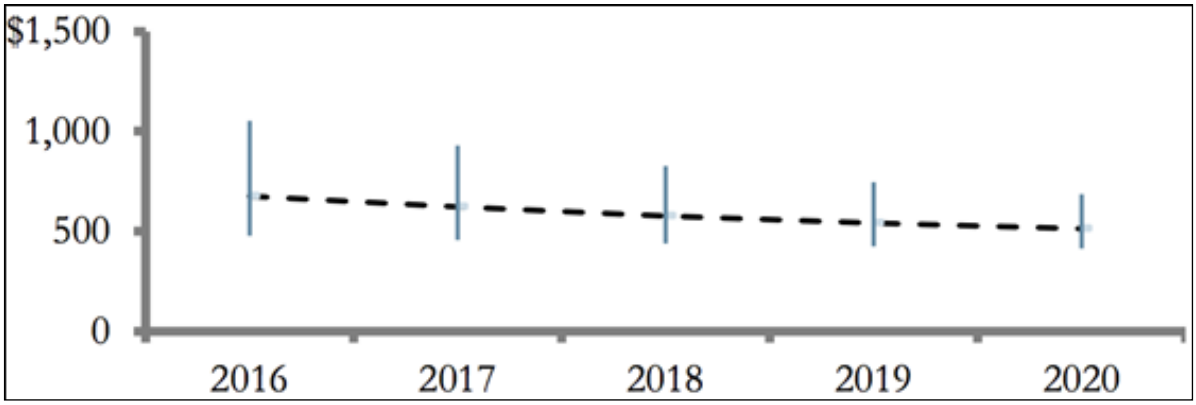
Source: Lazard (2018). Levelized Cost of Storage Analysis 2.0

FIGURE 5: LITHIUM-ION CAPITAL COST OUTLOOK (USD/KWH)6



Source: Lazard (2018). Levelized Cost of Storage Analysis 2.0

FIGURE 6: FLOW BATTERY CAPITAL COST OUTLOOK (USD/KWH)6



Source: Lazard (2018). Levelized Cost of Storage Analysis 2.0

1.4 EPC CONTRACTORS, ENGINEERING CONSULTANTS AND CONTRACTORS IN NEPAL

EPC Contractors

There are currently no Nepali contractors that offer EPC (Engineering Procurement and Construction). However, contractors in the construction space have a track record for hydro projects in the country, including:

1. Himal Hydro & General Construction
2. High Himal Hydro Construction
3. South Asia Infrastructure

With that said, a number of international contractors are comfortable working in Nepal and able to carry out EPC. Table 4 lists over 20 firms able to provide such services, including transmission construction (which is typically sub-contracted).

TABLE 14: POTENTIAL EPC CONTRACTORS

Ref	Contractor	Origin	Record in Nepal?	Hydro?	Solar?	Transmission?
1	Hindustan Construction Company	India	Yes	Yes	Unsure	Yes
2	CAMC	China	Yes	Unsure	Unsure	Yes
3	Larson & Toubro	India	Yes	Yes	Yes	Yes
4	Nagarjuna Construction Company	India	No	Yes	Unsure	Yes
5	Gammon India	India	No	Yes	Unsure	Yes
6	Özturk Holding Co	Turkey	No	Yes	Unsure	Yes
7	Lanco Infratech	India	Yes	Yes	Unsure	Yes
8	Renaissance Construction	Turkey	Unsure	Yes	Unsure	Yes
9	ENKA Construction & Industry Co.	Turkey	Yes	Yes	Unsure	Yes
10	JP Associates		No	Yes	Unsure	Yes

12	China Overseas Engineering Group Co.	China	Yes (Arun 3)	Yes	Unsure	Yes
13	Patel Engineering	India	Yes (Davighat)	Yes	Unsure	Yes
14	POLIMEKS	Turkey	No	Yes	Unsure	Yes
15	LIMAK	Turkey	No	Yes	Unsure	Yes
16	China Gezhouba General Construction (CGGC)	China	Yes (Bhote Koshi, Chameliya)	Yes	Unsure	Yes
17	Sinohydro	China	Yes (Upper Tamakoshi, Upper Marsyangdi)	Yes	Unsure	Yes
18	China Three Gorges (CTG)	China	No	Yes	Unsure	Yes
19	Hochtief	Germany	No	Yes	Unsure	Yes
20	Impregilo Celini	Italy	Unsure	Yes	Unsure	Yes
21	Skanska	Sweden	No	Yes	Unsure	Yes
22	Kosek	Rep Korea	Yes (Upper Trishuli)	Yes	Unsure	Yes
23	CMC	Italy				Yes

Engineering Consultants – Solar and Hydro

Unlike in hydro, the level of expertise in Nepal in large-scale solar projects is limited. There are, however, three solar consultancies and installation companies which work in the off-grid and home installation market. The three largest players are:

- Sun Farmer
- Gham Power
- Saral Urjal

The rest of this section will focus on services in the hydro space. The majority of the consultancy work in this space is carried out by the following six companies (listed in order of market share):

- Hydro Consult Engineering Pvt. Ltd. (HCE)
- Sanima Hydro and Engineering Pvt. Ltd. (SHEPL)
- ERMC P Ltd
- ITECO Pvt. Ltd.
- Jade Consultant
- Shah Consult International

HCE and SHEPL are specialist consulting firms that only provide engineering services (studies,

design, and construction management) in the hydro sector. The other firms also take on other engineering work for roads, bridges, irrigation, and water supply.

Hydro Consult Engineering (formally known as BPC Hydroconsult) was involved in the feasibility study, engineering design, and construction supervision of the 60 MW Khimti Project in the 1990s as part of the consortium led by Statkraft Engineering. BPC Hydroconsult was also involved in the design and construction supervision of the 5.1 MW Andhi Khola (recently upgraded to 9.5 MW) and the 12.0 MW Jhimruk hydropower plants. HCE is also the owners' engineer in the construction of the 37 MW Kabeli A (in association with Tata Consulting Engineers) and 30 MW Myagdi Projects in Nepal. They have also collaborated with their Chinese partner to develop approximately 800 MW hydro projects in the Marsyangdi Valley.

Sanima Hydro and Engineering Pvt. Ltd. was formed 12 years ago. Its shareholders include Hydroplan UK and several Non Resident Nepalis (NRNs). They were recently involved in the engineering design and construction supervision of the 22 MW Mai Project, 7 MW Mai Cascade, and the 14.9 MW Hewa Khola "A" Project. Currently, this company is undertaking feasibility studies and detailed engineering design of 10 projects with an aggregate capacity of about 400 MW, including the 28 MW Lower Likhu, 72 MW Middle Tamor, and the 285 MW Upper Tamor projects.

The other consulting firms (ERMC, ITECO, Jade, and Shah Consult) have worked for the Nepal Electricity Authority (NEA) and the GoN hydro works (e.g. studies on behalf of Department of Electricity Development) and as local partners in Joint Ventures (JV) with international firms. These consulting firms have also conducted feasibility studies and Environmental and Social Impact Assessments (ESIA) for various private sector national and international hydropower projects and transmission lines. Jade Consult was associated with Tractebel Engineering for the feasibility study 1,200 MW Budhi Gandaki Storage Hydro Project and Shah Consult recently completed the construction management of the NEA-owned 30 MW peaking run-of-river Chameliya Hydro Project in very difficult ground conditions.

Chinese and Indian consulting firms are also involved in the Nepali hydro sector. For example, Entura Hydro Tasmania India Pvt. Ltd. performed detailed design the 27 MW Dordi Hydropower Project. This company has also been involved in appraisals and independent review of a number of hydropower projects. Shanghai Investigation and Design Institute (SIDRI) of China has an office in Kathmandu and was involved in the investigation of the 750 MW West Seti Hydropower Project, which was intended to be developed by the China Three Gorges Corporation.

Nepali consulting firms are currently able to take on engineering services for projects up to 100 MW, including underground structures. Engineering services in projects larger than 100 MW may require association with international firms. The active Nepali firms together can take on feasibility studies and detailed engineering of about 200–300 MW annually, depending on the number of individual projects.

Civil Contractors

The three most active civil contractors in Nepal are:

- High Himalaya Hydro Construction Pvt. Ltd (3HC)
- Himal Hydro & General Construction Ltd (HH)
- South Asia Infrastructure Pvt. Ltd (SAI)

Among these, HH is the oldest hydro contractor in the country, with over 30 years of experience. HH was involved in the construction of the 60 MW Khimti Hydropower Plant in the late 1990s in association with Statkraft Anlegg. 3HC has been working as a hydro civil contractor since 2009 and has been involved in over 10 projects with a capacity of 3–42 MW. SAI is a relatively new civil contractor (established in 2014) that was involved in hydro tunnel works for projects of 20–30 MW.

These three civil contractors together cover a majority of the private sector market share in Nepal. There are also 5–10 contractors that have experience in civil works of small hydropower plants. There are also new entries in the hydro sector, mainly civil contractors that have experience in roads, irrigation, and construction.

Experienced civil contractors, such as HH, have experience in projects with capacities of 50 MW to 100 MW. Projects larger than 100 MW may require, in general, an international civil contractor. Hydropower plants larger than 100 MW are being built by international contractors (e.g., 456 MW Upper Tama Koshi by Sino Hydro, China).

The current capacity of Nepali civil contractors is limited. Thus, if the hydropower sector of Nepal is to grow, capacity in civil works construction must also increase concurrently, and more international contractors must collaborate with local contractors.

Electro Mechanical Contractors

The installation of electrical works in hydropower plants has two main steps:

1. Design, manufacture, install and commission electro-mechanical equipment
2. Electrical control and protection systems in the powerhouse and switchyard areas

The current practice in the Nepali hydropower sector is to award a “water to wire” contract to the electro-mechanical (EM) equipment supplier. Thus, electrical control and protection systems are part of the “water to wire” contract with the EM supplier. Since EM equipment is not manufactured in Nepal, this has generally been outside the scope of work of Nepali consultants, contractors, or suppliers. However, with recent experience, this is likely to change.

It is estimated that the Nepali and Indian firms (mentioned under Transmission Contractors, below) have over 90% of the market share in transmission line work, including NEA transmission line and substation installation work.

Electro mechanical equipment is generally imported from Europe, India, and China. The main electro-mechanical suppliers are:

- Andritz Hydro
- Alstom Power
- Toshiba
- Boving Foress Ltd (BFL)
- Harbin
- FLovel

Hydro-Mechanical Contractors

Hydro-mechanical work includes penstock, gates, motors, and general steel work. From Dolma's analysis into past projects, hydro-mechanical costs make up on average around 15% of the total project cost. The major H&M suppliers are:

- NHE – Butwal
- 3M – Pokhara
- CREAM – Butwal
- North – Butwal
- BYS – Kathmandu
- Constructo – Kathmandu
- Mega – Butwal

In addition, other suppliers will come in from India and China as the market in Nepal expands.

Nepal Hydro and Electric Limited (NHE), a company established in 1985 in Butwal, Nepal, is an experienced contractor with large, well-equipped workshop facilities. It is also active in the refurbishment of EM equipment (although NHE does not manufacture EM equipment). NHE also works as a local JV partner with international EM equipment suppliers in installation work.

HYDRO-MECHANICAL DESIGN

Simple steelwork design is undertaken by hydro-mechanical companies. More complicated designs can be carried out by TAC, based in Kathmandu. TAC is a small specialist consultant.

Transmission Contractors

Scope: construct substation facilities and transmission lines until the connection point.

1. Transmission line up to the interconnection point

The dedicated transmission line from the powerhouse/switch yard to the NEA interconnection point (substation) is often awarded as a separate contract package (it is outside the scope of work of the EM supplier). There are a number of Nepali and Indian contractors that are active in the hydro/transmission line sector. Generally, these companies will take responsibility for design, fabrication, and installation work. The main contractors are:

NEPALI FIRMS:

- Sigma Con Pvt. Ltd.
- Mudhbhary and Joshi Construction Pvt. Ltd.
- Urja International Pvt. Ltd.
- Cosmic Electricals Pvt. Ltd.

INDIAN FIRMS:

- Aster Pvt. Ltd.
- Jaguar Oversees Limited
- Power Grid Corporation of India
- KEC
- Jyoti
- Tribeni


UMITOMO

1.5 HIGH LEVEL STRATEGIES FOR CLIMATE ADAPTATION

Hydro is the leading energy asset class in Nepal, and given the country's development trajectory it is likely hydro will feature as a central energy source for Nepal moving forward.

If one takes a step back to appreciate the gravity of the issue surrounding the need to implement adaptation strategies in the future, one should appreciate the number of potentially affected individuals in the Himalayan Hindu Kush region.

OPTIMISING THE USE OF WATER THROUGH BETTER PLANNING AND INCENTIVES

Growing populations and rising incomes are increasing demand for water, according to the World Bank. In many parts of the world, the growing demand for water has been unchecked, and some policies have stimulated the overuse of water. Ensuring future water security will therefore require more prudent demand-side management.

REDUCING THE IMPACT OF EXTREMES, VARIABILITY, AND UNCERTAINTY

A major challenge for ensuring a water secure world is reacting to and reducing the impact of extreme weather events expected due to climate change, such as droughts, floods, storm surges, and increased rainfall variability. Reducing freshwater demand relative to supply and increasing the amount of water stored will go a long way towards increasing resilience against highly variable rainfall and the droughts and floods that the variability creates.

Mitigating damage caused by such events will require large investments in technology and infrastructure. Once built, investments are irreversible and much uncertainty surrounds where they should be optimally placed and how large they should be.

Other key investments include upgrading hydro-meteorological and early-warning systems. Increasing the lead time of a storm allows households to evacuate an area and move their belongings to higher ground. Better medium-term and seasonal forecasts can help farmers make cropping and irrigation decisions, which can counteract some of the added uncertainty brought about by climate change.

Another important yet underutilised tool to respond to growing rainfall variability in developing countries is crop insurance. Increasing farmers' access to crop insurance will protect households against falling into poverty or becoming food insecure when the impacts of climate change destroy harvests. Insurance will also incentivise farmers to invest in higher value crops and modern technologies by eliminating the catastrophic risk of losing a large investment if the harvest fails.

Adaptation goals can often be achieved through better management of ecosystems and investments in natural capital at a fraction of the cost of physical and engineering solutions. Natural infrastructure not only provides protection and resilience but is also required for sustainability, to ensure future supply of water. As the residual claimant, ecosystems receive water that is left over from other uses, so the water is often polluted. This, in turn, disrupts river health, the ability to flush pollutants, and a host of other ecosystem services. As the world grows more crowded and thirstier – which is

the case in the Himalayas, as shown in Figure 9 – threats to ecosystems will escalate and investments in their production will become more urgent.

Framing Climate Change as a Project Risk

Every hydro development and operation carries a unique set of commercial, economic, and financial risks, as well as complex technical, environmental, and social impacts that must be assessed to determine individual project viability. Changes in future activities in the project area, upstream irrigation, and land or water uses can affect proposed developments, especially during the dry season. In many cases, economic and financial aspects related to the construction cost, schedule and potential delays, discount rate, cost of debt and equity, electricity tariffs, etc., are critical to private and public developers to demonstrate the long-term viability of the project. In all projects, one of the challenges that policymakers, financiers, developers, and designers face is how to assess and quantify specific climate change and climate-induced natural disasters, among a multitude of other risks.

While the impacts of future climate change represent a relatively new threat that may be poorly understood by the hydropower industry, research to date has shown that these impacts are critical to assess but may not be the most important perceived risk for hydropower development. For example, hydrological risks and risks associated with the economic context of hydropower and dam construction, such as assumptions of future electricity prices, or the viability of future export markets and transmission capacity, can be seen as equally or more important.

According to Mott MacDonald's "Hydropower Sector Climate Resilience Guidelines", climate change and natural disaster risks may also be viewed as "threat multipliers", exacerbating risks from other sources when considered a compounding factor. The idea of climate change as a threat multiplier accentuating other project risks is highlighted in Figure 9. Climate change and natural disaster risks present a new dimension of hazards for which best risk management practices have not yet been established for hydropower development and operation.

FIGURE 8: THE WORLD'S LARGEST TRANSBOUNDARY RIVER BASINS AND THE POPULATIONS THEY SUPPORT

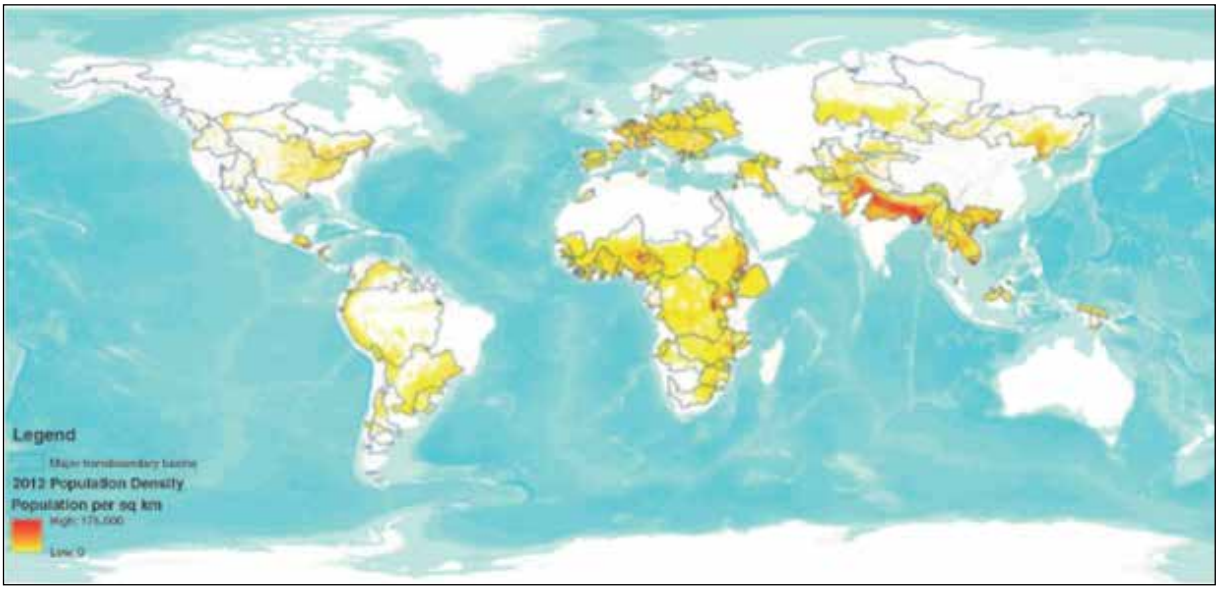


FIGURE 9: RANGE OF HYDROPOWER RISKS SHOWING CLIMATE CHANGE AS A PERVASIVE RISK/ THREAT MULTIPLIER

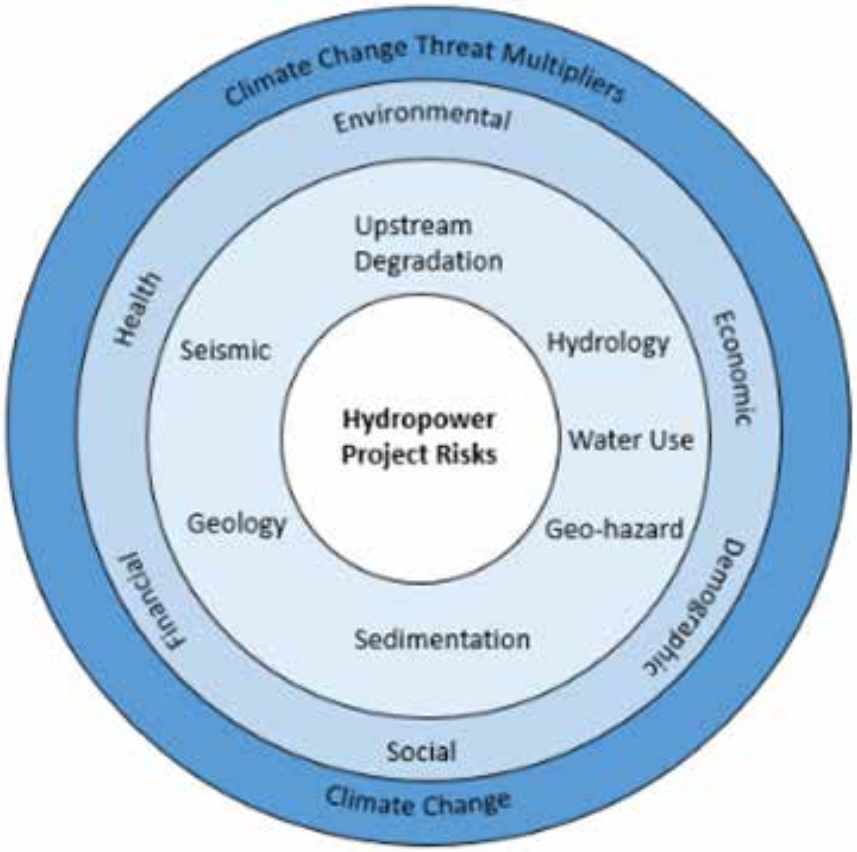
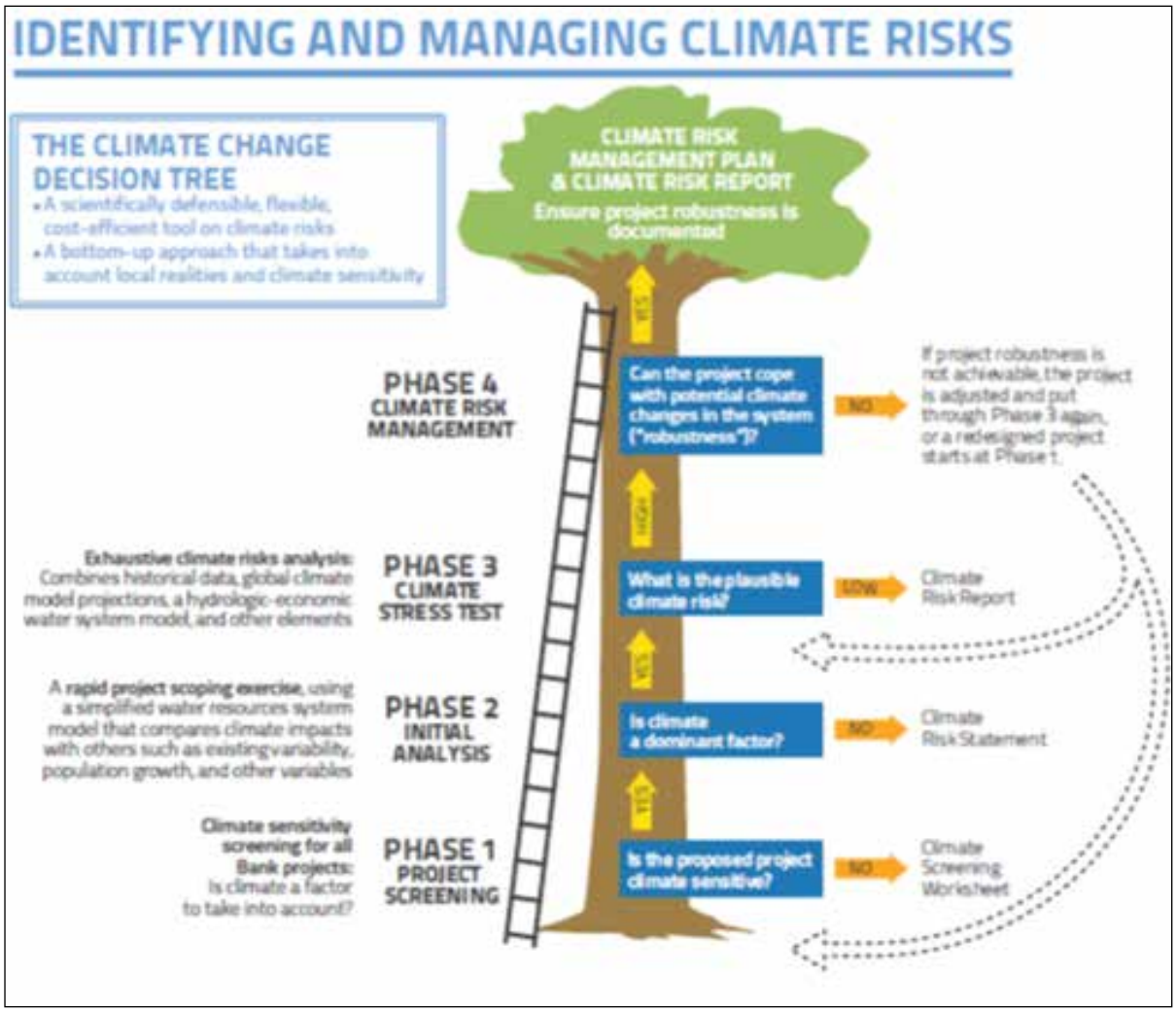


FIGURE 10: IDENTIFYING AND MANAGING CLIMATE RISKS



1.6 HIGH LEVEL STRATEGIES FOR CLIMATE RESILIENCE

A structured approach to climate resilience is required in the interest of cohesion on a global scale. The guidelines below are recommended by Mott MacDonald, broken down into four distinct phases, in line with the World Bank's report "Identifying and Managing Climate Risks"3 and Mott's internal assessment on the risks associated with climate change adaptation.

The World Bank outlines a pragmatic process for risk assessment of water resources projects that can serve as a decision support tool to assist project planning under uncertainty and that would be useful for the WB as well as other practitioners. The approach adopts a robust, bottom-up alternative to previous top-down approaches to climate risk assessment, the quality of which has been contingent on the suitability of future climate projections derived from general circulation models (GCMs).

1.7 RISKS AND DESIGNS SUITABLE TO NEPAL'S TRANSMISSION NETWORK

Risks

- Terrain
- Ground clearances
- Foundation conditions
- Floods and landslides
- Right of way, including land acquisition and forest clearance
- Environmental and Social (E&S) issues
- Social disturbance during construction

Designs

- Mountain regions
  - o Ridge route is preferred, but at times requires major valley crossing
  - o Vertical and site ground clearances on slopes
  - o Adequate protection (such as retaining walls and drainage) against floods and landslides
  - o Good stakeholder management; obtaining permits on time
  - o Avoiding national conservation areas and regions with endangered species
  - o Good stakeholder consultation

1.8 EXISTING ELECTRICAL AND MECHANICAL EQUIPMENT

Most power plants in Nepal are medium- and high-head, which use Francis and Pelton turbines; however, some low-head plants using tubular turbines are also in operation. Sediment management and refurbishing or replacement of turbines are key issues in the operation and maintenance of hydropower plants in Nepal.

Water conveying system include fully- or partially-lined tunnels and steel penstocks. Electrical equipment includes generators with adequate control and protection systems, transformers, substations, and switchyards.

Transmission to the grid substation is generally at 33 kV and 132 kv.

1.9 TECHNOLOGY OVERVIEW

Large scale solar

- As mentioned in Section 1.5, grid connected solar is still a relatively new concept in Nepal and suppliers will likely source equipment from India, China, or elsewhere.

Rooftop solar/distributed generation

- Monocrystalline PV, a type of crystalline solar technology, was incorporated into the Nepali domestic market over the years, particularly during the years of load shedding years in the Kathmandu valley.

Smart grids and net metering in Nepal, electrical vehicle (EV) charging

- Some progress has been made in net metering and EV development in Nepal. The first net metering project was established in November 2017 after ICIMOD's 92 kWp system was connected to the national grid. Others have followed since. EVs continue to garner support from the NEA and government authorities. A recent announcement from the NEA MD aiming to install EV charging stations across the country underlines this.

Hydro

- Mature energy asset class with little innovation.
- Automation, software development in the energy management of hydro

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