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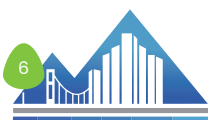


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Editorial

Since its inception in 2002, the Confederation of Nepalese Industries (CNI) has been actively engaged to enhance the business environment for Nepal's private sector by promoting legislative and policy changes and advocating reform on various issues including financial sector reform, strengthening of private sector's capabilities, streamlining of private sector's initiation on development agenda, and industrialization based on trade competitiveness. Over years, CNI has emerged as a thought leader working with the government agencies in formulating suitable policies to boost economic growth and attract investment across various sectors. As a part of its offerings, CNI has been organizing infrastructure summits, every three years, since 2014 and has been urging the government to address infrastructure bottlenecks to make Nepali industries competitive.

Following this legacy, CNI is proud to launch the fourth version of the Infrastructure Summit, this year, on the theme "Infrastructure for Growth". Acknowledging the challenges of infrastructure financing brought by the pandemic and the ongoing Ukraine crises, this year's Summit aims to initiate discussions amongst national and international stakeholders and investors to identify innovative financial mechanisms to bridge the funding gaps. Further, to address the specific bottlenecks to infrastructure development for crucial sub-sectors

such as transportation, energy, urban development, drinking water and sanitation, the Summit intends to encourage government's commitment through policy reforms, attract private sector investment, promote investment in digital infrastructure & technology integration, and prioritize projects that support environment-friendly infrastructure. This year as well, the Summit ensures participation of provincial and local government representatives, to assure a bottom-up approach to development and enable reforms for inclusive growth, in the federal context.

Along the thematic and technical sessions, the Summit will include a synopsis of national interactions carried out by CNI across all provinces in Nepal in terms of infrastructure development plans, future strategies and necessary actions plans. It is expected the deliberations will provide impetus for making Nepal's infrastructure space more conducive for private sector participation.

On behalf of CNI this Editorial Board welcomes all distinguished guests and participants and extends sincere appreciation and gratitude to each one of you for generously accepting our invitation to attend the Summit. We are confident that your participation in the deliberations will provide the needed push to increase momentum for development of climate resilient infrastructure for meeting our sustainable goals.



Editorial Board: Mr. Vishnu Kumar Agarwal, Mr. Birendra Raj Pandey, Mr. Deepak Raj Joshi, Mr. Madhukar Dahal

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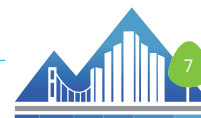
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Trade Tower, 5th floor, Thapathali, Kathmandu, Nepal

Phone: +977-1-5111122/23 **Fax:** +977-1-5111125 **Email:** cni@cnind.org **Website:** www.cni.org.np

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Message from MoPIT

I am delighted to be informed that Ministry of Physical Infrastructure and Transport (MoPIT) in collaboration with Confederation of Nepalese Industries (CNI) is organising the fourth series of the 'Nepal Infrastructure Summit 2022' on the theme 'Infrastructure for Growth'. I congratulate CNI for continuing the tradition and launching this souvenir to commemorate the summit.

Infrastructure development lies on the cusp of all economic activities. As we know, Nepal embarks to promote sustainable infrastructure development and has set ambitious targets to combat climate change. Immense opportunities of growth and prosperity lay ahead of us. However, since infrastructure financing is mostly led by the public sector alone, significant gaps exist. To bridge the gap, substantial investments and enhanced collaboration with private and foreign partners and investors is required. Moreover, as Nepal fights with challenges of fiscal deficit and microeconomic imbalances, the need and urgency for making coordinated efforts has intensified.

At this juncture, we are confident that the infrastructure summit will provide a common platform to diverse group of stakeholders including the government, policy makers, investors, development partners, and the private sector to focus, explore, and showcase investment opportunities in the infrastructure sector of Nepal. We are hopeful that the summit will garner financial commitments to address funding gaps and pave way for policy reforms for an unceasing growth.

As a nodal agency entrusted with the responsibility of planning and implementing physical infrastructure and transit management of the country, we remain committed in creating enabling



environment for investment and promote avenues for infrastructure development. In the near future, we thrive to augment our efforts in developing sustainable infrastructure to deliver equitable socio-economic development across the country.

I wish the Summit every success.

Mohammad Ishtiyaz Rayi

Minister

Ministry of Physical Infrastructure & Transport
(MoPIT)

Message from CNI President

It is a matter of contentment and pride for the Confederation of Nepalese Industries (CNI) to organise the fourth series of 'Nepal Infrastructure Summit (NIS)' with the theme of 'Infrastructure for Growth' on 8th and 9th of September 2022.

I believe 'Nepal Infrastructure Summit (NIS)-2022' will build on the legacy of the preceding summits, showcase Nepal's strength and emerging opportunities for infrastructure development and present innovative strategies and insights on best practices. This year, we will lay special focus on prioritizing green and climate-resilient infrastructure projects, digital infrastructure, and envision to revive the much-needed zeal for policy reforms.

We are fortunate to bring together luminaries from the business world, investors, developers, development partners, technical experts, policy makers and senior government officials into a shared platform for exchanging ideas and experiences. On a broader spectrum, we hope that the summit will positively contribute to Nepal's journey in attaining its SDGs, through promotion of investments in green & climate resilient infrastructure.

I express my sincere thanks to the Government of Nepal, especially, Ministry of Physical Infrastructure and Transport (MoPIT) for being the joint organizer; the Investment Board of Nepal (IBN) and Youth Community for Nepalese Contractors (YCNC) for being the co-organizers, and development partner organisations & partner companies for their continued support for building this event. I would also like to extend my sincere thanks to the members of the organising committee, the steering committee, CNI members and officials, sponsors and media personnel for their dedication and efforts.

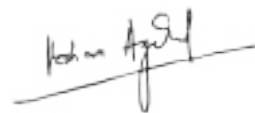
I present this souvenir which contains messages from our leaders, summit briefs, editorials, summaries of previous summits including



interviews with sectoral experts and knowledge articles on infrastructure development. I humbly thank Rt Honourable Prime Minister of Nepal and Hon'ble Minister for Physical Infrastructure and Transport for enriching this souvenir with their valuable messages. I appreciate the efforts of the summit team and knowledge partners, PricewaterhouseCoopers Pvt Ltd (PwC) and Institute for Integrated Development Studies (IIDS), for their input to design and finalise this souvenir. On behalf of CNI, I express my gratitude to the esteemed guests, foreign delegates, keynote speakers, panellists and other participants including our partners, sponsors and media.

I hope the souvenir will be a useful resource to all the participants and stakeholders of this summit.

I extend my best wishes for the success of the summit in achieving its objectives.



Vishnu Agarwal

President

Confederation of Nepalese Industries (CNI)

Rewind: Nepal Infrastructure Summit 2019



Nepal Infrastructure Summit (NIS) 2019, organised by CNI in coordination with Investment Board of Nepal (IBN) and Youth Community of Nepalese Contractors (YCNC) on 11th and 12th September 2019, was third in the series on the theme of ‘Resilient Infrastructure for Sustainable Development’. NIS 2019 was different from the last two series, it included interactions with chief ministers from all the seven provinces of Nepal and signing of an MOUs with provincial governments to set up a ‘Provincial Partnership Investors Forum (PPIF)’. The summit was joined by the chief guest, honourable Mr. Nanda Bahadur Pun, Vice President of Nepal; guests of honour, Dr Han Seung Soo, Former Prime Minister of Republic of Korea and H.E. Mr Raj Kumar Singh, Minister of the State (IC) of the Ministry of Power, New and Renewable Energy; and the Ministry of State Skills Development and Entrepreneurship, Government of India and other special guests like honourable Mr Raghubir Mahaseth, Minister of Physical

Infrastructure and Transport, honourable Mr Binod Kumar Chaudhary, President Emeritus, CNI; Mr Jingdong Hua, Vice President of the World Bank; Mr Woochong Um, Director General of the Asian Development Bank, and Mr Hari Bhakta Sharma, Immediate Past President, CNI.

The opening plenary was chaired by Mr Satish Kumar More, President of CNI, who conveyed the objective of the summit i.e., to facilitate discourse on resilient infrastructure for sustainable development, and to attract large scale private investment in areas of Nepal’s core needs and strengths. Mr Birendra Raj Pandey, Vice President, CNI, briefed the audience about the summit while Mr Hari Bhakta Sharma, Immediate Past President, CNI, delved into the journey and accomplishment of the summit since its organisation in 2014. The plenary was then followed by the addresses from the Chief Guest, Vice President of Nepal, guests of honour, and other special guests.

As the theme suggested, NIS 2019 focused on the need to build resilient infrastructures given that Nepal is most vulnerable to climate change and geographical disasters. With rapidly growing population, and a changing climate increasing the frequency and intensity of natural hazards, the need to adapt and invest in resilience should be an urgent priority. To build resilient infrastructures conducive for achieving Sustainable Development Goals (SDGs), and realising the aim of becoming middle-income country by 2030, Nepal requires effective financing mechanism, right governance framework, public private partnership, efficient project implementation, and competent management.

Resilient infrastructures contribute to the wellbeing of people by providing them better health, education, and livelihood. Moreover, resilient infrastructures have potential to contribute towards key policy priorities, such as supporting the low-carbon transition, protecting biodiversity, addressing disparities across regions and cities, and promoting sustainable development and inclusive growth. However, due to lack of resilience, infrastructure disruptions are everyday concern undermining businesses, job creation, and economic development. A World Bank study 'Lifelines-The Resilient Infrastructure Opportunity' suggests that a disruption of infrastructure costs households and firms in low and middle-income countries at least USD 390 billion a year and Nepal is no exception. For instance, a devastating earthquake in 2015 and flooding in 2017 contributed to stagnating economic growth primarily due to disruptions in infrastructure. The current state of infrastructure in the country is far from satisfactory. As per the Global Competitiveness Report compiled by World Economic Forum, Nepal's infrastructure score stood at 17 out of 100 which is significantly lower than other South Asian countries (India 51.4, Bangladesh 31.5, Pakistan 35.1). In this context, following points were highlighted by the keynote speakers during the summit.

Setting Up the Context: The Infrastructure Outlook

As the discourse on infrastructure has transformed itself from economic development to sustainability, there is a growing importance of private sector. According to Mr Woo Chong Um, the private sector is required to contribute 50% of total investment need of the country which is around 0.5 billion USD per year. However, its participation is not satisfactory. Infrastructure development in Nepal is largely fulfilled by the government grants, with private sector participation limiting itself to energy and hydropower projects.

The government has initiated actions to create a conducive environment for the private sector with initiatives such as Public Private Partnership (PPP) Act and Nepal Infrastructure Bank (NIFRA). Separate regulations are in operation to regulate startups and facilitate investment with hedging rules in place and a clear provision for repatriation.

PPP is an important and effective tool for investment if used properly. For it to be effectively implemented, government must ensure proper allocation of risk between private and public sector, ensure access to long term finance, and develop bond markets in the conditions where we cannot solely depend on banks and Foreign Direct Investment (FDI)

Another area of improvement in infrastructure investment is project management. In Nepal, due to lack of proper plan, there is delay in project implementation. Therefore, the concept of the National Project Bank and Project Implementation Governance Framework should be implemented at the highest level to ensure timely completion.

Prof. Dr Pushpa Raj Kandel, Vice Chairman, NPC pointed out that Nepal needs up to 9.5% of GDP to be spent on infrastructure to achieve an annual growth of 7.5%. However, current level of infrastructure is much lower. We need an additional USD 2 billion each year if we are to make our

infrastructures resilient. Therefore, the goal of the private sector should be to actively participate in project development with good quality and governance.

Infrastructure and Regional Connectivity

Nepal is among the 40 landlocked countries in the world where the cost of road transportation is typically higher. This makes it difficult for production to be competitive in the international market. Dr Swarnim Wagle, Former Vice Chairman, NPC highlighted that having a well-built transportation infrastructure is crucial. It lowers trade costs price volatility, integrates market, brings economies of scale, fosters externalities and spurs economic growth. However, Nepal is a country with the lowest road density in Southeast Asia with only about 40,000 km of adequate roads. The need of the hour, therefore, is high quality expressways and roads connecting Nepal with its neighbours.

Road connectivity is equally important from tourism perspective as we need to connect inaccessible but pristine areas of Nepal. Tourism can be used as a strategic lever to get Nepal out of the LDC status.

Connectivity for electricity transmission is crucial to manage imbalances in demand for electricity. Nepal has come up with a roadmap for energy sector wherein concerned authorities have identified several upcoming and additional projects that demand a production of 15000 MW by 2030. The plan is to utilize 10,000 MW for consumption while exporting the excess energy produced. However, the current peak load is less than 1500 MW, which means that an increase of more than 10 times of the current consumption is required. Cross Border Energy Trade has a substantial role in meeting this target. Since, both India and Bangladesh are expected to have electricity demand deficit, Nepal can supply the electricity to fill the deficit.

Mr Noritada Morita, Former Director-General of ADB highlighted that Nepal needs an investment between USD 29 billion and USD 48 billion from the period 2019 to 2030 to achieve SDGs. As the impacts of disasters are huge in Nepal causing 25% of capital expenditure loss every year, there is a need is to push for disaster resilient infrastructure through policy measures, financing mechanism, and risk information. Identifying the environmental impacts of projects by improving the capacity of institutions to conduct environmental and social



impact assessments will help international funding agencies make an informed decision. This will also help building resilient infrastructures with an ability to withstand calamities in a disaster-prone country such as Nepal. Given that 25% of total capital expenditure, which is already less than 8% of total government expenditure, must be allocated every year in repairing and maintaining damaged infrastructure in Nepal, resilient infrastructures are the need of the hour that are not only cost effective but are sustainable for long term growth.

Infrastructure Development Policies and Financing

To incentivise more participation from the private sector, one window policy for investors must be implemented effectively. There is also a need to bring transformation around institutional partnership and mechanism to identify and implement invaluable new resources which requires active contract between 3 tiers or government.

To be able to channel the huge amount of capital required, funds from public as well as private financial institutions must be mobilised. According to Mr Jingdong Hua, Vice President and Treasurer, The World Bank, public finance institutions such as Employers Provident Fund has more than USD 3 billion in assets that needs to be evaluated for investment in infrastructure. Similarly, BFIs are managing more than USD 30 billion of capital where the largest share goes to non-infrastructure sectors. Therefore, viable infrastructure projects have to be identified to attract investment from BFIs.

Delivering Infrastructure Projects

It is established that a country such as Nepal, having a very limited internal source of capital, needs to mobilise foreign direct investment in infrastructure. However, risk mitigation mechanisms need to be put in place to instil confidence in the investors. Prof. Dr Govinda Raj Pokharel, Former Vice Chair, NPC highlighted that for risk mitigation, currency risk mechanism and country rating would play an important role to increase the bankability of project finance model. Nepal should collaborate with international financial institutions in getting technical assistance



Banks need long-term instruments to collect resources and should venture into capital market. There is need for policies to augment exposure of banks investment in non-energy infrastructure sector that would result in long term low-cost lending.

for economic and policy reforms. For instance, assistance in moving up the World Bank's Ease of Doing Business rank, a benchmark for assessing the investment climate for international investors, would help attract foreign capital.

To be able to attract foreign investors, bankability

of the projects also needs to be strengthened. Projects need to be viable to the needs of the country and be technical and financially feasible to implement. Reputation of the organisation should be considered when evaluating feasibility and design study of the projects. Project construction should be controlled while delay and cost overrun due to contractors must be brought to minimum.

Timely completion of the projects has been a major challenge in Nepal particularly for international companies. There is a need to streamline procurement and other bureaucratic processes. Project management is an area that needs to be improved with a provision of planning mechanism before starting the projects. The concept of the national project bank, project implementation, and governance framework can be implemented for timely completion of the projects.

To improve the project planning and implementation, the government needs to be involved in front-end planning and efforts need to be made in streamlining planning processes. While the Public Procurement Act has already been amended multiple times, it still requires overcoming all the hurdles faced by the contractors. Nonetheless, new and innovative steps are being taken by the government to tackle the problems and to deliver infrastructure projects. For instance, new liability contracting provisions have been introduced for greater accountability from everyone involved. Recent projects funded by ADB on highways have this provision added in the contract.

Opportunities in Provinces

Nepal should take advantage of recent change in federal structure by drawing learnings from India to attract investment in infrastructure. Each province has its unique feature and needs to be identified through comparative studies that include local capacities, niche areas for investment, and financing needs. This practice would

create competitive yet cooperative investment environment among provinces.

Given the various niches in each of the provinces, plans and strategies should be developed. To develop competitive federalism, a Competitive Federal Index can be developed in line with what is being implemented in Vietnam or India through Ease of Doing Business in States.

Honourable Krishna Bahadur Mahara, Former Speaker, House of Representatives pointed out that regular dialogue mechanisms with provinces is required to obtain feedback and suggestions at the local level. To address this, the formation of Provincial Investment Partnership Forum (PIPF) was announced that will ideate and expedite projects for each province.

Challenges in Infrastructure Development

Clear policy guidelines, choices in financing options, and investment-friendly bureaucracy are the foundations for infrastructure development. However, constraints in these aspects have clearly limited the amount of potential infrastructure investment in Nepal. Some specific challenges highlighted by the NIS 2019 are as follows:

- Lengthy approval process in licensing, construction, and operation of the projects.
- Multiple policies with overlapping authorities that conflict with sectoral infrastructure investment from both domestic and foreign investors.
- Risks due to political uncertainty with frequent changes in government authorities.
- Risk due to unstable macroeconomic indicators such as changing inflation, interest rates and foreign exchange rates.
- Limited financing options and lack of clear guidelines on raising capital for infrastructure projects.

- Build, Own, Operate, Transfer (BOOT) model is the only available form of public private partnership.

Key Takeaways and Way Forward

Nepal's average economic growth in the past 20 years has hovered around 4% which is not satisfactory. While Nepal has met the technical criteria to graduate from UN-defined status of a least developed country (LDC), its ambition is to meet all the SDGs and become a lower middle-income country by 2030. If Nepal is to realise its ambition of achieving middle income status by 2030, it must achieve annual growth of around 7% consistently until then. Therefore, the need of the hour is to invest in resilient and sustainable infrastructure since infrastructure of low quality tends to deteriorate faster, making it costly to maintain and repair. The World Bank also emphasises the importance of 3 'I's- Investment, Infrastructure, and Inclusion to take a major leap towards development. Therefore, NIS (2019) identified the priority sectors that will help in achieving sustainable economic growth.

Given the infrastructure requirement of the country, it is important to focus on certain key strategies. There needs to be rigorous institutional capacity building at federal, provincial, and local level. Formal, technical, and vocational trainings are required for new skills in developing and implementing resilient infrastructures. To foster the ecosystem of innovation and entrepreneurship, Government can launch a program called Start-up Nepal which is in line with India's flagship Start-up India Program.

Large amount of infrastructure funding needs to be mobilised that can be obtained domestically through joint contribution from public and private sector including BFIs, government, and EPF and internationally through FDIs. The role of new institutions such as Nepal Infrastructure Bank can also be prominent in leveraging private investment.

There should also be policy level changes to augment exposure of bank's investment in non-energy infrastructure sector by leveraging long-term and low-cost fixed lending. The creation of PIPF at the centre to enable private participation at province level needs to be expedited.

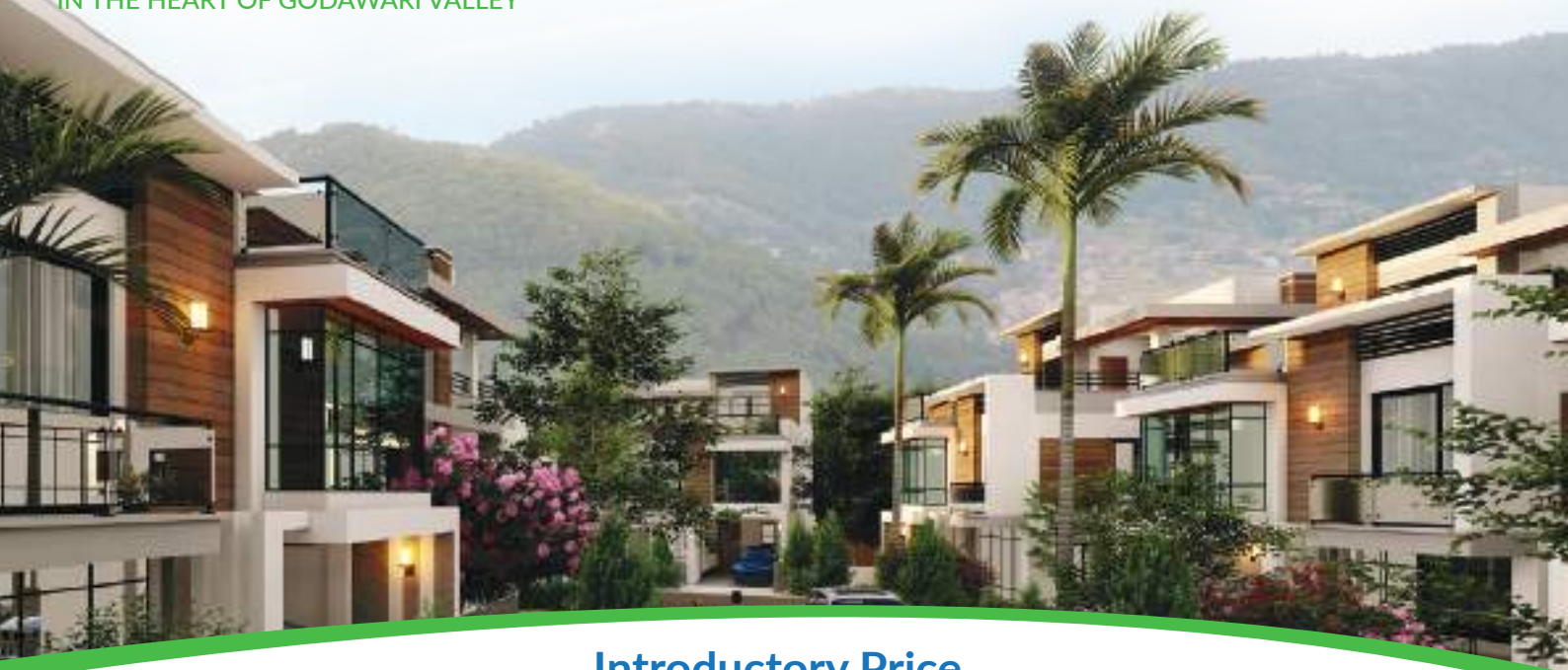
Developing project implementation and governance framework as well as Standard Operating Procedures (SOPs) is essential for effective and efficient project implementation, management, and monitoring. Timely completion of the projects has been a major challenge in Nepal particularly for international companies. There is a need to streamline procurement and other bureaucratic processes. Project management is an area that needs to be improved with a provision of planning mechanism before starting the projects. The concept of the National project bank, project implementation, and governance framework can be implemented for timely completion of the projects.

Nepal should also take advantage of recent change in federal structure to attract more investment in infrastructure. Each province has its unique feature and needs to be identified through comparative studies that include local capacities, niche areas for investment, and financing needs. This practice would create competitive yet cooperative investment environment among provinces. Collaborative governance structure needs to be implemented to enable smooth functioning of 3 tiers of Government. Provincial governments can take inspiration from Provincial Competitive Index created by countries such as India and Vietnam to improve Ease of Doing Business Framework.

Developing resilient infrastructures must be a priority that have potential to contribute towards adapting to climate change, protecting biodiversity, and promoting sustainable development and inclusive growth.



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Nepal Infrastructure Summit 2022

Infrastructure for Growth

Since the last NIS in 2019, Nepal's economic growth has contracted by 2.37 percent in 2019-20 owing to Covid-19 pandemic. Due to the pandemic, the economic activities came to a standstill, globally, and the world experienced unprecedented supply chain disruptions that undoubtedly affected Nepal's economy as well. While the economy was slowly recovering from the pandemic, the ongoing Russia-Ukraine war has further added challenges to the situation by increasing fuel and commodity prices causing inflation to soar. This has subsequently contributed to currency devaluation, recorded current account deficit, and depletion of foreign reserves, leaving the country to grapple for balancing external position

Despite such setbacks, Nepal has set an ambitious economic growth target of eight percent for FY 2022/23 while the growth rate for current fiscal year is estimated to be only around 5.84 percent. To attain such targets, Nepal needs to devise and implement bold and innovative policy measures and financing mechanisms. One of the compelling arguments that have emerged as a stimulus post Covid -19 is investment in climate resilient infrastructural development.

The need for resilient recovery has been fortified by factors like an uncertain global economic environment, escalating climate vulnerability, increasing economic cost of climate change, and the urgency for all countries to reduce their carbon emissions. All these, cumulatively compel Nepal to use this window of opportunity, not just to internalise environmental externalities but also to proactively pursue long-run multipliers for meeting its sustainable goals. Against this backdrop,

the NIS 2022 seeks to reinforce the idea that in the path to economic recovery and growth, the best bet is investments in infrastructure with focus on green infrastructure and financing.



Summit Highlights

- Nepal's largest & most comprehensive event on infrastructure sector organised by the private sector in cooperation with the government.
- Third edition in Nepal to know about the infrastructure development.
- Learn global best practices, partnership strategy, and policy updates through interactive sessions, round table discussion, and infrastructure bazaar
- Identify new strategies and techniques for challenges and opportunities facing the sector.
- Network with policy makers, business leaders and market experts for new partnership and gain business advantages.

Objectives



Build on the legacy of the past three editions of the Summit to continue identifying key constraints to infrastructural development in the current context



Catalyze reforms promised by the government for infrastructure development.



Forge stronger networks and alliances in the region for seamless connectivity and shared growth;



Attract large scale private investment in Nepal's core needs and strengths;



Prioritise the delivery of green, climate-resilient infrastructure projects that help achieve the Sustainable Development Goals (SDGs).

Concept Note

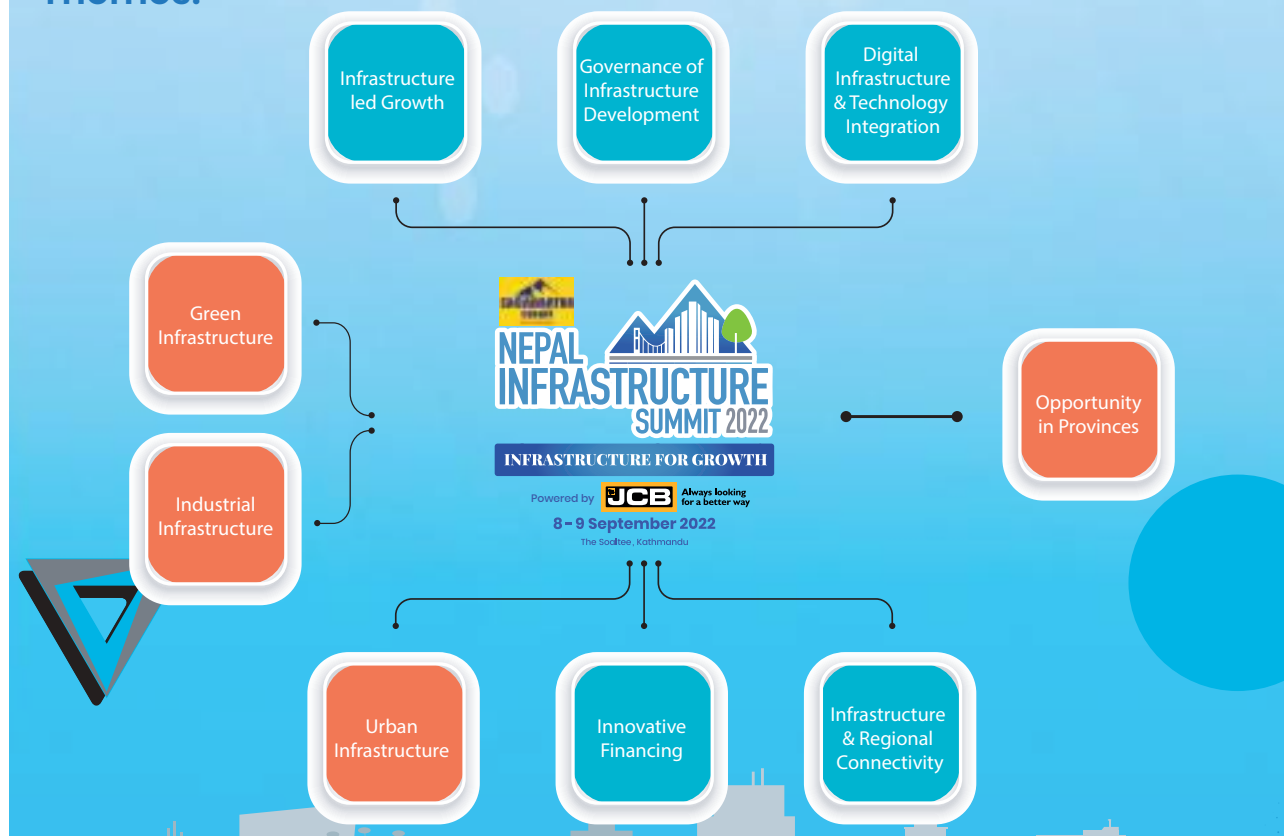
While public funding of capital projects in Nepal has increased in recent years, there is still disparity. According to a recent study by CNI and IIDS, there is a need of investment between USD 77 billion and 136 billion until 2030, in four concerned sectors: energy, transport, urban development and water and sanitation. However, the pandemic and the ongoing Ukraine-Russia war have forced countries to redistribute the budget earmarked for infrastructure to other urgent priorities, and Nepal is no exception. The current world situation is causing global supply chain disruptions, energy and fuel crises, trade wars, economic sanctions, protectionism, and fragmentation leading to soaring commodity prices. The IMF expects global prices to rise by 8.7 percent in developing economies. Similarly, according to the data by Nepal Rastra Bank (NRB), inflation in Nepal in June 2022 stood at 8.56 percent, the highest in the last five years.

Inflation along with currency devaluation has

contributed to record current account deficit, making things further exigent for Nepal, as the nation relies heavily on imports. Therefore, the country is impelled to divert the resources required for infrastructure investment towards balancing the external position. To add to this, Nepal is currently undergoing a liquidity crunch pushing the interest rate very high. The increased interest rate on government treasuries have posed additional challenges in mobilising resources for infrastructure investment.

Considering these circumstances, the NIS 2022 seeks to fill the imposing gaps through a constructive dialogue on innovative financial instruments and modalities by taking both local and international investors into confidence. A stronger network and connectivity in the region in the form of new air routes, better roads, transmission lines, electricity grid as well as policies regarding trade will not only address some of these challenges but also protect from external shocks, provide a foundation towards greater regional integration, and lead the country towards sustainable long-term growth.

Themes:



Key Focus:

Broadening the scope of infrastructure: The summit lays special focus on ICT. Nepal, although well-endowed with natural beauty, has difficult terrain and topography for connectivity. Being landlocked, both internal and external movement of goods and people is costly and inefficient. ICT is one area where goods (services) are independent of distance and weight. Further, the pandemic has increased the dependence on digital infrastructure for connectivity. NIS 2022 believes that investment in digital infrastructure and technology integration will help Nepal ride the digital wave, develop a competitive edge and be part of the global value.

NIS 2022 will revive the zeal for policy reforms: The innovative financing modalities, foreign direct investments, further engagement of the private sector, technology adoption and digital transformation require a solid foundation of

policies, strategies, and governance - accompanied with a zeal for sweeping legal and economic reforms spearheaded by the central government in coordination with its subnational counterparts. To this end, NIS 2022 is designed to ensure participation of provincial representatives, which will bring a bottom-up approach to development and enable reforms for inclusive growth.

Participants:

Government of Nepal, diplomats, development partners, foreign dignitaries, private sectors, think tanks, investors, consultants and builders



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Infrastructure for Growth: The big picture in post Covid scenario

Global supply-chain disruptions due to pandemic and wars leading to volatile macro-economic circumstances demand reflection on the linkages of economies that either promote or stifle growth. Infrastructure can be singled out as the most critical linkage that determines an economy's capacity to keep growing steadily – despite adversities. In the context of Nepal, while the economic growth has slowed down in recent years due to global events, the Government of Nepal has set an ambitious economic growth target of 8 percent for FY 2022/23. However, it is not far-stretched to argue Nepal's economy would grow at higher rates if it has a robust infrastructure in place.

Future disruptions and the case for resilient infrastructure

In June 2020 National Planning Commission (NPC) released a report estimating an outlay of approximately NRs 20 billion per year in infrastructure projects with approximately 37 percent contribution by the private sector to meet the sustainable development goals (SDGs) by 2030. However, the recent global events have contributed to soaring inflation, currency devaluation, record current account deficit and depletion of foreign reserves in Nepal forcing the country to direct its resources elsewhere towards balancing external position. Furthermore, the escalating climate change and the disasters that come along with it are likely to increase the need of diverting resources towards protecting the environment and livelihood. Therefore, it is high time that Nepal uses the post pandemic window of opportunity to invest in resilient infrastructures that can internalize environmental externalities and pursue long-run multipliers.

It is understood that investment in resilient infrastructure will lead to growth and enable the country not just to achieve the SDGs but also smoothly graduate from a Least Developed Country (LDC). Resilient infrastructure paves the way for increased economic activities, job creation, facilitate production and improvement in overall architecture to run competitive enterprises. While the

basic framework of infrastructure as a propeller of growth has always been relevant, there could be further insights on the type of infrastructure, focus on sustainability, impact to environment, new opportunities that need to be captured in the infrastructure-growth nexus discourse. Moreover, Nepal being an import dependent country that frequently faces challenges of maintaining balance in external sector as it is facing now, major infrastructure initiatives therefore must necessarily consider the prospects of generating a trade surplus.

The Changing Mega-trends and a case for Digital Infrastructure

One of the significant ways in which the world has changed in the post-Covid scenario is the deepening of digital infrastructure, adoption and integration of technology in everyday work. The pandemic served as a fulcrum for both the consumer and service providers to adopt digital means to conduct their business. The digital economy is giving scope to entrepreneurs, micro small and medium enterprises (MSMEs) and large companies) to explore the emerging model of employment. Nepal also witnessed a rise in the digital economy with apps concerning the e-commerce sector, food delivery, ride sharing and payments.

Nepal stands to benefit from this changing behavior and adoption of technology by investing in ICT, digital infrastructure and platforms. Considering Nepal's topography and geographic location, it is not in Nepal's comparative advantage to compete in the production and trade of goods. With services especially with on-demand services such as the gig economy and digital technologies Nepal has the potential to create jobs, raise incomes for informal workers and be more competitive and better integrated into the global value chain.



Regional Connectivity for Economic Growth

Modernising cross-border physical infrastructure is an important factor for expanding bilateral or multilateral connectivity. Nepal being a landlocked country, transport infrastructure is a necessary cornerstone for economic connectivity that helps in reducing trade costs, lowering price volatility, integrating market and bringing economies of scale.

The strategic positioning of Nepal offers a unique opportunity to participate in numerous regional projects. Before engaging in such projects, it is essential to understand our strengths concerning connectivity, and the reasons holding back our connectivity with South Asian countries. In this regard, improving connectivity through sub-regional cooperation such as the Bangladesh, Bhutan, India, and Nepal Motor Vehicles Agreement (BBIN MVA) plays a crucial role in pushing forward social and economic development among these South Asian countries. The BBIN MVA seeks to build a road-based economic corridor linking Bangladesh, Bhutan, India and Nepal. The BBIN MVA aims to promote the smooth movement of passengers, personal and vehicular cargo traffic within and between the BBIN countries.

Looking at the composition of transport connectivity in Nepal, 90 percent of goods and passenger transport services take place via road, 8 percent by air and 2 percent by rail, rope and others. Nepal should prioritise high-quality road infrastructure to increase connectivity in the short term. While high quality road infrastructure could be expensive at initial stage, investing in such massive projects is worthwhile in the long term. Nischal Dhungel in his article, 'Connectivity via sub-regional cooperation', writes middle- and low-income countries show a positive relationship between transport infrastructure and economic

development. Therefore, transport infrastructure becomes extremely important as a primary driver of economic growth. Nepal can tap into two huge markets, China and India, if it can develop advanced road and railway systems.

Nepal also confronts significant economic development obstacles due to constraints in electricity supply. However, there has been some positive developments. Nepal and Bangladesh intend to hold meetings about bilateral power trade and Bangladeshi investment in Nepal's hydropower industry. The positive side of the bilateral power trade is that Nepal can buy power from Bangladesh during the winter and sell its power dominance during the rainy season. This increases the prospect of improving energy trade not only with India but also with Bangladesh. In this regard, The Millennium Challenge Cooperation (MCC) Nepal Compact ushers in a new era in United States-Nepal Partnership, which aims to improve road quality, increase the availability and reliability of electricity, and facilitate cross-border electricity trade between Nepal and India.

Nepal can also benefit from new railway connectivity with another neighboring country China. The feasibility study for the proposed Kerung-Kathmandu railway project would significantly boost the development of a "cross-Himalayan connectivity network" using transportation, ports for trade, roads and telecommunication. While implementing projects like the BBIN MVA, Nepal should be free from political ties and act in the country's best interests. Swift implementation of high priority connectivity projects should be first on the agenda, bringing considerable macro-economic benefits not limited to generating thousands of jobs for the Nepali people.

Digital Infrastructure and Technology Integration: Leapfrogging Opportunities

ICT is one of the emerging sectors that can transform Nepal's economy by providing alternative to producing physical goods whose productivity and mobility is severely limited by difficult terrain and landlocked ness of Nepal. While e-commerce and gig economy were already

are further divided into eight sectors – digital foundation, agriculture, health, education, energy, tourism, finance and urban infrastructure. The framework envisions digital transformation in these sectors that can help Nepal achieve its SDG goals by 2030. The fifteen five-year plan of Nepal has also prioritized the implementation of the DNF 2019



gaining traction, the pandemic has accelerated the process as the government and businesses in Nepal are adopting digital mechanism. This trend can also be attributed to the steady penetration of digital equipment and broadband internet in Nepal.

Policies, Strategies and Progress so far

The Digital Nepal Framework (DNF) 2019 is a policy framework through which the government of Nepal outlines its digital initiatives. Under the framework there are 80 digital initiatives that

where ICT infrastructure, cyber security and digital literacy are mentioned as key strategies. In addition, there are several other policies such as National ICT Policy 2015 and National Broadband Policy aiming to complement ICT sector by expanding broadband access and reach nationwide. Also, the Nepal Cyber Security Bylaw has been enacted in 2020 to handle cyberattacks and cybercrimes.

The Government has made efforts to establish an e-payment system in the country. Payment for various services like – road tax, traffic fines, blue

book renewal fee, no objection letter payment among others can be made online. Even the provincial and local government are making concrete efforts to digitize services for citizens. Apps such as Local Levels Mobile App and Smart Palika have been developed with primary objective of disseminating information regarding the government services such as utility payment and filing taxes. The Nepal Rastra Bank (NRB) implemented the first phase of National Payment Gateway System in November 2021 that brings all the banks and digital payment vendors together allowing the NRB to monitor all payment systems. The NRB has also emphasized the need to shift gears from cash and cheque payment to digital payment.

Challenges to Digitization

The surge in the gig economy and e-commerce can largely be attributed to the expansive use of social media and internet penetration. However, there are many start-ups selling their products online through social media without officially registering. To bring such businesses under law, the government drafted the Electronic Commerce Bill in 2019 which has not yet been endorsed by the parliament. Without such law, it is not possible to bring all the online businesses under tax jurisdictions which is a loss from government revenue perspective. Another compelling challenge for e-commerce in Nepal is a lack of development of a state of the art digital map. Substandard digital map has a direct impact on service delivery and a lack of digital map can pose a major obstacle in enhancing the e-commerce sector.

Lack of digital literacy in Nepal can also limit the effective use of technology. Lack of awareness about malware, virus and hackers can expose people's privacy and make them vulnerable to attacks. While digital infrastructure is expected to enable the growth of the economy, alarming digital divide between urban and rural population can contribute to income inequalities which is not conducive for sustainable growth.

Regular, open, and meaningful interactions with stakeholders to address the existing challenges.

Implementation of the existing policies to make it easier for investing in digital infrastructure as a development priority.

Learning from some initiatives of countries with similar economies such as Bangladesh.

Supporting workforce development/ skilling/ upskilling through education and training through policy reform in education and labor acts.

Encourage and support Business Process Outsourcing (BPOs) and Information Technology Enabled Services (ITES) with a conducive environment such as payment channels, visa regulations, workforce development and policies to meet requirements of global business

Amendment of the Telecommunication Act 2053 (1997), which is more than 2 decades old and passing of the Electronic Commerce Bill.

Investment in Edge computing, sustainable strategies, data compression, and efficiency-enhancing mechanisms.

Rebooting Digital Infrastructure in Nepal

- Regular, open, and meaningful interactions with stakeholders to address the existing challenges.
- Implementation of the existing policies to make it easier for investing in digital infrastructure as a development priority.
- Learning from some initiatives of countries with similar economies such as Bangladesh.
- Supporting workforce development/ skilling/ upskilling through education and training through policy reform in education and labor acts.
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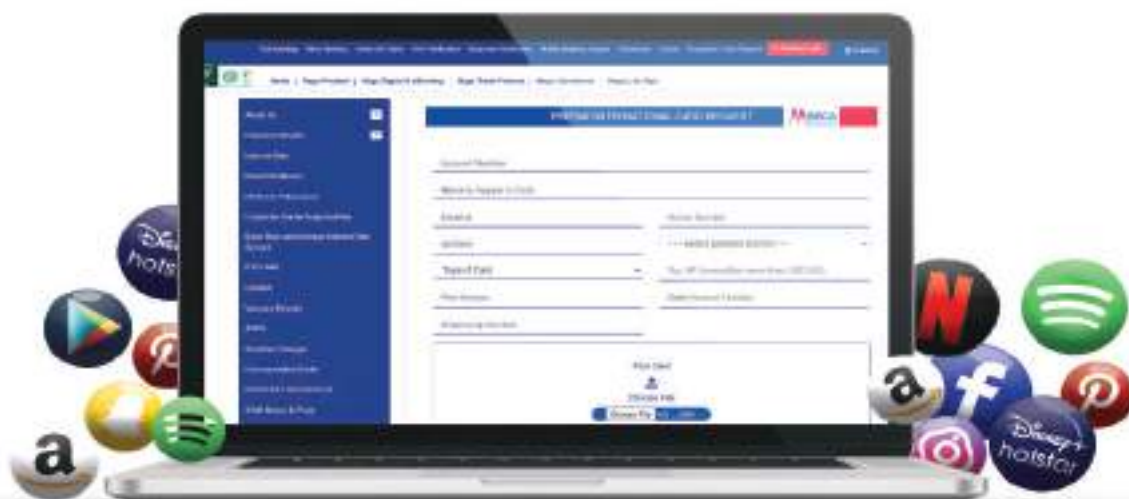
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Innovative Financing for Infrastructure: Financing Modalities for resource mobilization

Infrastructure investment has a positive effect on growth. However, infrastructure projects require large upfront capital injection which is a challenge for developing countries like Nepal with existing problems of reduced fiscal space, macroeconomic imbalances, rising inflation rate, and growing foreign debt burden. A 2019 CNI-IIDS study estimates that Nepal needs to invest around 8.74% of GDP in infrastructure between 2019-2030 to attain an optimistic growth scenario of 7.5%.

Existing Financing Scenarios

In Nepal, majority of infrastructure finance is met by the public sector. However, under-spending of capital expenditure remains prevalent. On average, 70% capital expenditure is utilized annually, with major portion spent in the last months of the fiscal year. In certain infrastructure projects that require private investment, banks face funding constraint due to asset-liability mismatch, collateral requirement, single obligor limit, etc. Although specific financial institutions dedicated to financing infrastructures like Hydroelectricity Investment and Development Company Ltd (HIDCL) and Nepal Infrastructure Bank Ltd (NIFRA) exist, their share in the total infrastructure spending is still negligible. The other sources of infrastructure financing are grants (7.5%) and soft loans (92.5%) from various multilateral development banks (MDBs). However, the proportion of ODA (Official Development Assistance) spent

on infrastructure projects is small. For instance, in 2019, only 2.5% of the total ODA was spent under the drinking water and sanitation sector, and around 5% in the energy sector. Furthermore, Nepal's equity and bond market are still in a very early stage of development. Therefore, to bridge the financing gaps, foreign and domestic investment in infrastructure sector is a must.

Stakeholders: The major stakeholders include Ministry of Physical Infrastructure and Transport (MoPIT), Road Board Nepal, Civil Aviation Authority of Nepal, Nepal Telecommunications Authority, Nepal Electricity Authority, National Planning Commission (NPC), and Office of the Investment Board (IBN), among others.

Existing Policies related to Infrastructure Financing

Financing for infrastructure projects comes under a host of different policies of the government of Nepal. Some of the relevant policies include- Fiscal and Monetary Policy, Hydropower Development Policy 2001; National Transport Policy 2001; Public Private Partnership Policy, 2072; Built Own Operate and Transfer Act (BOOT); Payment and Settlement Act, 2018; Privatization Act 2050, (1994); Land Resettlement and Rehabilitation Policy (2015); Public Procurement Act, 2007; Foreign Investment and Technology Transfer Act, 2073; and Hedging Guidelines 2075

Current Challenges / bottlenecks:



Some Innovative Financing Options for Infrastructure and their use in the region:



Governance of Infrastructure Development

Much of the development narrative in Nepal focuses on the financing aspect of infrastructure investment while public discussion on the quality of such investment is very limited. In fact, the governance of infrastructure investment is largely overlooked. There is a need to explore more on aspects such as infrastructure selection and prioritisation criterion, evidence-based project planning, and streamlining project executions and operations. Without these aspects we are missing opportunities to make most out of our limited resources.

We need a holistic infrastructure governance framework. In this regard, the recently published report on 'Infrastructure Finance Strategies for Sustainable Development in Nepal', has identified potential sources of public expenditure efficiencies by highlighting robust ways to reduce the cost involved in infrastructure projects and improve overall infrastructure governance.

One way for sound infrastructure governance is to improve project prioritisation to optimise the infrastructure portfolio. Even if the country saves 10 percent of capital expenditure, which amounts to NRS 8 billion, it would provide sufficient cushioning to finance large scale infrastructure projects. Achieving these efficient outcomes demands identifying projects with clear purpose, evaluating projects using improved cost-benefit analysis, and prioritising projects at portfolio level. The government must select projects with clear purpose based on socio-economic priorities and the metrics must consider long-term economic, social and environmental effects.

Another way of improving infrastructure governance is through utilisation of existing infrastructure assets. This is important given

Nepal's limited ability to mobilise domestic resources for infrastructure. Adding more roads and constructing more hydropower plants will not resolve problems if the existing infrastructure is not maintained. Nepal should move away from the build, neglect, and rebuild mentality and implement an infrastructure management system together with appropriate financing framework. We should take smart infrastructure utilisation management approach. For instance, recent elimination of power cuts in Nepal is the result of better utilisation and demand management of existing infrastructure. On contrary, the valley road expansion project has turned out to be poor and traffic congestion has not reduced. Deployment of information technology in establishing intelligent transport system (ITS) for roads would enable the utilisation of the existing road capacity.

Moreover, the opportunity by making most of the infrastructure assets like power and water systems lies in reducing non-technical losses such as electricity leakage and distribution losses. An article 'NEA incurs more losses due to power leakage', published in Kathmandu Post on August 2016 points out that electricity leakage was 25 percent, the 4th highest leakage rate in the world. However, the situation has significantly improved in recent years due to the better management of existing infrastructure. This avenue is worth taking seriously as reducing the losses can cost significantly less than what it cost to build a utility infrastructure project.

The above discussion suggests an immediate need to have a national level infrastructure governance framework. Such framework would not only help in effective utilisation of the already constraint resources, but also create conducive environment for private investment in infrastructure.

Urban Infrastructure for Livable Cities

Urban infrastructure encompasses the basic facilities, services, and installations needed for the functioning of a community, such as transportation and communication systems, water and sanitation, waste management, sewage systems, electricity distribution, public institution such as school and health care services and environmental regulation. Under the new Federal structure,

of urban infrastructure catalyzes private investment for high end functions such as business, health, and education thus leading to improvement in overall quality of life of most urban areas. Consequently, urban centers create desired economic and employment opportunities and live up to expectations of becoming “engines of growth” in terms of innovation, productivity, and contribution to GDP. Alternatively, as evidenced through



there are six metropolitan cities and 11 sub-metropolitan cities, with current level of urbanization of around 40 percent, which is projected to grow with declaration of new municipalities and migration as two main factors.

Across the world, it is observed that prioritised investment in basic services

the rapid urbanization process of Kathmandu over the years, unplanned urban development can give a sense of growth in the short run but pose a challenge to sustained growth in the long run, often causing an irreversible damage to the environment, structure of the city, congestion, deficit of basic services and income inequality.

The federal restructuring of the country poses an opportunity to consolidate efforts on urban infrastructure development for creating livable cities at both national and sub-national level for primarily three reasons: first, the urban centres designated to be provincial capitals will attract priority investments in infrastructure and urban development in general. Second, the provincial strategy of the development and prioritization of basic intra-province road infrastructure can affect the existing urban hierarchy in so far as it would redefine the locational advantages of small towns and market centres. Third, the policies of provincial government with respect to the development of agriculture, industries, biodiversity and hydro-power will also impact the functional role of provincial urban centres and to that extent influence the regional urban system. (NUDS, 2017)

Urgent Issues and Challenges that need to be addressed

Nepal faces urban infrastructural challenges in areas of solid waste management, access to water and sanitation, lack of green public spaces, efficient public transportation, alternatives to fossil fuels. Introduction of policies to urban infrastructure issues are challenged by financial constraints and institutional challenges. Change in government policies and changes in fiscal policies like tax and duties, as well as introduction of different schemes have not been successful in achieving targeted success. Efforts are also limited by policy-level barriers of the lack of long-term vision and planning, lack of fixed tax exemption policy, along with technical barriers, infrastructural barriers (limited service and repair experts and personnel), economic barriers (high prices and demand of goods and services, high replacement costs, higher electricity charge, lack of credit access), and social barriers (lack of knowledge, lack of environmental knowledge, lack of structured demonstrations) among others.

Urban Infrastructure Development Opportunities

Waste management

Concerted efforts by local governments to solve issues with waste dumping sites like Sisdoile is the immediate need. At the same time, introduction of a viable and long-term alternative waste dumping site should be planned. Not just relying on landfill sites, there should also be local, provincial and federal budget allocation for opening newer technologies like thermal and sewage treatment plants, composting grounds, waste incinerator plants, chemical-physical and biological treatment, among others. Local governments should also promote compulsory sustainable waste management techniques at the ward level that aid waste collection; these include orientation and

Local governments should adopt models of urban green spaces and promote green parks.

training programs on waste management, city and river clean-up schemes, promotion of recycling methods, among others.

Traffic management and well managed public transportation

Installation of automated traffic lights at key intersections of cities can aid in traffic management while also effectively re-routing traffic police resource from precarious and difficult working conditions. The pertinent longer-term solution lies in promoting large-scale public transportation bus and more EVs in the market instead of present gasoline-based vehicles. Through public-private partnership models like Sajha bus, urban centers can lessen the requirement of private two and four-wheelers by increasing the presence green public modes of transportation as well

as increasing the required infrastructure (like charging stations) for EVs. In regard to the consumption of EVs, Nepal could tap into its rising hydro-power electricity production to generate clean energy as well as lower the consumption prices to be used for EVs. Municipally operated bus routes that service destinations at a regular and reliable interval could be an area of focus for all urban centers. At the same time, local governments can encourage private and public partners to use cycles as an effective alternate transportation. For this, policies as well as physical infrastructure must be made available.

Clean air and Green Spaces

The local governments should adopt models of urban green spaces and promote green parks. Local governments as well as Civil Society Organizations should coordinate with the federal government to reclaim urban spaces currently occupied by entities like the Nepal Army, government institutions and other public and private holdings. Every ward should be mindful to incorporate creating and conserving parks, children playgrounds, communal exercise parks, communal ponds, *hitis*, *patis* and *pauwas*, among others, in their annual programs and policies. Local as well provincial and federal governments must also work to mandate the compliance of The Environment Protection Act, 2019 (2076) that has set the standards to reduce and regulate vehicles emission, hazardous waste, pollution emitted by vehicles, equipment, industries, hotels, restaurants and other institutions or activities.

Managing existing urban cities

Additional issues include haphazard overhead cable and wires; footpath vendor and business; rapid and uncontrolled urban sprawl; illegal or unmanaged land plotting; irregular, substandard, and inaccessible housing development; haphazard building construction, lack of compliance with building codes; limited connectivity of farmers to urban supply chain, the lack of outlets for farmers; and rising inflation; among others. All these issues require immediate coordination between the three-tier governments and relevant public and private partners.

Equal provisions for city planning

Lack of Nepal's urban infrastructures is also highlighted by the disparity among the Hills and Terai urban centers in the condition of water supply, sanitation, solid waste management, housing pattern, transport, and energy. For instance, only 32.9 percent of urban households in the urban Terai have access to piped water supply compared to 81.2 percent of households in the urban Hill. Similarly, only 56.1 percent of urban households have access to sanitation system, 88.2 percent households have access to toilets, and only 6 municipalities have sanitary landfill sites. A national, consolidated policy as well as an effective monitoring and compliance mechanism should be developed to manage such disparities.

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Provincial Infrastructure for Inclusive Growth



The constitution of Nepal has envisaged a three-layer system of governance in the country to make the infrastructural development more dynamic at the provincial and local levels through decentralization of structural and institutional setups. Studies also acknowledge the effectiveness of infrastructure development when left to subnational authorities as the direct result of allocative and productive efficiency achieved through delegated approach of decentralization. Subnational governments are more likely to plan and execute infrastructure development projects with efficient project management practice that meet the development requirement of a particular region or locality. Remarkable progress has already been achieved in the areas of infrastructure

development, drinking water supply and sanitation improvement, effective internal resource mobilization, and small and medium-scale industry establishment due to the promotion of governance at provincial and local levels. Before the country went into federal structure, there was a problem that the regions such as Far-West and Karnali regions were lagging behind while the regions nearby the central capital of the country were more privileged in terms of economic and infrastructure development. But due to the federal structure, each province has its own government and budget allocated for priority sectors. This provision has certainly helped in inclusivity by increasing the reach of development works towards people in each province.

Province	Key Infrastructure Projects
Province 1	Koshi Highway Project Upper Arun Hydropower Project
Madesh Pradesh	Nijgadha International Airport
Bagmati Pradesh	Melamchi Drinking Water Project Upper Tamakoshi Hydropower Project Kathmandu Terai Madhesh Fast-track Project
Gandaki Pradesh	Budhigandaki Reservoir Hydropower Project
Lumbini Pradesh	Gautam Buddha International Airport Project Babai Irrigation Project Sikta Irrigation Project
Karnali Pradesh	Bheri-Babai Diversion Multipurpose Project
Sudurpaschim Pradesh	Rani Jamara Kulariya Irrigation Project West Seti Hydropower Project

Opportunities for Provincial Infrastructure

Using the opportunity of the federal structure in terms of expansion of economic activities and the creation of effective demand, infrastructure including cross-border economic zones, industrial zones, industrial corridors, special economic zones, and industrial villages are being developed. The major prospects in Nepal are that each province has its own potential infrastructure for inclusive economic growth. Some potential projects that can significantly contribute to inclusive economic growth in the country are listed below:

Challenges and Possible Solutions for Provincial Infrastructure

Provincial governments largely depend on central transfers for funds as their own revenue sources are limited. This affects their independent and autonomous decision on infrastructure investment. Poor execution of capital expenditure is also a serious concern in Nepal at the sub-national level. Inadequate institutional capacity, ineffective management, administrative leadership, lack of

coordination between provincial ministries and agencies, and lack of coordination between federal, provincial, and local governments are some of the issues that need to be addressed. Furthermore, the provinces have not yet formulated all the necessary laws and regulations or established the requisite offices to carry out the functions that have been delegated. Private investors have faced numerous challenges as a result of limited policy provisions and laws. To address these issues, formulation of necessary laws has to be expedited. Federal government needs to provide more autonomy to provincial governments in terms of decision making on important infrastructure projects. There should also be more funding available to each province through central transfers. However, as federal government might also have limited funding, provinces should look to increase their own source of public revenue by incentivizing more local economic activities and enhancing local tax base.



Industrial Infrastructure

Industries play a pivotal role in contributing to the countries' economic growth and provide employment opportunity for their citizens. However, the industrial sector in Nepal has not been the most sanguine with its GDP contribution in the fiscal year (FY) 2020-21, being only 13.11%. Outmigration, lack of business-friendly policies, inadequate infrastructure, and political hurdles have been the consequences for a weak entrepreneurial ecosystem in Nepal.

Nepal has a short history in the industrial sector. The first industrial act was Nepal Companies Act 1936 which was followed by the establishment of the first joint venture industry and production plant in Nepal – Biratnagar Jute Mill. The first industrial policy was charted out in 1957. Subsequently, the industrial policy of Nepal was revised or replaced in 1960, 1974, 1981, 1987, and 1992. The Industrial Enterprise Act 2020 is currently the latest act that administers the industrial sector of Nepal. To realize the potential of the industrial sector, other relevant and complementary acts like the Public-Private Partnership and Investment Act 2019, Investment Board Act 2011 and Special Economic Zone Act 2016 were enacted.

Commercial Zones

To enhance economic growth and promote the manufacturing sector, the government of Nepal established the Industrial District Management Limited (IDML) in July/August 1988. The aim for creating an industrial district was to provide physical infrastructure facilities like buildings, electricity, water and other necessary physical infrastructures. At present, there are ten operational industrial areas in Nepal – Balaju, Patan, Bhaktapur, Hetauda, Nepalgunj, Pokhara, Butwal, Dharan, Birendranagar and Gajendranarayan Singh. Additionally, the

government of Nepal has declared 7 new industrial estates, namely, Damak, Mayurdhapa, Shaktihor, Lakshmipur, Motipur, Naubasta and Daijee. The government plans to declare five other industrial areas. The fifteen five-year plan has targeted to establish 351 industrial villages by 2023-24. But the progress of establishing industrial villages nationwide is currently lumbering in Nepal.

Special Economic Zones

There are seven Special Economic Zones (SEZ) in Nepal with one in each province. The idea of establishing SEZ is to attract both domestic and foreign investment to increase the competitiveness of export-oriented industries in Nepal. These commercial areas have liberal tax regulations with varying degree of exemptions on income tax, excise duty and VAT to create a fecund environment for industrial production. However, SEZs in Nepal have not been able to attract enough investment from private sector due to some infeasible provisions such as very high rental cost and stringent policies in terms of minimum export volume requirement.

Key Outcomes and Suggestions

The current pace at which the government is constructing these commercial zones begs the question of efficacy as they are struggling to allure private investors. While the vision of the government is to increase job opportunities and stop out-migration, these special zones have not been able to reach their potential and harness an entrepreneurial ecosystem. The government should focus on following areas to make these zones an attractive destination for foreign and domestic investors.

- The private sector has the potential to bring capital as well as innovation for the growth of industrial infrastructure as it has done

in telecommunication, information and broadcasting, and energy sector. Therefore, the government should create opportunities for the private sector in the development, operation and management of industrial infrastructure by making commercial zones and SEZ more conducive for business environment.

- Nodal infrastructure focused institutions such as NIFRA can work with private sector and public institutions for development of industrial infrastructure by arranging equity and debt for their projects. It can provide debt financing for the project invest equity in the project either through NIFRA promoted separate company or directly.
- IFC Country Private Sector Diagnostic Report recommends, there should be improved allocation of land for infrastructure projects by:

- (a) implementing land zoning;
- (b) updating the Land Act and making it consistent with Land Acquisition Policy; and
- (c) developing industrial parks tailored to specific industries.

- The government should make provisions for banks and financial institutions to mobilize at least 10 per cent of their loans to export-oriented industries.
- The role of Public-Private Partnership (PPP) for public infrastructure project is very significant in potential industrial areas. PPP arrangements are useful for large projects that require highly skilled management and a significant cash outlay to get started.

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Opportunities for Green Infrastructure Development

Approximately 70% of global greenhouse gas emissions come from infrastructure construction and operations such as power plants, buildings, and transport. Covid 19 has warned the world that a global crisis not just add unexpected cost to the economy but also reverses the development gains achieved in the past. The global health crisis re-enforced climate change as another impending global crisis, if not tackled on time. Thus, for economic recovery from COVID-19, green infrastructure is emerging as a strategy to move countries towards a low-carbon economy that will lead to a sustainable growth.

An International Finance Corporation (IFC) study shows that in Nepal, green finance has the potential to create a market of USD 46.1 B by 2030. There is large investment opportunity in renewable energy (USD 24.6B), transport infrastructure (USD 10B), agriculture (USD 4.8B), green building (USD 3.4B), electric vehicles (USD 2.5B), urban water (USD 686M), and waste (USD 83M) (UNDP, 2021). It is imperative for Nepal to use this window of opportunity to internalize environmental externalities as long-run multipliers for growth.

Existing policies and commitments towards Green Infrastructure

On a national level, Nepal Rastra Bank has published Guidelines on Environmental and Social Risk Management (ESRM) 2018, to ease the transition of banks and financial institutions towards investing in green infrastructure. Nepal is also gearing towards the adoption of a national green finance roadmap and the issuance of its first green bond.

On a global level, Nepal is a part of the ratified

Paris Agreement. At the UN Climate change conference, COP26, Nepal committed to building climate-resilient, inclusive infrastructures. In 2020, Nepal presented a revised Nationally Determined Commitment (NDC) that aims to cut GHG emissions by 28% by 2030 and reach net zero by 2050

Challenges and bottlenecks

Nepal would need USD 250 B to realize this ambitious goal of COP26. Thus, green infrastructure cannot be developed without the involvement and financing of private players. The NPC has estimated an outlay of approximately NRs 20 B per year in infrastructure projects with approximately 37 percent contribution by the private sector to meet the sustainable development goals (SDGs) by 2030. Nepal has identified a financial gap of NRs 585 B in achieving the SDGs by 2030, which includes NRs 367 B from the private sector. However,

In the absence of government level regulations and policy, there is no clear mechanism to incentivize the private sector in going green.

Lack of awareness and understanding among policy makers, investors, and institutions of what constitutes a 'green' infrastructure and its long-term benefits, resulting in possibility of green washing of grey infrastructures

Lack of skills and technology needed to accommodate green infrastructure

As per estimates, greening of projects cost at least 5-10 percent more than traditional infrastructure projects, which is a difficult decision for a developing country like Nepal, with high poverty and low socio-economic status and an already wide infrastructure funding deficit

Green Infrastructure remains largely a donor funded agenda. While international funding comes with defined conditions, domestic money is free from green obligation

Green funds have not been leveraged in either public or private sector infrastructure projects

There is no clear allocation in the current budget for green infrastructure development except for a hint of issuance of green bonds for “large and game –changing infrastructure projects”

Opportunities

Nepal could close the financing gap in infrastructure being a part of the Green, Resilient, and Inclusive Development (GRID) initiative.

By being a net zero carbon country, Nepal can benefit hugely from the enormous potential of carbon trade which in turn could diversify the limited sources of the foreign exchange. Electricity imported from Bhutan’s hydropower replaced the coal-powered plants and railways in India. This helped Bhutan receive carbon fund. Nepal can employ similar strategies, as it exports electricity

to India and Bangladesh in future.

Renegotiate with the creditors if the annual debt servicing amount of at least next three years can be used for creating green fund to promote green investment

Capitalizing on Nepal’s potential in generating clean, renewable energy

Utilize green finance mechanisms, such as green bonds as proposed in the fiscal budget to pilot financing green project in the municipal level

Incentivize the participation of private sector through (i) Quality, authentic and legal Detailed project report (DPR), (ii) Government guarantees that assures the private sector against sovereign risks and the risks of repayment.

Creating enabling environment for the growth of private equity and venture capital firms. The introduction of the Specialized Investment Fund Regulation (SIF regulation) by the Securities Board of Nepal (SEBON) is a positive step. However, there is a need for additional incentives and reforms.

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"This is the age of Green Infrastructure"

Dr. Bindu Lohani is a former Vice President of the Asian Development Bank (ADB), who holds significant knowledge of the dynamics of sustainable development and climate change. Lohani played a remarkable role in sensitizing issues regarding sustainable development and the impact of climate change for 30 years of service in the ADB. Before joining the ADB, Lohani, served as a government official. An elected member of the National Academy of Engineering of the United States, he has worked with many academic and research institutions at home and abroad. As the world is gearing up to promote green investment given the deepening impact of climate change, Bhim Gautam, editor of Nepal Infrastructure, had a brief conversation with him focusing on green infrastructure and economy:



There have been more debates and discussions about the development of green infrastructure around the world. How significant are these deliberations?

The world has observed climate change as the most pressing issue. It has inflicted a negative impact not only on a single region, country, and

individual but on the whole world. No area remains untouched by the climate phenomenon. Nepal is among the countries which are at the frontline of climate change impact. The snow peaks in our mighty Himalayas are also melting. This has directly affected snow-fed river flows making the downstream population more vulnerable to its impact. Due to changes in climate patterns

and temperature changes, agriculture is hugely affected, and hydropower projects are likely to face water shortages in future. Scholars from different countries have been conducting various research on this crucial topic. These studies have estimated that climate change will have an impact of 1.5 to 2 percent of the gross domestic product (GDP) of Nepal. The focus areas of these studies were agriculture, hydropower, and water resources sectors of Nepal. In 2017, it was found that the GDP had been affected by up to 3 percent, because of climate change. If we were to conduct a study today, the amount of such an effect would be even higher. If we are to project the impact after a hundred years, it is certain that there will be a host of other bigger problems including economic and human displacement. Since climate change has emerged as a global pain point, there is an urgent necessity of collective efforts globally. Although the Paris Agreement was signed in 2015, its implementation in many countries has been weak. The 'COP-26' held in Glasgow, the UK in October 2021, has further emphasized the need to sincerely deal with the growing problem of climate change and effectively implement the Paris Agreement.

Nepal has also committed to zero carbon emission by the year 2045 at COP 26 in Glasgow. How easy is it for Nepal to fulfill the pledge?

With the current pace and efforts, it looks challenging to meet our commitments. Just take example of air pollution in Kathmandu, which is one of the most polluted cities in Asia. Studies state that our GDP has declined by 1 to 2 percent due to excessive traffic congestion, air pollution and its socio-economic effects. Air pollution has led to increase in lung diseases, thereby increasing the expenditure on treatment. Across sectors, such environmental issues pertain. That is why, we should promote development of green infrastructure to tackle such problems.

How significant are green infrastructure projects?

Every infrastructure project we build must be

climate and environment friendly. Many years ago, we worked hard to implement the concept of Environmental Impact Assessment (EIA) in Nepal. Such documents are instrumental to make our development projects environment friendly and ensure minimum impact on the environment.

Whatever infrastructure we build, we should focus on the impact of climate change. We have been operating transport and building roads in traditional fashion. Now it should be done in a 'low-carbon' way. Of course, building such infrastructure will incur additional fees and expenses. Although it may seem expensive at the beginning, it is sustainable in the long run. Therefore, during project preparation, if we take into account the national climate policy, climate impact, and risk accounting systems, it will help to make the projects environmentally friendly.

How can people benefit from green infrastructure?

We need to create green infrastructure to ensure their long-term sustainability and security. For instance, we all know, glaciers in Nepal are melting more than ever before. So, building resilient and tall bridges around the rivers is a must. Therefore, embracing a longer-term vision in the planning & designing of infrastructures is crucial, especially in the areas prone to natural disasters. Similarly, we should be mindful of our carbon emissions across initiatives, the objective should be to reduce emissions and facilitate carbon trade for financial benefits. By taking our country towards a green economy, it will become a win-win situation for all parties.

It is said that Nepal's economy cannot afford green infrastructure because it is expensive. Is this a situation?

The problem is, we are unable to adequately tap in the avenues of global and regional climate finance. For instance, every year, more than USD 100 Billion has been collected for the Global Climate Fund. We are not able to capitalize such

funds. There are many opportunities where we can attract such international funds, for example by introducing programs like low carbon pricing, issuing green bonds, etc. We must quit the misconception that we cannot do it, rather we should focus on our strengths and show commitment to deliver.

Where is the gap in our country to go towards green infrastructure?

Our government lacks clear strategic plan to move towards a green economy. Therefore, we hesitate to explore ambitious projects like electrifying public transportation in the Kathmandu valley. Most of the countries in the world have done it. For instance, in the Chinese city of Shenzhen, more than 16,000 public buses and 17,000 taxis are running on electricity. If our government shows similar commitment, we can follow such examples. The current problem is that we do not have such commitment and vision. In other countries, regular studies are carried out to evaluate the potential in water supply, electricity, agriculture, transportation, and others, including assessments to explore ways to reduce carbon emissions in various sectors. However, such studies are either not conducted or the results of the assessments are not considered for bringing necessary policy actions. Hence, there is a huge gap in policies and their implementation in our country

The government has been announcing various programs regarding climate-friendly development projects in the budget speech for a long time. Are Nepal's infrastructures becoming climate-friendly?

Although the budget aims to build climate friendly infrastructure, it is not seen in practice. Similarly, the government's announcement for Green, Resilient, Inclusive Development (GRID) is a good intentioned effort. However, specific and targeted actions are yet to be taken.

The conflict between development and the environment is seen in Nepal from time to time. There is also a debate about whether the environment comes first or infrastructure. How do you see the balance between the two?

This is a very old debate that gathered heat during the 1970s. Since then, we have been advocating for the concept that environment and development should go hand in hand occurred. In our country, infrastructure is only perceived as cement and rods. There is lack of understanding that infrastructure is not only a physical concept.

Though I am not a climate expert, as per my experience EIA is an important tool to manage climate change, if implemented effectively. I have reflected upon this fact on my book as well. However, there are confusions and apprehensions about EIA in Nepal and it is not conducted diligently, unlike in countries like India, the US, Thailand, and others. Here, the relevant authorities do not view EIA as a comprehensive tool which also takes into account the socio-economic and other aspects of a proposed project.

Other problem is lack of awareness of our local resources. For instance, there are abundant forests of Sal trees around Kathmandu and other parts of Nepal. However, there is no awareness whether Sal tree is a rare or endangered species. Hence, although policies and programs exist, there is lack of understanding and coherence in our efforts.



Sustainable Urban Infrastructure

Er. Kishore Thapa
Former Secretary, Government of Nepal

The world is urbanising fast and about 56 percent of the world's population (4.2 billion people) is living in cities and towns. By 2030, more than 60 percent of the world's population will be living in cities. In the next three decades, about 2.5 billion people will settle in urban areas, so the urban population is expected to reach 70 percent in total. The rapid growth of urban population will not be in Europe and America, but it will happen in developing countries like mainly India, China and Nigeria. Out of the current urban population of the world, more than one billion people are living in slums, squatters, and substandard living conditions.

In the case of Nepal, unprecedented urbanisation is taking place, particularly in Terai regions and hilly areas. Kathmandu and Pokhara valleys have the largest concentration of urban population of the country. Although recent census data shows 66 percent of the total population is living in municipal areas, it cannot be considered as urban population. In many municipalities, people are living in villages and undertaking agricultural and livestock activities. Although exact data is not available, the real urban population of Nepal stands between 25- 30 percent of the total. Out of the 293 urban municipalities, majority of them are located in Terai- Madhesh regions. Madhesh Pradesh, which is the smallest province in the country, has the highest number (77) of municipalities followed by Province 1. Karnali province has the least number of municipalities. The municipalities of Nepal are divided into Metropolitan City, Sub-metropolitan city and municipality. The urbanisation in Nepal is triggered by mass migration to urban areas of Kathmandu Valley, towns, and cities in the bordering areas of Terai and along the East -West Highway. Except for a few cities in the Terai region, the service sector



is the main driving force for urbanisation in Nepal. Nepal's urban sector contributes to more than 64 percent (2020) in national GDP.

Status and issues of Urban infrastructure in Nepal

Most of the cities and towns in Nepal suffer from inadequate urban infrastructure. In Kathmandu Valley which has the largest urban agglomeration with two metropolitan cities and 16 municipalities, roads and public transport is insufficient to cater to the ever-growing number of vehicles. With the estimated population of 4 million, towns and cities of Kathmandu Valley have become congested and polluted. Standard quality of the water supply and sanitation system is not available to the majority of the population. For example, the demand for water supply in Kathmandu Valley is 400 million litres per day whereas the government's water utility agency is able to supply only 150 million litres per day. The water deficit is met by private supply, household wells, tube wells, rivers and springs. In the towns and cities outside Kathmandu

Valley, the water supply is provided by Nepal Water Supply Corporation, Water Supply Boards, Water User Committees and household wells.

Similarly, city-wide faecal sludge management system is almost non-existent in most of the cities. Urban dwellers are dependent on household septic tanks or local level sewerage systems which discharge untreated sewage directly to rivers and streams. Even Public transportation in urban areas of Nepal is critically inadequate and the citizens have to depend on private transport operators for short and long-distance travel. Traffic lights are available only at major road intersections of Kathmandu, Lalitpur and Bhaktapur. In other cities of Nepal, the traffic light system does not exist. So far, modern transportation infrastructure such as flyovers, monorail, metro rail, and rapid bus transit systems do not exist in Nepal. Streetlights are available only in some parts of major cities.

In the case of electricity, telecommunication, and information technology, the scenario is somewhat encouraging. About 95 percent of urban dwellers have access to electricity and telephone. The latest mobile network is available in most of the towns and cities with 3G and 4G internet. In most of the towns and cities, urban dwellers get access to internet and television channels through government as well as private service providers.

There is a huge disparity in the level of infrastructure between the larger cities and smaller towns. Urban areas of Terai suffer from the perennial problems of flooding, choking drainage, uncollected garbage, and polluted water sources. The electricity supply has improved since the last five years but the quality and reliability are yet to be achieved. Local municipalities have not been able to provide sufficient streetlights within their territories.

Integrated urban infrastructure for sustainable development

The main issue in the provision of urban infrastructure in Nepal is that there is no integrated approach, with many sectoral agencies responsible

for providing different types of infrastructure. For instance, the Department of Roads of the Federal Government is responsible for strategic and major arterial roads, municipalities are responsible for roads less than 8 M wide. However, the federal and provincial governments are also undertaking road projects at the local level. Sometimes all the three agencies are involved in a single stretch of the roads without knowing who is doing what and where. Under the road section, there are water supply pipes, drainage and sewerage pipes, and electrical and telecommunication cables. Each agency operates under its own policy, regulation, and project document without acknowledging the existence of other agencies. The roads in urban areas are dug several times in a year for system improvement, repair, and maintenance. As a result of continuous digging and filling, the quality of pavement gets deteriorated leading to potholes. While digging roads, sometimes one agency destroys the assets of another agency incurring huge loss of property. There is a need for a proper database on the underground infrastructure which each line agency should know and inform other agencies while digging the roads.

All the forms of urban infrastructure are interrelated and interdependent. If the road network is not proper, it will be difficult to lay the water supply and drainage network. If the roads and intersections are narrow, garbage trucks cannot move around the city for collection and transportation of the garbage. Similarly, if garbage collection does not take place on a timely basis, it will go to the nearby drain and choke it. If proper street lighting is not provided, street cleaning and garbage collection cannot be done at night when the streets are empty. Similarly, faulty water supply and drainage systems lead to water leakage which damages the road pavement.

Disasters and urban infrastructure

Urban infrastructure projects demand a huge number of financial resources as well as technical and

managerial capabilities. In a country like Nepal, which is prone to multiple hazards such as floods, landslides, and earthquake, infrastructure development is very costly and time consuming. The country suffers from fragile topography, uncertain geology, and natural and man-made disasters. In many instances, infrastructure such as roads and bridges are swept away by rivers during construction. Electricity towers fall down due to landslides, water supply intakes are filled up with debris, and hydro-electricity headworks are swept away by Glacier Lake Outburst Flood (GLOF). In recent years, the effect of climate change is visible in urban infrastructure development. The excessive rain has led to flooding due to inadequate cross section of drainage. Similarly, debris flow in Himalayan rivers have blocked hydro-electricity tunnels, water supply intakes, and damaged power houses. Flooding in Himalayan

Inclusive urban infrastructure

The sustainable development goal (Goal 11) emphasizes the need for inclusive cities and human settlements. To realise the goal by 2030, the national and sub national governments of member countries of the UN need to work towards provision of inclusive infrastructure. This means, roads and transportation systems shall be accessible to pedestrians, cyclists, motorists, people with disabilities, women, and children. Similarly, water supply, drainage, public toilets, public parks, and buildings shall be accessible to all kinds of people including people with disabilities. Adequate streetlights and closed-circuit TVs are necessary for the safety and security of women and children. In Nepal, the aspect of inclusiveness has been largely



settlements, which was unknown few decades ago, has become a regular phenomenon. The city of Pokhara which had never experienced flooding is now adversely affected by it. Water induced disasters have become a regular phenomenon in Kathmandu Valley.

Disaster mitigation should be considered as a major factor in the provision of infrastructure in the country. In order to ensure that the infrastructure can withstand natural disasters, proper research, planning, and implementation shall be carried out in each and every project. The existing rhetoric of Environmental Impact Assessment (EIA) is not sufficient for urban infrastructure projects.

ignored leading to many infrastructure and public utilities inaccessible to children, women, elderly, and people with disability. Many cities and towns of Nepal lack public open spaces, gardens, and entertainment spots which are necessary for the younger population.

Government's role in the provision of infrastructure

Government agencies are primarily responsible for the provision, operation, and maintenance of infrastructure. In Nepal, they are responsible for water supply and sanitation, electricity, solid waste management, roads, and transportation. As per

the federal structure, there are now three tiers of government in Nepal, e.g., federal, provincial, and local. Although the Constitution of Nepal has clearly allocated the roles and responsibilities of each level of government, there has been overlap and duplication of their roles in the provision of urban infrastructure. Although it should have been under the sole responsibility of local government, the provincial and federal government allocate huge sums of money in municipalities and undertake the projects themselves. Considering the low investment in the urban sector, local governments alone cannot fulfil the needs of an ever-growing population in cities and towns. Hence, financial and technical support from provincial and federal government agencies is necessary. However, there must be proper financial planning and coordination among the government agencies to avoid duplication, overlaps, and wastage of scarce resources. The more the local governments are strengthened, the better shall be the quality-of-service delivery.

Private sector's role, different modalities (BOT, BOOT)

In recent years, the private sector has shown tremendous interest in the provision of urban infrastructure. Since urban development is an economic activity, any investment done in the sector generates income in the form of taxes, fees, and profit. Due to limited resources as well as its basic responsibility in the social sector, the government alone cannot bear the cost of infrastructure development. In many cases, government agencies lack technical and managerial capabilities. Specialised private parties can support the government programmes by investing in infrastructure projects. There are several models of private investment such as Build, Own, Operate and Transfer (BOOT), Build Operate and Transfer (BOT), Operate and Manage (OM). Depending upon the nature of the project and government policies, private parties can choose the appropriate model. In the first two models, private parties are responsible for project development, financial

closure, construction, and operation. They are required to handover the infrastructure after a certain period of time. In the third model, government agencies develop the infrastructure and give it to a private party to operate and manage it for a certain period of time. It is also known as a 'management contract'.

In Nepal, the private sector is not very much attracted to the BOOT and BOT model due to several reasons. The first reason is the inconsistent and unstable policies which get changed frequently mainly after the change of government. The second is the lack of trust among both the parties due to social and political bias towards private entrepreneurs. Third reason is the non-transparent procedures and dealings of the private parties which creates doubts among the people and draws unnecessary media attention. Fourth reason is the lack of competitive risk-taking attitude of the private sector of Nepal. Despite all the reasons, private developers have made tremendous progress in the hydropower sector, housing development, and transportation. Hydropower projects come under Electricity Act, 2049 and develop the project as Build, Own, Operate and Transfer. We are yet to see similar ventures in expressways, bus and airport terminals, metro rail, water supply and solid waste management systems.

Public Private Partnership (PPP)

Public Private Partnership is an innovative concept to create synergy between the government and private sector in a development project. The regulatory authority of the government sector and the financial and technological capability of the private sector can be brought together in project development, implementation, operation, and management. In this concept, the government does not invest money in a normal situation but if there is a financial loss incurred by the partner company, the government provides financial assistance through Viability Gap Funding (VGF). Normally, the government does not get any direct profit from the PPP ventures but there are indirect incomes

through VAT and indirect taxes. The properties and assets created by the private party are taken over by the government after a certain period. Then, it is up to the government whether it operates and manages by itself or looks for another private party.

In Nepal, despite strong legislative and policy tools, the PPP model has not succeeded so far. The Kathmandu View Tower Project of Kathmandu Metropolitan City (KMC) is the largest PPP project undertaken so far. Earlier, KMC had engaged with private parties to build and operate overhead pedestrian bridges. One of the main reasons for the failure of the PPP model in Nepal is the lack of viability gap funding system. In the present context, the government is eager to share the profit but not ready to bear the loss. This undermines the basic principle of partnership and discourages national and international investors.

Way forward

All the towns and cities in Nepal suffer from inadequate physical infrastructure. Due to

its limited resources, the government alone cannot fulfil the demand of the growing urban population. Due to bureaucratic procedures, government projects generally suffer from delays, cost overrun, and financial losses. Private sector has implementation efficiency, financial and management capability. Private sector needs to come forward to grasp the opportunities provided by rapid urbanisation in the country. They can get involved in urban infrastructure development projects as contractors, consultants, developers, builders, and investors. They can develop the projects entirely on their own or can have partnership with the government. Some of the PPP projects which are attractive to the private sector are - toll roads, flyovers, airport terminals, bus terminals, multiplexes, and amusement parks. To attract the private sector and build trust, the government has the main responsibility to create a conducive policy environment. In addition to our own experience, examples of neighbouring countries like India and Bangladesh will be very relevant to us.



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Wildlife and Sustainable Infrastructure

| Er Aparajit Koirala

After the devastating impact of the Covid virus on the globe, personal lives as well as global economy is slowly getting revitalised to cope with the post- pandemic world. The global community has started developing and mainstreaming the post-2020 Global Biodiversity Framework. The main vision of the framework is to be living in harmony with nature by 2050. To achieve such harmony, new projects as well as existing ones should incorporate not only existing environment considerations but also future variables such as climate change. The already existing 17 sustainable development goals (SDGs) under Agenda 2030 garnered numerous countries committed to the cause of making infrastructure development a sustainable initiative towards the protection of the planet for the current and future generations.

Sustainable Development Goal 15 aims at “protecting, restoring and promoting sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and biodiversity loss”. (UN, 2015)

Currently, performing environment assessment before the initial stage of the project has become a norm. Numerous countries have added such impact assessments from national to local level governments. As urbanisation and economy grow so should infrastructural investments by both government and private sectors. Due to technological advances and economies of scale, sustainable infrastructure these days is becoming more cost effective. Due to various legal provisions and environment friendly regulations, it has become cheaper to construct sustainable infrastructures rather than pay fines and extra

taxes. If the infrastructure is environment friendly, it reduces the maintenance cost as well as lowers the requirement for budget allocation to restore the baseline environment after the completion of the infrastructure project.

The current mitigation and conservation hierarchy endorses four steps for earth, which are: refrain, reduce, restore, and renew. These simple steps can be applied by any stakeholder group regardless global or local in terms of accountability and conservation towards biodiversity. Applying these steps to wildlife and infrastructure would mean, *refraining* from construction or mining in sensitive wildlife hotspots, *reducing* adverse impacts during the project life, *restoring* the ecosystem to sustain baseline wildlife occupancy, and finally, *renewing* indicates building/creating additional designs in infrastructure projects to revitalise wildlife biodiversity to its actual state before its degradation due to years of anthropogenic activities.

From building a road through a forest or executing urbanisation projects in rural areas, everything has been done adhering to environment, social and governance (ESG) considerations, but such considerations are yet to mature to integrate all past, present, and future aspects of environment. Such approaches would lead to, for example, building road without considering wildlife density, and crossings leading to roadkill incidents after the project completion. Furthermore, land animals are affected by irrigation canals built within their natural habitat in terms of crossing the linear structure. Such adverse effects on the wildlife and environment can be avoided or mitigated only if infrastructure project's designing phase considers all the possible variables.

Anthropogenic activities have also adversely affected the freshwater ecosystem. Though hydropower dam and irrigation canal projects perform environment assessments yet the extent of pressure on the ecosystem is not fully

are having a hard time nesting and navigating the migratory routes specific to the species. Furthermore, construction of airports in wild bird habitat hotspots would increase the likelihood of bird-airplane collisions. Lack of concern



accounted. Even though fish ladders are frequently used to facilitate migration, the change in water level downstream, sediment transport, water quality, flow regime and nutrient cycle puts extra pressure on the survival of species of fish. The decline of even such small animals in the river system would affect the food chain leading to extinction of bigger species in the downstream ecosystem of the river. Though the diet of Gangetic Dolphins has not been extensively studied, but in general, as food decreases so will the population of the wildlife depending upon it. The modern infrastructure projects should ensure variables for optimum requirements of habitat to maintain baseline population of wildlife.

As more electric transmission lines and telecommunication towers are being set up to fulfil the needs of the 21st century, our feathered friends

towards bird species can lead once abundant in numbers to extinct. Spiny Babbler (*Turdoides nipalensis*), Nepal's only endemic bird whose habitat generally lies in the middle hills including parts of Kathmandu valley i.e., Godavari and Phulchoki area close to the city of Lalitpur, should be considered during city expansion projects. As urbanisation and connectivity increases in numerous areas, proper study and implementation of infrastructures, that integrates all forms of wildlife, is utmost important if conservation results are to be expected.

Frequent human-wildlife unfavourable interaction surrounding urban areas could have been prevented only if wildlife habitat considerations were taken into account while expanding and upgrading the human settlements. For example, Marsh crocodiles (*Crocodylus palustris*) and

mainly once endangered American alligators (*Alligator mississippiensis*) have been found near treatment plants, urban areas, and drainage outlets possibly due to dead animal smell and salinity level. The instances of leopard (*Panthera pardus*) entering Nepal's most densely populated Kathmandu Metropolitan City from nearby forests of Shivpuri National Park shows the extent of chaos haphazard urbanisation is causing without considering habitat loss of wildlife.

Primarily, the construction industry is responsible for mining most of the natural resources and occupying physical spaces. The built environment should be made with onsite expertise to ensure wildlife and ecosystem as part of whole preservation. Generally, trees that need to be trimmed or cut for various infrastructure projects should be properly investigated for habitat signs of small animals and birds. Notifying authorities of wildlife activity besides 'big species' that can harm human life is often neglected, as it can be costly for the contractors in terms of halting the site works, relocating the species, or creating structures not mentioned in the design estimate for protecting the habitat. If a snake is seen during project construction, the poor animal is often scared away instead of locating and notifying the concerned authorities. Since Nepal is densely covered with forests, such instances can be frequently observed. The combined roles of insurance companies and construction contractors can effectively mitigate such onsite issues. WWF provides insurers a mechanism to effectively work with regards to wildlife in hydropower projects. Such guidelines should be made broader to encompass other infrastructure projects.

Lack of proper waste management by infrastructure industry is commonly seen all over the globe. The mixing of pollutants in the habitats have not only altered habitats but has also changed species biologically. In the context of Nepal, lack of timely monitoring and oversight waste produced on site is generally haphazardly managed, affecting mainly the surrounding freshwater ecosystem. For

example, turtle-headed sea snake (*Emydocephalus annulatus*) living in the coast of the Pacific Island of New Caledonia, exhibits industrial melanism, i.e., becoming darker due to pollution, and sheds skin more often than their lighter brethren due to higher concentration of heavy metal pollution in the area.

Another consideration, while designing infrastructure projects would be climate change. As the earth temperature is on the rise, and with heat waves becoming normal, wildlife can wonder in city areas for shades as well as gradually move towards the cooler places, changing the usual habitat of the species. Also, survival rate of migratory birds en route, entering urban heat islands is questionable. In such cases, wildlife-human negative interaction would happen more often, and change due to habitat and scarcity of food can lead to decrease in population. When the altered competition increases, it puts pressure on the ecosystem to sustain pre-existing species, migratory species, and alien species. The WWF scientists deduced an estimate of 'fast movement' of species by 1000 meters every year to keep themselves in their usual climatic habitat

The Environment Protection Act 2019 and Environment Protection Rules 2020 does not provide clear instructions on wildlife atrocities. These acts are, basically, a format for consultancies to submit environment assessments such as IEE, EIA, SEA, etc. The need of wildlife friendly infrastructures has been separately endorsed as 'Wildlife Friendly Infrastructure Construction Directives 2078'. The effectiveness of such regulation is doubtful, since present quality of EIA shows the importance of documentation but lacks the implementation of recommendations from such assessments, mainly due to vested interests of political leaders and infrastructure industrialists have been observed in many past instances.

Further, the EPA 2019 though being recently promulgated, it still leaves out biodiversity net gain (BNG), which clearly shows the lack of farsightedness of stakeholders involved during

the drafting of the act and its directives. BNG is critical as it underlines minimum criteria post infrastructure development biodiversity state, which is generally 10% predevelopment condition. Criterion such as this would ensure wildlife and biodiversity friendly infrastructure as well as ensure stricter post monitoring and evaluation.

All-inclusive plannings and structural designs with proper oversight mechanism is of utmost importance, to develop a climate resilient and ecosystem preserving infrastructure for future generations. The project life spans multiple decades and tends to cross administrative boundaries from local to national. Sustainable alternatives to conventional construction and management of the infrastructure industry must be prioritised and encouraged by both government and private sectors. As rural areas are rapidly transforming into urban centres, possible urban wildlife unique to the environment and climatic conditions should be considered while developing urbanisation projects. The indicators that show the effects of built environment on wildlife should be quantified and developed. The trend to compensate before going through the steps in mitigation hierarchy should not be decreased, as it tends to be an easy way out that can hardly impact on the global level.

Furthermore, tedious bureaucratic procedure, half-hearted political agendas towards environment, minimal inclusiveness, and lack of solid monitoring mechanism, even though mentioned in the EPA 2019, are few reasons why even after two decades of environment advocacy, the desired onsite results are limited to official documents mostly. The continuous pressure from policymakers, strong political will, and acknowledgement of citizen's responsibility towards conservation are the few requirements that Nepal needs, to achieve the sustainable development dream.

The article is entirely a personal opinion and understanding of the author. The author can be reached at koirala.aparajit@gmail.com

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Digital Infrastructure and Technology Integration

Maresh Karki, Sunil Suwal



There are various aspects of digital infrastructure and technology integration, however, on the occasion of ‘Nepal Infrastructure Summit 2022’ discussing the use of disruptive technology integration in the field of architecture, engineering, construction and built environment in Nepal is a must. Disruptive innovation is the introduction of new technologies, products, or services to promote change and gain an advantage.

The term ‘digital infrastructure’ describes the digital systems that support a nation's or an organization's

information technology and business activities. The digital infrastructure, for example, consists of the network and data centers, mobile telecom infrastructure, digital communication suites and applications, broadband internet, Internet of Things (IOT), data centers, and many more. In most cases, the digital infrastructure when working perfectly is invisible to the people but, it is everywhere. It is the backbone of the 21st century and many more to come.

The term ‘technology integration’ refers to the use of digital infrastructure to support different

areas that are key to the functioning of a society. The emails that we receive and send every day are possible due to the establishment of various digital infrastructures around the globe. As simple as phone calls, GPS, internet, websites, and various others that we use every day are due to the establishment of multifaceted digital infrastructures. Similarly, in the past years, the Covid-19 pandemic demonstrated the essential need for digital infrastructure and connection for maintaining business continuity and social resilience during the time of emergency.

The necessity to create digital infrastructure and incorporate diverse technologies and solutions is urgent in the present Nepalese scenario. The government's ambitious plan for increasing digital literacy and fostering ICT development in Nepal, known as the 'Digital Nepal Framework (DNF)', has been created as a guide for how digital initiatives might support economic growth.

However, the government's efforts to integrate digital services into people's lives have so far fallen short of expectations. In terms of digital governance, the government has made some steps to digitize public services, including digitising data from land revenue offices, launching the Nagarik App, the Nepal National Single Window (NNSW) system, and the National ID card, etc. However, service seekers continue to encounter issues due to limited installed technology capacity and inept system management.

The built environment we live and work in has a huge potential for technology integration to provide an optimised way for data-driven operations. The projects we plan, design, construct, and operate can adhere to new heights with the use of such technological innovation and digital infrastructure. The technological development and interventions in engineering projects have seen an adaptive transformation, and currently, most developed

The following is a summary of some of the main advantages that technological integration of BIM procedures bring:

- Faster, more efficient procedures and cooperation allow for easier sharing, value addition, and reuse of information.
- Documentation that is generated automatically and connected to other data makes updating and managing changes easier.
- Better design outcomes are possible because of the ability to evaluate and analyse options thoroughly, run simulations fast, and compare performance, which enables more creative and advanced solutions.
- Controlled lifetime costs and environmental data result in more predictable environmental performance and a better understanding of lifecycle costs.
- Better production quality: customisable and automated output for documentation. Automated assembly is a technique where digital product data is utilised to assemble structural systems and is leveraged in subsequent steps.
- Facilities management may use lifecycle data, including information on needs, designs, construction, and operations.

Integrating the BIM process in major projects can achieve benefits such as:

- Elimination of unforeseen changes up to 40%.
- Cost projection accuracy is within 3%.
- Reduced cost estimate generation time up to 80%.
- Through conflict detections, savings of up to 10% of the contract value might be realised.
- Reduction in project time up to 7%.

countries require the use of such tools, processes, and systems, namely Building Information Modelling (BIM).

The model-based system, also well known as Virtual Design and Construction (VDC), provides the designers with various tools to virtually design and create an optimised solution of the design where the building and infrastructures are first virtually created. These systems are actively used to analyse the constructability aspects of the designed projects virtually, collaborate with the project stakeholders in real-time in a virtual environment as well as help in the identification and eradication of possible conflicts before they go to the construction sites.

Building Information Modelling (BIM) is a developing terminology that describes a process where the digital information content of the physical asset is created, which helps for better collaboration and communication by sharing information throughout the project's lifecycle.

BIM has demonstrated perceived benefits in the built environment projects across the life cycle to all the stakeholders involved in the project. Such tools and processes are efficiently used to finish a project on schedule, within budget, as well with higher-quality results. While Nepal still uses conventional 2D techniques and procedures, the BIM process will potentially provide huge benefits for the Nepalese AEC sector and stakeholders.

The lack of proper water and sanitation, waste management, public transport, roads and traffic, and disaster management services in Nepal poses a considerable risk to the public. The technological integration of BIM into the Nepalese Architecture, Engineering & Construction (AEC) sector would help to strengthen the development of Nepalese-built environment.





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Importance of 'Green Infrastructure' and the Role of IBN

| Investment Board of Nepal (IBN)

Infrastructure serves as the backbone for any country's development. However, because of the

Because of climate change, Nepal has been increasingly affected by adverse weather conditions every year, of which, flooding and landslide are the most serious



threat posed by climate change, infrastructure must not only meet the need for economic growth, but of sustainable economic growth. That is, the infrastructure must be resilient to the effects of climate change and must minimally emit greenhouse gases (GHGs). For a developing country like Nepal, which is not a net transmitter of GHGs, the first requirement is critical.

and frequent. Nepal is a water-rich country and has a dense network of rivers, streams, and lakes (in the mountain areas). In the Terai region, flooding displaces people and destroys crops, whereas in the hills, peoples' lives, settlements, and businesses are destroyed. Nepal is also at risk for seismic activities, and it is necessary that the infrastructure should be resilient to the effects of earthquakes.

The risk of combined effect of climate change and seismic activity is very real, and this is a risk for many districts. As a pertinent example, the combined effect of the 2014 Jure landslide and the earthquake that happened the following year, has severely affected economic activity in Sindhupalchok District, many years after these events. It also increases the risks of Glacial Lake Outburst Flooding (GLOF) in other mountainous districts of Nepal. Thus, there is a substantial need to make infrastructure resilient to these kinds of shocks.

However, the negative effects of climate change are not limited to the mountains. The floods in the Terai region has already led to enormous losses, and this would be worsened over time. Thus, economic losses in both the mountains and Terai are likely to be huge because of the effects of climate change; and The Asian Development Bank estimates that by 2050, Nepal could lose 2.2 percent of its annual GDP because of it.

As a result of these prevailing risks, and with a clear view of mitigating and adapting to them, Nepal ratified the Paris Climate Agreement and its second National Determined Contribution (NDC) in 2020. The NDC is a climate action plan that helps reduce emissions and adapt the country to climate change. The NDC incorporates a financial strategy for achieving outcomes which needs to be updated every five years. In the second NDC, the government has estimated that the total cost of meeting the mitigation targets till 2030 is USD 28.4 billion and this only includes activity-based targets and not the cost of policies, measures, and actions. The cost of adaptation, as laid out in the National Adaptation Plan (NAP), is USD 47.4 billion till the year 2050.

These are very large figures and will be difficult to be mobilised from government sources or from traditional financing. The Government of Nepal (GoN) has committed to achieve the target of graduating to a middle-income country status by 2030 and achieve the net-zero greenhouse gas emission by 2045. The GoN has also set specific

targets to be achieved by 2030. This includes, but not limited to, generating 15000 MW of clean energy, construction of 200 km of electric rail network, 2000 km of rail network and black topped roads, building five international airports, and attracting 5 million tourists.

The GoN has been implementing the 15th Periodic Plan that envisions investment of over 79 billion USD in five years, starting from 2019. The Government expects about 56% of investment to be realised from the private sector. This shows the importance of private investment including FDI for infrastructure development in Nepal. The Investment Board of Nepal (IBN), the country's nodal agency for implementing large projects, will play a key role in attracting and facilitating these investments.

IBN's role in Green Infrastructure Development

IBN, established in 2011, is a high-level government agency under the chairmanship of the Rt. Hon'ble Prime Minister to develop, implement, and facilitate projects in Public-Private Partnership (PPP) and private investment by mobilising domestic and foreign investment in Nepal. During the ten-year period of its establishment, the Board has played a significant role in the development of large and transformative infrastructure projects that will make a significant contribution to the socio-economic transformation of Nepal. The Board has approved an investment of about USD 8.74 billion for 33 projects out of which 20 projects are in the energy sector and the remaining projects in other sectors. Further, under the Public Private Partnership Investment Act (PIPPA) 2019, all investments more than NPR 6 billion fall under the purview of IBN.

IBN has contributed to wider clean energy in Nepal through hydropower projects and has been exploring opportunity in solar projects, electric transport, and smart urban cities. The flagship project, Arun-3 with 900 MW installed capacity is in the advanced stage of construction with

almost 62 percent progress being made so far in generation component. Similarly, the 900 MW Upper Karnali HEP is at the financial closure stage. IBN's Cement Projects such as Hongshi and Huaxin have adopted waste heat recovery systems (WHRS) for power generation. Similarly, the Board has allowed to conduct a Feasibility Study for 350 Solar Project (Doti & Dadeldhura).

an indication of the increasing credibility of IBN.

IBN's Strategy for Green Infrastructure Investment

IBN's project portfolio and achievements so far clearly demonstrate that we are geared towards significantly contributing to the target of achieving the net zero emission. We have developed a



IBN as the fast-track agency and facilitator of private investments and PPP in Nepal has been able to increase investors' confidence by bringing in more investment in Nepal for the development of green energy projects in various sectors. Some of the recent milestones achieved in the last two fiscal years include- signing of an MoU with SJVN Limited to develop Lower Arun with an indicative capacity of 679 MW; with Risen Energy Singapore JV Pvt Ltd for 250 MWp solar project; and with Power Construction Corporation of China for Tamor Storage HEP of 756 MW. Recently, IBN has signed an MoU with NHPC Limited for detailed project study of 1200 MW West Seti & SR 6 hydroelectric projects. These are some examples which demonstrate that the investors are finding their comfort zone to invest in Nepal. This is also

project bank with probable list of bankable projects and have advanced systems such as Project Bank Management Information System, Roster Management System, and the web based One Stop Service that will expedite the growth of green infrastructure.

IBN is equipped to achieve the national goals with its first ever Strategic Plan and Business Plan. The key goals of IBN are to approve investments of at least USD 10 billion by 2026, manage PPP projects of about USD 6 billion by 2026, develop IBN as a PPP Centre of Excellence, and contribute to improving investment environment through effective investment promotion. IBN has adopted four Strategic Pillars (focus area) to achieve the strategic goals. These are project development and

management, investment promotion, institutional development, and coordination and collaboration with other agencies mainly domestic and international.

The nature of these pillars indicate that IBN is an institute with a broad scope. The PIPPA 2019 mandates IBN as the fast-track agency for implementing large projects. It provides IBN the authority to conduct many activities such as originating ideas, carrying out feasibility studies, developing project procurement plans, making important documents¹, screening, evaluating, and selecting the winner-bidders. Once all the processes are complete, signing the PDA and causing the project to be implemented, are the final steps.

The PPP model is one of the most widely used methods that countries use to finance big infrastructure projects. This model allows leveraging of private sector strengths towards public-oriented goals. This is the model that is primarily used within IBN, and the institute has been successful in the implementation of large hydropower projects like 'Arun III' hydroelectric project.

Hydropower is necessary for Nepal as it provides energy security and reduces dependence on imported fossil fuels. Moreover, it is a renewable and clean source of energy. Hence, for these reasons, hydropower will continue to be a central focus. However, IBN clearly sees the need to go beyond hydropower. IBN has also enabled the implementation of two large cement factories – Hongshi and Huaxin which incorporates WHRS that eventually helps to reduce carbon dioxide.

Cement is a critical input in any physical project, and the presence of cheap and reliable domestically produced cement would enable projects to securely access this valuable resource. In addition to this, IBN has signed MoU for the detailed feasibility study of large-scale grid connected solar project with battery energy storage system (BESS).

The IBN has identified several projects with a green component. Two of the significant ones are the Electric Bus Rapid Transit (EBRT) in Kathmandu and the Sudurpaschim Transport Project. Both are urban projects. As cities and urban centres are particularly large emitters of GHGs, mass transit can be one of the most effective ways of reducing emissions, particularly if the transit system is electric. Mass transit has other benefits such as reducing traffic jams (commuter time), thereby, providing reliable and timely point-to-point transportation services, and allowing all sections of society the access to high standards of transportation. In terms of promoting economic growth, mass transit is critical as it can aid with the development of a professional workforce.

IBN's commitment to energy includes non-hydropower projects such as the Venture Waste to Energy Project in Dharan Sub-Metropolitan, Sunsari. The project, already being implemented, meets multiple objectives of both waste management and energy security. Moreover, it also meets ecological goals such as allowing waste to degrade biologically and without emitting significant GHGs.

Nepal is on the path of generating economic prosperity by creating a robust legal and policy framework which aims at providing a conducive business environment for the private sector whilst acting as one of the main pillars of the economic development. In recent years, the GoN has undertaken various reforms as part of its sustained efforts to garner private sector investment. IBN, as the 'first reference point for investment in Nepal', is committed to avail excellent and quality services to investors for timely execution of projects.

IBN has a vision of developing Nepal as an attractive investment destination. To achieve this vision, it is devoted to accelerating investment in transformative green infrastructure projects across a variety of sectors by promoting and managing public private partnerships and facilitating private investments.

1. and such as EOI, RFP, MOU, Survey License and PDA

Railway Development in Nepal

Ashish Gajurel

The development of railways has been one of the most discussed development issues in recent years. Railway development has been at the forefront of our current Prime Minister's development agenda. Railways has been a critical political agenda for all the major political parties as reflected in their election manifestos. The post-election governments at the federal, state, and local levels have fabricated plans to develop and operate a railway system. There have been wide discussions on the development modalities of railways which depicts that the elected representatives are bound and determined on the issue. This is a step towards the right direction for development of railways in Nepal.

Nepal's railway story began in 1927 with a 39 km (about 24.23 mi) railway system from Raxaul to Amlekhganj. Sadly, the service could not be continued for long. After nine long decades, the issue of railway development in Nepal has come to the forefront of our development agenda. Janakpur-Jaynagar railway service has recently resumed operations. Cargo rail from India up to Birgunj Dryport is operational. Biratnagar has been linked with the railway system. Both our neighbours, India and China have well-developed railway networks. China has the second largest railway network in the world with more than 150,000 km and India has the fourth largest network with more than 68,000 km network. It is high time for Nepal to develop the railway networks and connect with her neighbouring countries to improve national as well as international trade.

Transportation is said to be the mother infrastructure that forms the basis for the development of all other infrastructures. One of the criteria for measuring the prosperity of any country



is the development of transport infrastructure. Nepal has already constructed 100,000 kms road network out of which more than two-third of the roads are built by local level government without following due engineering standards. Therefore, the existing roads are degrading and cannot fuel the growth and development of a prosperous Nepal. Railways can be a viable option to develop a robust transport infrastructure, which in turn can contribute to economic growth and development. The discovery of the steam engine in England in the 18th century led to rapid industrialisation and growth of the United Kingdom. The presence of large railway networks in our neighbouring countries have helped them achieve rapid growth. Nepal too can embark on the path of growth and development by proper planning and development of a railway network. Nepal has already initiated the development of railways in the past. In the year 2009, the government conducted feasibility study of East-West (945 km) rail and

has already started the construction of the section-Bardibas to Lalbandi. The beginning of construction of this East-West railway system in Nepal has to develop railway service. In a bid to develop railway systems in Nepal, the department of railways was established in 2011. The signing of the China led 'Road and Belt Initiative' in 2017 has provided a good opportunity to Nepal to link itself with international rail networks.

For the promotion of international trade and tourism, railway connection with China and India must be our top priority. To make the East-West railway line feasible, it should be linked to Kathmandu. The capital city has a dense population. Other important railway networks that Nepal require are Kerung-Kathmandu and Kathmandu-Raxaul. Raxaul to Kathmandu route will be around 140 km and Kathmandu to Kerung will be around 150 km. China will be completing the construction of 540 km railway line from Sigatse to Kerung by 2025. Raswagadhi is only 24 km from Kerung.



The private sectors are not attracted to invest in the development of railways because such projects are capital intensive and possess high risks of development. And so, the government must take the lead and arrange the funds for the development through its own treasury or concessional loans from multilateral and bilateral organisations to finance railway projects. Furthermore, construction of

railways in the hilly terrain can be very costly. The construction of a double track railway system from the East to the West will cost around NPR one billion per kilometre. This cost can increase drastically when railway lines are constructed in the hilly and mountainous terrains.

How long will it take to develop railway system in Nepal?

Taking the Kerung-Kathmandu railway as an example, if we start development work immediately, it takes around two years to hire a consultant with expertise and to conduct a feasibility study. A further one year will be needed by the concerned authorities to choose the best development modality and prepare a Detailed Project Report (DPR). Selection of a construction contractor will take another one year and if all goes well, the actual construction will begin only after four years, and it will take another four to five years for the construction depending upon the length of the network. It should be clear that for such rail projects Public Private Partnerships (PPP) is not suitable.

The way forward

Different studies have shown that logistic costs can be reduced by 30 percent if goods are transported by rail as compared to roadways. Therefore, Nepal should work on developing railway systems. Expanding the railway service is widely needed throughout the country. Primarily, Nepal needs to immediately work on developing East-West Railway Service, Kerung-Kathmandu, and Kathmandu Raxaul railway. Development of railways will stimulate economic development by creating a suitable environment for national and international trade. To develop such a huge infrastructure project, government must enact a separate railway act and should have strong authority to carry out all the project related work. If one railway project is developed in the country, it will help to build expertise and experience on other railway development projects.

Infrastructure Development Opportunities and Challenges

Mr. Ram Krishna Khatiwada
Chief Executive Officer
Nepal Infrastructure Bank (NIFRA)

Infrastructure is essential in all three aspects of sustainable development: the economy, the environment, and society. Transportation systems, electricity production facilities, and water and sanitation networks are some examples of infrastructure services that enable society to operate and economies to thrive. According to the World Economic Forum, worldwide investment in infrastructure is expected to be USD 79 trillion by 2040¹. However, the actual global investment need is closer to USD 97 trillion. To close this USD 18 trillion gap, average annual global infrastructure investment would be needed to increase by around 23% per year. Most of this infrastructure gap is attributed to insufficient investment in the road and electricity sectors. The Asian region alone needs USD 1.7 trillion annually exclusively for infrastructure until 2030 to maintain the momentum of economic growth, alleviate poverty, and mitigate climate change risks.

Infrastructure investment is indispensable to meet Nepal's short and long run goals for development. Much of the population in Nepal does not have reliable and adequate access to infrastructure services. The World Economic Forum Global Competitiveness Index 2019, in the infrastructure pillar, ranks Nepal 112 out of 141 countries surveyed². Although the country's



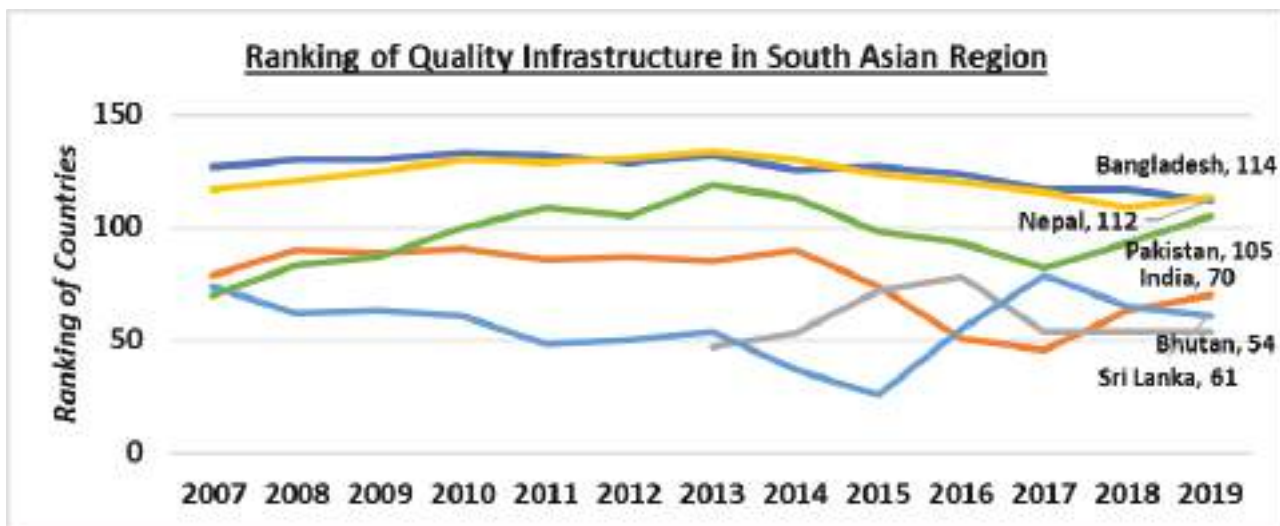
rank has seen a slight rise since 2017 (119th out of 137³), the progress is substantially low in terms of infrastructure, institutions, innovation, and financial market development. The figure below shows that Nepal ranks the lowest in the South Asian regions, hence, requiring significant efforts both from the public and private sector to engage in infrastructure development.

It has been projected that Nepal needs to invest between 10-15 % of GDP in infrastructure

1. Global Infrastructure Outlook 2025

2. https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf

3. <https://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf>



Source: World Economic Forum Global Competitiveness Index 2019 (compiled by NIFRA)

annually up to 2030 with timely and appropriate service delivery⁴. The current annual investment is USD 2.7 billion (NPR 3.24 kharab) while the required investment is USD 13 billion (NPR 15.6 kharab). This brings an annual gap of USD 10.3 billion (NPR 12.36 kharab). Minimising this increasing infrastructure gap should be Nepal's priority in order to achieve the aspiration of graduating from LDC status by 2026 and fulfil the vision of becoming a middle-income country by 2030. In addition, Nepal also must create a coherent path towards sustainable development in the form of 'low-carbon resilient development' which will help in accomplishing the government's mandate of SDGs 2030. The country's lack of physical and institutional infrastructures may act as barriers to achieve desired ambitions. Nepal's infrastructure is unreliable to sustain any climate-induced changes such as heavy floods.

Industry and manufacturing in Nepal contribute about 18.43% to the total GDP⁵. These two

sectors have been declining mainly due to lack of investments, owing to lack of good governance, and limited access to basic infrastructure. The private sector participation in infrastructure is needed for not only increasing efficiencies via sharing of expertise, technologies, and increased competition but also through sharing of risks. The National Planning Commission (NPC) has estimated an outlay of approximately NPR 20 billion per year in infrastructure projects, with approximately 37% contribution by the private sector to meet the sustainable development goals (SDGs) by 2030⁶. Nepal has identified an annual financial gap of NPR 585 billion in achieving the SDGs by 2030, which includes NPR 367 billion from the private sector⁷. Nepal spends approximately NPR 300 billion per annum towards infrastructure sector alone. As seen in the figure below, the current participation in the infrastructure development of Nepal includes 63% by the government and various multilateral institutions, 30% by banks and private sector investors, and the remaining 7% by traditional investors such as insurance and employee provident fund⁸.

4. Nepal Infrastructure Sector Assessment by World Bank Group 2019

5. [https://www.mof.gov.np/uploads/document/file/1633341980_Economic%20Survey%20\(English\)%202020-21.pdf](https://www.mof.gov.np/uploads/document/file/1633341980_Economic%20Survey%20(English)%202020-21.pdf)

6. New Business Age 2021, The Nepali Private Sector and Infrastructure Investment by Jagdish Prasad Agrawal

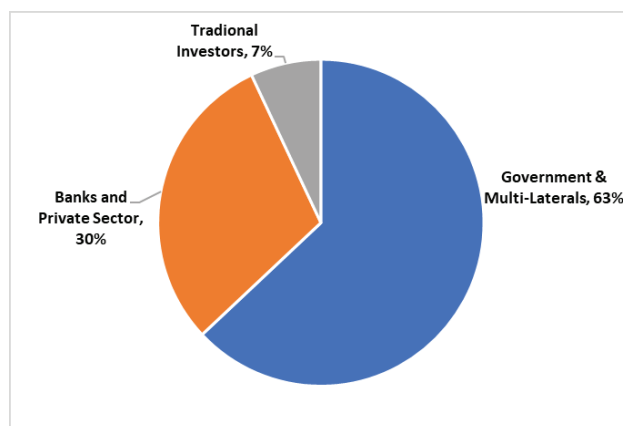
7. NPC (2018a) Needs Assessment Costing and Financing Strategy for Sustainable Development Goals

8. Report on infrastructure investment pipeline in Nepal, Conducted Jointly by NIFRA and PwC in support of FSSP

Nepal must work on building quality roads and focus on industrialisation and development of infrastructure with joint investment of the government and the private sector. The role of Public-Private Partnership (PPP) for a public infrastructure project is very significant in potential industrial areas. PPP arrangements are useful for large projects that require highly skilled management and a significant cash outlay to get started. The participation of private sector in telecommunication, information and broadcasting, power, hospitals, schools, and colleges has been so promising that the overall performance has improved. However, the investment by the government in roads, airports, rail and water ways, industrial parks etc. does not show encouraging result. Similarly, private sector shows huge potential to bring capital as well as innovation for the growth of industrial infrastructure. However, there are multifaceted obstacles in industrial and infrastructure development. They are highlighted in the following sections:

2. Opportunities

Based on the IFC study, USD 46 billion investment opportunities for climate-smart investment are available in Nepal from 2018-2030, out of which USD 24.6 billion is in renewable energy, USD 10 billion in transport infrastructure (USD 2.5 billion in electric vehicles), USD 3.4 billion in green buildings, USD 686 million in climate-smart urban, USD 83 million in municipal solid waste management, and USD 4.8 billion in climate-smart agriculture⁹. In Nepal, there are several potential domestic institutional investors for such long-term infrastructure viz. Insurance Companies, Citizen Investment Trust (CIT), Employees Provident Fund (EPF), Welfare Funds of Nepal Army, Nepal Telecom, and others with a combined asset size of around 15 % of GDP¹⁰ i.e., tentatively USD 4 Billion (NPR. 4.80 kharab. The GoN has immense opportunities to mobilise these resources for



Source: Infrastructure Pipeline in Nepal, Jointly by NIFRA and PwC

development of various infrastructure projects by devising certain policies and regulations.

If we could mobilise only 50 % of this fund to the infrastructure sector, then we can develop:

- 1,200 to 1,500 kilometres of double lane bituminous road;
- 3,200 to 3,500 kilometres of Single Circuit 220 KVA Transmission Line; and
- 19,000 to 20,000 meters of seven meters carriage way concrete bridge.

The GoN is set to develop one cross-border economic zone, seven special economic zones and 15 industrial zones along with one industrial village each in all local levels and operate in partnership with the private sector. This creates an ample of opportunity for private sector in development, operation, and management of industrial infrastructure.

The government is openly promoting Independent Power Producers (IPPs) for energy generation and honouring the IPPs supply. There are numerous transmission line projects under construction, and the World Bank has also prioritised Transmission Lines projects to promote power development. The government has also launched an independent

9. Climate Investment Opportunities in South Asia, International Finance Corporation

10. <https://openknowledge.worldbank.org/bitstream/handle/10986/32355/134956.pdf?sequence=1>

company—Rastriya Prasharan Grid Company Limited (RPGCL) to accelerate the construction of transmission lines. This shall ease the developers to wheel the energy to prospective buyers.

There are tremendous opportunities for hydro-electricity development in Nepal, not only with the country going on energy surplus with export to other markets but also with its own domestic consumption. Empirical research conducted from 1972 to 2014 shows that with every 1% increase in hydro electricity consumption, there is a 0.04% increase in the GDP of Nepal in the short run and 0.52% increase in the long run¹¹. Such evidence should entice commercial and government players to invest more in infrastructure.

To bridge the widening funding gap in Asia, local currency bond financing for infrastructure is becoming an alternative avenue for infrastructure financing. Large financing gaps and the advantages of bond financing for long-term infrastructure projects provide an impetus for the development of long-term local currency bond markets and, therefore, the rationale for the Asian Bond Markets Initiative¹². The development of bond market in Nepal can be an alternative way for development of infrastructure project with participation of private party.

3. Challenges

In many emerging markets, there are around 55-65% of infrastructure projects which are un-bankable as there is no support from the government or multilateral-development banks¹³. -In Nepal, there is lack of institutional investors for financing long-term projects. Moreover, long-term

investment projects are often financed by short-term liabilities creating asset-liability mismatch and risk of debt sustainability trap in the long run. Due to limited long term funding availability in local currency markets, many infrastructure projects don't get off the starting blocks. In many instances, projects are simply not suitable for US dollar funding because volatility resulting from currency fluctuations would create unsustainable risks.

The government has the challenge of maintaining the fiscal balance and investing in development of infrastructure. Given the macroeconomic situation and the sheer size of the investment requirements, mobilising the limited resources to fill the infrastructure investment gap for sustainable development, remains a critical issue. Between 1975 and 2015, the government expenditure-to-GDP ratio was more than double i.e., from 9.1 % to 24.6 %. The national Debt to GDP ratio of Nepal accounts to 42.16% as of 2021 which is relatively high, raising concerns about a potential debt crisis in the future. The ratio has been increasing at an alarming pace, and it is projected that by 2026 it will raise to 56.6%¹⁴.

Banks and financial institutions in Nepal are bounded by NRB clauses to not spend more than 50% of core capital in a single hydro power project if they have signed the PPA, otherwise it is 25%. Reports say that all banks combined can lend only USD 2.108 billion in each loan maturation period to hydro power projects¹⁵. Private commercial banks also have less capacity to borrow from international financial institutions with the challenges of currency fluctuation creating exchange rate risk. With little long term funding availability in local currency markets, many

11. Khatri, A., & Pajja, N. (2022). A long-run nexus of renewable energy consumption and economic growth in Nepal. In *Energy-Growth Nexus in an Era of Globalization* (pp. 27-66). Elsevier.

12. ASEAN-5 bond market development: Where does it stand? Where is it going? <https://onlinelibrary.wiley.com/doi/full/10.1111/apel.12051>

13. Marsh & McLennan Companies' Asia Pacific Risk Center 2017

14. <https://www.statista.com/statistics/422519/national-debt-of-nepal-in-relation-to-gross-domestic-product-gdp/>

15. <https://www.nrb.org.np/category/monthly-statistics/>

infrastructure projects don't get off the starting blocks. In many instances, projects are simply not suitable for U.S. dollar funding because volatility resulting from currency fluctuations would create unsustainable risks. For example, two private sector hydro power projects-Khimti (60 MW) and Bhotekoshi (45 MW) in the past with the dollar term Project Development Agreement (PDAs) has resulted in significant exchange losses due to Nepali Rupee depreciation. Therefore, to address such fluctuation in exchange rates, Hedging Regulations 2019, issued by the GoN, can play a catalyst role which can surge foreign investments through different sources. The government has recently revised the Hedging Regulations, which could play an instrumental role in attracting more foreign private sectors to invest in Nepal.

In energy infrastructure development, particularly in the hydro power sector, there is also a 'Single Buyer Risk' since Nepal Electricity Authority is the sole buyer of the electricity in Nepal. There could be delay and inability to complete transmission line and substation projects on time or even default in financial commitments for electricity purchased. The existing transmission and distribution system are not adequate to handle the quantum of power and the challenge for NEA, at present, is the shift on focusing to operating and maintaining a robust transmission and distribution system. The existing system needs to be urgently expanded, upgraded, and rehabilitated so that uninterrupted and reliable supply of power can be supplied through the national grid.

Apart from above mentioned obstacles, there are some other challenges as well. In project financing, the benchmark practice is to create a special purpose vehicle or standalone facility. However, there hasn't been such attempts in Nepal due to lack of capital formation and risk sharing among stakeholders. Similarly, although the initial PPP projects were adapted back in 1990s with Khimti Hydroelectric Project (HEP), Bhotekoshi HEP and Chilime HEP, there has been a negligible PPP development in hydro power for almost ten years

with no clear-cut PPP structure. The procurement process since Build Operate-Transfer (BOT) Act lacked pulling effect to attract the foreign investment as there was no provision for financing mechanisms such as Viability Gap Funding (VGF) and the project structuring for PPP also remained intricate and difficult for risk-return profile.

4. Role of NIFRA in Infrastructure Development of Nepal

Nepal infrastructure Bank Limited (NIFRA) aims to play a catalyst role towards accelerating the infrastructure development and bridging the financing gap in infrastructure and its allied sectors in Nepal. As the only infrastructure bank, it aspires to provide an integrated value to all the stakeholders of NIFRA comprising of 1.5 million public shareholders, government, BFIs, insurance companies and other corporates. Furthermore, NIFRA projects also make significant contribution to Nepal government's mandate towards achieving the Global Sustainable Development Goals by 2030. Its projects are focused on both hard infrastructure such as roads and bridges, and soft infrastructure such as hospitals. NIFRA has focused on three major pillars as part of its strategic plan up to 2025. They are:

Pillar 1: Unlocking public infrastructure financing,
Pillar 2: Raising low-cost stable capital for long term from domestic and international capital markets, and

Pillar 3: Mobilising blended capital in infrastructure.

As part of its new pillars, NIFRA has been extensively focused on issuing specialised debenture instruments such as Energy Bonds which can act as a low-cost alternative sourcing for the Bank's infrastructure projects.

NIFRA has conducted preliminary studies of several infrastructure projects in Nepal which can be game-changer projects for the country's economic development. These infrastructure projects can create both economic and social value supporting Nepal government's mandate for infrastructure



development as well as the SDGs 2030 mandate. As part of energy infrastructure, NIFRA is closely working with government entities on developing integrated energy ecosystem, including generation, transmission, and trading of energy. Similarly, as part of urban infrastructure development, NIFRA is in collaboration with province and local governments for developing integrated infrastructures such as 'liveable cities. NIFRA has made a high priority to support the industrial infrastructure by developing Special Economic Zones (SEZs) and Industrial Parks through PPP modality.

NIFRA has financed 26 projects worth NPR 29.795 billion in the sectors such as energy, tourism, cement, and healthcare, thereby, generating various economic, social, and environmental benefits. NIFRA works with government entities on unlocking policy bottlenecks toward infrastructure development. It provides best advice for accelerating infrastructure investments in Nepal.

5. Creation of Project Bank

NIFRA prioritises creating a list of bankable projects before approaching private sector within and outside the country. NIFRA has sped up its engagements with

all three layers of the government—federal, province and local—as well as private sector and bilateral and multilateral entities to create a project bank. The post-Covid situation has generated competition among the least developed and developing nations in attracting investments. Hence, Nepal needs to be well equipped while creating its project pipeline and approaching the investors around.

NIFRA believes that Nepal needs to focus on high-value products and establish their value chain. Given the investors struggle in acquiring land, the government should develop Special Economic Zone (SEZ)s and industrial parks with state-of-art-facilities, so the industries feel comfortable to invest in equipment and products.

6. Collaborative Approach is the Way Forward

To assist Nepal to get back on track of achieving middle-income country status and to fulfil the SDGs by 2030, the GoN has decided to collaborate on a joint green recovery plan. The government's 15th Development Plan, climate goals, and the following common principles for green recovery support are all reflected in this collaborative effort. The Green Recovery Strategy acknowledges the need for immediate investment in protecting lives, securing employment and livelihoods, as well as the long-term need to develop resilience, promote inclusivity, and improve sustainability. Investment in infrastructure has a positive spill over in all these areas. Therefore, it is crucial for the government to make some changes to the existing infrastructure mandates to strengthen the current infrastructure investment, particularly for various institutional investors like insurance companies on the issuance of long-term financing instruments that can accelerate the infrastructure development in Nepal.

Nepal has pledged to attaining net-zero emissions

by 2045, boosting the proportion of energy in the nation's energy usage to 15 % by 2030, and raising the percentage of its land covered by forest to 45%. Development partners have contributed an estimate of up to USD 7.4 billion in current and forthcoming investment towards the Green, Resilient, Inclusive Development (GRID) objectives. However, for Nepal to realize its GRID goals, USD 250 billion will be essential¹⁶. Several economies in the Association of Southeast Asian (ASEAN) region have started with the green energy deployment with technologies such as Carbon Capture & Storage (CCS) towards combating climate change and achieving sustainable economic growth. Nepal can learn from such complementary policies that promote both public and private sector energy investments in the region¹⁷. In this context, government guarantee plays an essential role in guaranteeing the private sector with not only sovereign risks but also repayment risks. Furthermore, a culture shift is needed to establish a platform from which the public and private sectors may engage as equal partners.

The bank, capital market, and institutional investor often face maturity mismatch and lack of capacity to assess the infrastructure projects while the regulatory norms further restrict these institutions to provide long-term project finance. The maturity and development of the bond market are imperative for the growth of financial market which in turn has substantial positive catalytic effects in an economy. It has the potential to develop and mitigate the challenge of long-term funding disparity faced by the bank-dominated financial sector. A vibrant bond market is also necessary to reduce financial sector fragility and provide for much-needed long-term capital for

infrastructure financing.

The most significant source of infrastructure finance that contributes to improving a country's infrastructure condition is Foreign Direct Investment (FDI). Additionally, a country's developed economic infrastructure is the main reason of rising foreign investment. Every economy requires a well-developed infrastructure because it forms foundation of many industries, including industrial production, agriculture, tourism, social development, and economic success. In a study conducted in South Asian region between 1990 to 2018, it was found that 1% increase in the Foreign Direct Investment reduces the total industrial energy intensity by 0.02%. Thereby, recommending implementation of energy efficient infrastructure policies for sustainable development and long-term growth gains¹⁸. Such empirical evidence should serve as the basis towards Nepal's convergence with regional energy infrastructure aspirations.

NIFRA as a dedicated financial institution for infrastructure financing is constantly looking at ways to expand its business horizon and increase its acceptability among different stakeholders by increasing its technical capability of entire domain of infrastructure financing and development. With the policy support from the government, welcoming foreign direct investment regulations, and a forward-thinking PPP, infrastructure conundrums can be turned into opportunities.



16. <https://www.spotlightnepal.com/2021/11/11/nepal-cop26-commitments-and-funding/>

17. Nepal, Rabindra, Han Phoumin, and Abiral Khatri. "Green Technology Development and Deployment in the ASEAN—Lessons Learned and Ways Forward." *Energy Sustainability and Climate Change in ASEAN*. Springer, Singapore, 2021. 217-238.

18. Nepal, R., Paija, N., Tagihizadeh-Hesary, F., & Khatri, A. (2021). Promoting Energy Efficiency Through Foreign Direct Investments: Evidence from South Asian Countries. In *Energy Efficiency Financing and Market-Based Instruments* (pp. 151-171). Springer, Singapore.

Problems with Nepal's Connectivity Infrastructure

Dr. Surya Raj Acharya

Post 1990, after the Panchayat system, Nepal's major focus was on liberalization and privatization. Despite weakness in implementation, it was desirable policy. But there was also overkill in terms of adopting a policy approach of government has to do the least. Infrastructure institution and domestic technical capacity became the victim of this mind set. Construction industry was largely left to the private sector and market without any government engagement. Planning and policy making for connectivity infrastructure were driven by ad-hoc and ritualistic approach. The target of the government was to link district headquarters with roadways, complete the East-West Highway, and reach the nook and corner of Nepal without accessing Indian roadways. The government succeeded in doing so.

In the first phase, when it was all about having basic access, the ad hoc planning and policy process might work. Now we must upgrade our objective and vision for connectivity. The focus should shift from basic access to efficient mobility. Infrastructures for higher mobility, reliability, and safety, that can be instrumental for our socio-economic transformation, is the need of the hour. The basic roadways that Nepal currently have, are not making its economy competitive.

For this vision, Nepal needs to focus on two domains. First, improving the reliability, speed, and resilience of domestic transportation modes. Second, reducing the cost of connectivity. For this, Nepal requires advanced civil infrastructure such as tunnels, viaducts, expressways, motorways, good quality and high-speed roads, railways, and full-fledged international airports.



It can be observed that the political leadership has the realisation for the need of shifting gear to advanced level of connectivity—both domestic and regional. In the past basic access and primary connectivity were achieved without any robust and comprehensive institutional system in place. But to move to the advanced level of mobility and connectivity, we need to have rigorous planning, research, and policy analysis for conceiving, designing, and implementing mega projects. Currently, Nepal has an ambition to move towards advanced connectivity, but the institutional, planning, and policy approaches are, yet to be fixed. The political ambition, sadly, is not reflected on the ground works. Those ambitions are just limited in political manifestos.

The aspirations and realisation of political parties



and leadership needs to be reflected on the ground by shifting gear. The focus and investment, now, should be on developing multimodal infrastructure as no single mode can serve all the mobility and connectivity purposes. In Nepal, three modes i.e., roadways, airways, and railways should be developed in a coordinated way. For instance, railways are the best option to connect Kathmandu with Terai. As the number of people travelling between these two regions is excessively high, development of railways is the best option as it can ferry large number of people and it is cost effective too.

To connect the nearest *Palikas* [municipalities and rural municipalities], roadways play a pivotal role. Likewise in the rural regions, where constructing roads is challenging, the government can build or upgrade airports. It is all about identifying the respective role of all these three modes within the integrated and coordinated transport system.

What the government needs to understand is that developing mega projects is just not enough. There must be proper planning to integrate different modes. Many European countries had built

airports and railway stations far apart, and now facing problems to reap the benefits of integrated transport system. We can learn from such an international experience.

Earlier, people used to take flights to travel even 300 kilometres. Today, bullet trains are more cost effective to travel up to 700 kilometres. So, European countries are shifting rail stations near to the airport—and in many cases in the underground section of airports. They have realised that integration should not be a problem for domestic connectivity.

As Nepal is also constructing two mega projects—Nijgadh Airport and East-West Railway, it needs to focus on integrating these projects. The East-West Railway line should pass through the airport terminal building. When you deboard a plane, there should be a railway station within walking distance. A lot of policy exercise and planning is needed when it comes to developing game changing projects.

In Nepal, planning is always done in an ad hoc way. I have always criticised the planning of the East-West Railway. The detailed project report (DPR)

is completed. But the DPR of different sections is done by different consultants with different standards. Our government entities do not have expertise on railway planning and design. So, there is minimum supervision and review works while engaging consultants to prepare DPR. As railways are technically complicated, the planning has to be perfect. Otherwise, there is risk of railway projects becoming a 'white elephant'. For instance, the newly constructed Jayanagar-Janakpur Railway is facing a loss of millions of rupees.

Likewise, Pokhara International Airport, which is set to be inaugurated, is surely facing a huge loss. It can't handle big planes. There is a dumping site near the airport. Likewise, a hill needs to be chopped off for the full-fledged operation of the airport. This project proves how projects are planned in Nepal- 'Projects without Plans'! But as the airport is already constructed, it should be utilised to the extent possible for the prosperity of the nation.

If projects are rightly chosen, they can turn out to be game-changer projects. After World War II, East Asian countries like Japan, Korea, Taiwan, and Malaysia kick started their economies by investing in big infrastructure projects. We should learn from these international experiences. For any economy to kickstart, one of the instruments is investing in productive, reasonable, rational mega projects that could potentially serve as a game changer.

Game changing projects have an economic meaning. It brings about significant structure changes. For instance, when the fast track is opened, it connects Kathmandu and Terai in just an hour. Many industries located in Kathmandu would relocate to Bara and Rautahat as labour cost and raw materials are cheaper in the Terai region. That is not just a hypothetical claim. This is what happened when Japan opened a bullet train connecting Tokyo and Osaka, and Korea opened Seoul-Busan highways.

In Nepal too, the Mugling-Narayanghat road section, though a small project, changed the whole

economic structure. It turned out to be a game-changer project. Chitwan became a transportation hub. Now, Chitwan has industries, hospitals, and colleges. Had there been no construction of the road section, Chitwan would still be isolated and never see such development. It would take a whole day or two to bring production of Chitwan to Kathmandu through the Hetauda-Naubise road section.

As Nepali people have a dream of a transformation, the government needs to have a target of increasing per capita income by almost five-folds in the next twenty years. For this, only having plans in papers is not enough. Rather than making mega projects a political agenda, the government needs to be serious, and invest in it. In next 10-15 years, Nijgadhi Airport, Keyrung-Kathmandu Railway, and Karnali Hydropower projects must be completed.

There is an ongoing debate that constructing Nijgadhi Airport is destroying environment. Of course, we must be sensitive to the environmental conservation and need to strike a judicious balance between development and environment. However, opposing every big project in the name of environment would not serve the purpose of sustainable development. One of the factors responsible for environmental damage is poverty and lower income. We, therefore, have to take development and conservation side-by-side.

Another problem is about the planning of projects. Our planners' problem is that they always worry about the capital. Where does the money come from? Do we have to take loans? Will we fall in the debt trap? Will Nepal become the next Sri Lanka? These are the questions our policymakers and planners have when it comes to mega projects.

If we have the technical capacity to implement big projects with our own contractor, materials, engineers, and experts then, money is a secondary thing. The key is good economics, farsightedness, determination, building technical capacity, planning, and execution. If an appropriate approach is followed, the investment would not

be as binding as it is commonly perceived to be. The East Asian countries achieved it by applying innovative and strategic approaches to overcome financing challenges. So can we. Our economic and infrastructure planners should rethink and draw some inspiration and adopt possible lessons from them.

Nepal has a low debt to GDP ratio. The current figures show the debt to GDP ratio at around 45 percent, so we can easily afford more debts for infrastructure development. At the current context, it can be extended up to 65 percent. But the loan amount must be invested in the productive sector, which gives a return.

There should be clarity if Nepal needs any project or not. Some projects may not be commercially beneficial, but it will have a positive impact on the economy in the long run. For instance, the investment would not be recovered from the operation revenue of the Keyrung-Kathmandu Railway. But in the long run, the project would have a massive impact.

The railway connects Kathmandu with Chengdu in just 24 hours. By 2030, China is set to become the world's largest consumer market. It is graduating to become a developed country. The cost of production and wage would accelerate in China in the next decade.

Projecting this, Chinese manufacturers are already looking for destinations in Myanmar, Cambodia, Laos, among other economies. We need to tap this opportunity, and completing the railway and getting connected with China is the first step towards it. Once the railway is completed, Chinese manufacturers would invest in Nepal as the wage and production cost will be lower in Nepal.

The scenario is different when it comes to our southern neighbour—India. As India is the biggest trading partner, and there is no possibility of China overtaking it, we must complete the construction of Raxwal-Kathmandu Railway—which would reduce the transportation cost of goods by a massive amount. Nonetheless, as the structure of economies of India and Nepal is not drastically





different, there is not much we can benefit from Indian market.

Nepal is also behind in asking foreign contractors to transfer knowledge to Nepal. When Japan built its first 29 km railway network, it developed the project from British financing borrowed at a heavy interest rate. The Japanese had no idea about railways back then. The railway was built under the best British and European advisors and engineers under one condition, that they would train the Japanese workforce. The railway route was built in four years. In the next ten years, Japanese workforces were themselves involved in railway construction. They got the skill and knowledge from the Europeans.

But Nepal lacks the same vision. It has failed to ask experts from abroad to transfer knowledge and skills to Nepali people. So, every time there is a technical problem in big projects, we have to call experts from abroad. And it is expensive to bring experts. We have not been serious in this issue.

Unfortunately, we have not been able to complete projects on time because the problem lies within the policy and planning level. For years, Nepal enjoyed planning its road projects in an ad hoc way, and it worked. Now is the time to change our planning and policy approach, but we are failing to do so. Our policies and laws discourage bureaucrats and project managers from taking risks

in the decision-making process. This is the reason why files of different projects are moved from one table to another table, because no bureaucrats are allowed to take risks.

Also, development projects have become a source of corruption for politicians. Nepal has been heavily relying on foreign construction companies developing projects, but the fact is that Nepali engineers, in a huge number, are still unemployed in Nepal.

Nepal, lately, has been constructing projects just for the 'sake of completing the project'. After completing the project, our project manager, planners, and engineers have a meagre understanding about how that project helps in socio-economic transformation.

For now, Nepal should complete two or three mega projects, that benefits the economy, on time. This effort will make people believe that the government is focused on development rather than making mega projects a political agenda to lure votes during elections.

{ This article is based on a conversation with Dr Acharya. Dr Acharya is an infrastructure expert based in Kathmandu. }



Regulating growth in Energy Sector through ERC

Dr. Ram Prasad Dhital

Nepal's electricity sector is organic in its very nature. The section 14 of the Electricity Regulatory Commission Act, 2074 ("ERC Act") has vested on ERC the quintessential duty of maintaining competition in the electricity market. Our statutes governing the sector have envisioned to allow any citizen of the country to contribute to either generation, transmission, distribution or trade of electricity, and to bring in foreign investment for the same.

ERC, as the sector regulator, has a key responsibility to oversee that the monopolistic elements are discouraged, consumer interest is protected, the competitive environment is maintained in fixation of consumer tariff and power purchase rate, the syndicate is deterred, and that merger/acquisition/takeover/purchase of plants/ transfer, etc. of licensees and their projects are regulated properly. In addition to these, any disputes between power producers and off takers or consumers and utility are resolved as per internally accepted modalities. Any person, organization, etc. involved in the aforementioned activities fall under the regulatory shadow of the ERC.



The ERC act has bestowed the duty of fixation of transmission and distribution of wheeling charges within the ERC's jurisdiction. ERC is currently accumulating resources internally to prepare a consolidated instrument laying down the procedure on the determination of power wheeling charges. Furthermore, the Open Access provision is

Power Wheeling

Instruments launched by the ERC since its formation

1. Bylaws on Power Purchase Sale and Conditions to be Fulfilled by Licensees, 2019,
2. Directives on Public Issuance of Shares by Electricity Related Companies, 2019,
3. Directives on Fixation of Electricity Consumers Tariff, 2019,
4. Directives on ERC Conduct of Public Hearing, 2020 and,
5. Directives on ERC Licensee's Merger, Amalgamation, Purchase of Share, Transfer, Acquisition, Takeover, 2020.

Power Purchase Rate Determination. ERC determines the Power Purchase Rate between the generation licensee and the power purchaser according to the procedure prescribed by Bylaws on Power Purchase Sale and Conditions to be Fulfilled by Licensees, 2019.	Tariff determination Directives on Fixation of Electricity Consumers Tariff, 2019 of ('Tariff Directive') of the ERC has laid down detailed procedure on fixation of consumer tariff.
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expected to be introduced by the new Electricity Act (currently the Bill is awaited to be passed by the Parliament, which has been recently tabled at the National Assembly), which will pave the way for the implementation of wheeling charges for transmissions and distribution. ERC is already in the process of drafting the regulation on open access and wheeling charge based on ERC Act 2017 and rules 2017.



Challenges of ERC

The electricity generation is projected to increase and ERC as a sector regulator must keep an oversight of the infrastructure required for power transmission and distribution. Poor transmission networks are the major challenge of the electricity sector.

Specifically, the challenges of ERC are broadly two-fold. The first one is to make the electricity sector

gradually accustomed to the practice of regulation as we do not intend to provide any regulation shocks to the system. We should also be mindful of the fact that since the regulator is a new entity, the influence from stronger agencies could result in a regulatory capture.

The second challenge is to further the organisational capacity of the ERC to its full potential. ERC must realize its full organisational capacity to stand prepared for an increased flow of power supply, given that ERC is currently functioning with a limited number of human resources.

Worst-case scenario for Nepal's energy sector

If utilised to its optimum capacity, Nepal's electricity sector alone has the capacity to be a major contributor to the nation's GDP. The government, state agencies, power producers, distributors, along ERC should constantly exert to better the scope of power generation, transmission, distribution/consumption and uphold the interest of electricity consumers.

Nepal resides in a geographically and geopolitically delicate region. Therefore, first, it is essential to disaster-proof our power projects and infrastructures. Proper studies and precautionary measures should be taken to prevent such disasters. Moreover, the leadership should also be aware of the difficulties in project completion caused by the politicisation of the power projects which can be an obstacle to the electricity export aspiration of the country.

(Dr. Dhital is an Electricity Regulatory and Renewable Energy Professional)

Decarbonizing the Economy and Energy Transition

Prof. Amrit Nakarmi

In contrast to industrialised countries, households and the end users release most of the Greenhouse Gases (GHGs) in Nepal. Nepali industries have a negligible carbon footprint, which is significantly below one percent of the total global carbon emissions. Overall, the country emitted 32 MtCO₂e in 2011, although the current figure in 2021 will be much higher.

What does energy transition mean? Energy transition refers to the shift of energy sector from fossil-based systems of energy production and consumption including oil, natural gas, and coal to renewable energy sources like hydropower, wind and solar. Eventually, Nepal should aspire to become net-zero emissions by identifying feasible options for transitioning into a low carbon economy.

However, it is alarming that the share of petroleum imports continues to dwarf goods exported from Nepal. We must put in place the right incentives for households, industries, and transport systems to adopt cleaner forms of energy.

Current energy scenario:

Between 2013-2015, the electricity sales growth averaged 7%, whereas it was 20% between 2017-19. The energy mix in 2019 was 69% for biomass, 17% for petroleum products, 7% for coal, 4% for electricity, and 3% renewables respectively. Sectoral consumption in 2019 was 75% residential, 10% industrial, 10% transportation, 4% commercial, and 1% agriculture.

Therefore, reducing emissions at the household level is critical for achieving Nepal's goals of a



low carbon- based economy. For the last couple of years, due to enhanced technology innovation, thermal efficiency of electric cooking stoves such as induction cooktops has improved tremendously to more than 80%, whereas LPG cooking stoves remain at around 50 to 60 percent and traditional firewood cooking stoves stand around ten percent. So, what ought to be done?

The Government of Nepal's long-term strategy (LTS) to mitigate GHG (greenhouse gas) emissions:

Nepal submitted the first Nationally Determined Contributions (NDC) in 2016 and then second NDC in December 2020. While the first one aimed at reducing use of carbon-based fuels in the transport sector by 50% before 2050, the

second targeted decreasing fossil fuel dependency by 9% and ensuring that 15% of total energy is supplied through clean energy sources. Nationally determined contributions (NDCs) are a core component of the Paris Agreement. The global agreement requires each country to prepare, communicate, and maintain successive nationally determined contributions (NDCs) that it intends to achieve.

Additionally, the government introduced Nepal's Energy Sector Vision 2050, National Renewable Energy Framework 2074, National Climate Change Policy 2076, and National Energy Efficiency Strategy 2075. The existence of such extended policies indicate that the issue of clean energy is a priority for the government in the long term.

Investment needs:

Massive investments are required to decrease GHG emissions and Nepal's aspiration for a

decarbonized economy. With existing mechanisms in place, it would take 20% of the national GDP by 2030, and 12% by 2050. Whereas with additional mechanisms, the investments required will be 23% of the GDP in 2050. Additionally, measures entail use of 100% electric cooking, electric boilers, and dramatic electrification in industry, transport, agriculture, and commercial sectors.

(Professor Amrit Nakarmi is on the advisory panel of the Energy Development Council, and coordinator of Energy Systems Planning Analysis, Centre for Energy Studies, Institute of Engineering, Tribhuvan University)



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Towards Green Finance Regime in Nepal

| Sameep Khanal, Sujan Shrestha



Green financing is the increase level of financial flows from public, private and non-profit sectors to sustainable development priorities, the key part being, the management of environment.³ Green financing could be promoted through changes in countries' regulatory frameworks, harmonising public financial incentives, increases in green financing from different sectors and alignment of public sector financing decision-making with the environmental dimension of the sustainable development goals. It can also be boosted through investment in clean and green technologies, financing for sustainable natural resource-based green economies and climate smart blue economy, an increase use of green bonds, and so on.⁴ Green financing includes an array of loans, debt mechanisms, and investments that are used to encourage the development of green projects

or minimise the impact on the climate caused by regular projects, or a combination of both.⁵ Green financing is to play a crucial role in addressing the risks that climate change can bring to businesses and allow businesses to transition towards a low-carbon economy. One of the commitments from the Paris Agreement is to 'make finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient developments'. There are other initiatives, led by investors that promote green finance and influence policymaking surrounding green finance, to make this sector a significant driver for achieving the aims of the Paris Agreement.⁶

Green finance was first implemented through means of green bonds. The Green Bond Principles (GBP) are a set of voluntary guidelines set out by the International Capital Markets Association (ICMA).

The latest version of the GBP was published in June 2017 following consultations with the ICMA members and other observers.⁷

International Practice:

United Kingdom

UK launched the Green Finance strategy on 2 July 2019. The Green Finance Strategy has three core elements⁸:

Greening Finance: It ensures current and future financial risks and opportunities from climate and environmental factors that are integrated into mainstream financial decision making, and that markets for green financial products are robust in nature.

Financing Green: It accelerates finance to support the delivery of UK's carbon targets and clean growth, resilience and environmental ambitions, as well as international objectives.

Capturing the Opportunity: It ensures that UK's financial services capture the domestic and international commercial opportunities arising from the 'greening of finance', such as climate related data and analytics, and from 'financing green', such as new green financial products and services.

In September 2021, the UK government launched the United Kingdom's first green "gilt" (i.e., gilt-edged security or UK government bond), a 12 year bond which raised £10 billion. This was followed in October by the issuance of 32 year green gilt of £6 billion.⁹

The key design features of the green gilt are as follows:

The specific categories of expenditure that can be financed with green gilt proceeds are published in 'use of proceeds framework' document. They include areas such as clean transportation, energy efficiency, and climate change adaption including flood defences.

The proceeds can be used to fund green expenditures within a four-year window, which includes both new expenditure as well as

expenditure that occurred in the year prior to issuance. At least 50 percent of the proceeds will be allocated to new projects.

The expenditure will be overseen by a new Inter-Governmental Green Bond Board, chaired by HM Treasury with participation from government departments benefitting from the proceeds.

As part of the pre-issuance assurance process, the UK government sourced two independent second-party opinion reports. A report by Vigeo Eiris (VE) found that the framework is consistent with the Green Bond Principles developed by the International Capital Market Association (ICMA). A report by the carbon trust found that the intended use of proceeds is consistent with targets set by the committee on climate change. This assurance process was felt to be particularly helpful given the forward-looking nature of some of the intended expenditures.

Alongside the green gilt programme, the UK government is offering a green retail savings product, which offers households a three-year fixed rate savings product whose proceeds will be earmarked for green spending projects.

India

Under the rules of Securities Board of India, investment opportunities for green bonds include funds for wind, solar, sustainable water management, clean transportation, climate change adaptation, sustainable waste management, energy efficiency, land use and biodiversity preservation.¹⁰

Masala Bond in India

International Financial corporation (IFC), a member of the World Bank Group, issued Masala bonds in India in 2014 worth INR 16 billion (approximately \$250 million), attracting first time investors from Europe to the offshore rupee markets.

Masala bonds are bonds issued outside of India by Indian organisations or entities in Indian currency rather than the local currency. They are categorised as debt instruments that help to raise money in Indian Rupees from foreign investors. These bonds

can be issued by both government and private entities and any investor outside India can subscribe to these bonds.

Some of the features of masala bond are as follows:

The issuer of a Masala Bond is unaffected by a decline in rupees exchange rates as Masala Bonds are issued directly in Indian rupees, the exchange rate risks fall on the shoulders of the investors.

Bonds issued up to the rupee equivalent of USD 50 million are said to have a three-year maturity period, whereas bonds issued for more than USD 50 million should mature in 5 years, citing the RBI.

To further streamline the regime, Securities Exchange Board of India (SEBI) released a circular on 4 August 2016 clarifying that such foreign investment in Masala Bonds will not be treated as investments by Foreign Portfolio Investors (FPIs) and it will be governed by the regulations issued by RBI and will not come under the purview of the SEBI (Foreign Portfolio Investors) Regulations, 2014, as amended.

RBI mandates that the proceeds raised from these bonds cannot be used in activities prohibited by Foreign Direct Investment guidelines i.e., purchase of land, investing in capital markets, and usage of proceeds for equity investment domestically.

Nepal

Green Financing

In Nepal, there is lack of uniform standards as to what constitutes green financing. There are certain sectors where the NRB directive requires investment as a priority sector such as agriculture, tourism, and renewables. Further, NRB has directed that the banks must issue green bonds as per the recent monetary policy. The monetary envisage to create a draft of the green taxonomy with themes like issuing green bonds, reporting climate risks, identifying capital needs, and others to promote green financing. NRB has directed the banks and financial institutions to carry out Environmental and Social Risk Management while advancing the credits. Guidelines on 'Environmental and Social Risk Management for

Banks and Financial Institutions(ESRM)' issued by the NRB in 2018 has been the guiding force behind Nepal's regulatory-driven development of green finance. The Nepal ESRM guideline contains general and sector-specific checklists and sector-wide lists of permits and licenses to support financial institutions assessment of E&S risk. NRB has now directed the BFI, via Unified Directives, to prepare the policy, and have an arrangement of environment risk assessment while extending loan and to submit the report within 30 days from the closing of every FY.¹¹

Green Bond

Raising bond outside Nepal

In Nepal, provision for issuing the bond is governed by the 'Provision to Issue Local Currency Bond', 2013 ("Local Currency Law"). As per this law 'Bond' has been defined as the local

currency denominated bond to be issued by an international financial institution in the international financial market, with the approval of the Government of Nepal. This law requires international financial institutions desirous of issuing Nepalese Currency Denominated Bond to submit an application to the Nepal Rastra Bank, clearly setting out the purpose of issuing such bond (Section 3).¹² One of the issues with the Local Currency Law is that it does not distinguish between the NPR-linked loan, which is a bond issued in dollars in the overseas market, with the NPR-denominated loan which is the loan that will be issued in NPR and for which the exchange risk will be borne by the investor. Further, the law doesn't contextualise the possibility for the Nepali corporate entities to raise the bond overseas and instead only provides such a possibility only to financial institutions. This contrasts with the provision of the Foreign Investment and Technology Transfer Act, 2019 which provides for this possibility of raising finance.

The Foreign Investment and Technology Transfer Act, 2019 (2075) ("FITTA") envisage the public company to issue bond in foreign market with the approval of Government of Nepal and SEBON. Likewise, it envisages company with foreign

investment to issue bond in foreign market subject to prevailing law. However, the concerned regulators have not issued procedures or guidelines in relation to the issuance of bond by Nepalese corporate body to issue bond in foreign market.

Raising Bond Inside of Nepal

Securities Act, 2007 approves/authorise 'securities' to include bonds issued by the Government of Nepal or by a corporate body against the guarantee of the Government of Nepal. Law does regard that issuing the bonds onshore doesn't specifically provide incentives and benefits for green equity and debt investment. The Securities Issue and Registration Rules, 2073 envisages that foreign financial institutions can raise the proceeds by enlisting the debenture with the SEBON.

Conclusion

Nepal needs to green its economy for several reasons. The financial system is dominated by banks with most of their assets invested in the brown sectors such as agriculture, construction, and real estate, all with environmental hazards and high climate risk. According to the 2020 Global Climate Vulnerability Index, Nepal is ranked as the 9th most vulnerable country in the world to the climate crisis. Nepal's banks have limited knowledge of environmental risk calculations making their investments highly risky, for example in infrastructure downstream from expanding glacial lakes.¹³

Thus, it is necessary to incentivise green financing in Nepal. It would be relevant to provide both a uniform standard and sector-specific guidelines for green financing. This would be relevant for determining policy priority and sustainable sectors of investment in Nepal. Additionally, the law must be in consonant with the international practice regarding raising bonds in the overseas market. Such a law should provide currency, repatriation, and procedural flexibility for raising finance. Further, it would also be necessary to incentivise the green

Sectors in the form of additional financial benefits and procedural exemptions, so that the investors

are encouraged to invest in these sectors. These would also be consistent with Nepal's obligations under multilateral framework to promote sustainable financing, reduce carbon emission, and curb the effect of the climate change.

(Authors are associate at Pioneer Law Associates)

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Skilling workforce in Construction Sector

| Baljit Vohra

In FY 2021/22, the construction industry comprised 6.2% of Nepal's national GDP, whereas it is estimated to have grown to 9.5% (Central Bureau of Statistics, GoN). To say the least, Nepal's infrastructure development is categorically dependent on a reliable and skilled workforce in the construction sector. Without a good infrastructure base, the country will never realize its potential to become a competitive economy. With my experience working with the private sector in the country, I am aware how firm productivity has been hindered.

This write-up is divided into four parts. The first three parts pertain to labour productivity in the construction industry across the world. The last part is based on reflections related to the engagement of UKaid Skills for Employment Program (SEP) in skilling human resources in the construction industry.

Skills and Productivity in the Construction Sector

Formalising Nepali Construction Industry Workforce

Approximately 1 million people are estimated to work in this industry. While workforce in most sectors in Nepal engage informally, this trend is even more salient in the construction sector. This has encouraged non-Nepali workers to be predominantly hired.

The construction industry across the world appears to be incapable of being innovative, compared to industries such as retail and manufacturing.



A report from McKinsey & Company states global labor productivity growth in construction has averaged just 1% per year over the past two decades, compared with a growth of 2.8 percent for the total world economy and 3.6 percent in the case of manufacturing. The case for Nepal may be even more dire.

Need of Skilling as well as Upskilling

The needs of the construction industry are complex. The construction process is a complex one starting with planning and design through construction, commissioning to operations and maintenance. There is a very wide spectrum of roles and corresponding skills that needs to be

While there is scope for skilling a large number of workforce entering the job market each year, a considerable segment of workforce already engaged are in need of upskilling.

It is not far-fetched to argue that Nepal currently has a very low stock of needed infrastructure. This means there is immense scope for growth for this industry. Bi-lateral investors from China, India and other countries, and multilateral investors have been interested to be involved in Nepal's infrastructure industry, reflected in the new projects.

Multiple construction projects like hydropower, airport, road, and irrigation, among others are underway in the country which have led to a

Going forward, UKaid SEP will explore opportunities to engage with the largest construction companies and others to skill and place in an increasing number of job roles in the construction industry.

(Author is the Senior Vice-President at WSP USA and Team Leader at UKaid SEP)

NEPAL INFRASTRUCTURE SUMMIT 2022

TuPIN: Looking Five Years Back and Forward

| **Shashi Bhattarai, Shiv Kumar Basnet, Sandip Shah, Ram Hari Sharma, Birendra Raj Pandey**

Tunneling Process Innovation in Nepal (TuPIN), a knowledge collaboration initiated on 12 November, 2016 started as coffee meetings with Understanding for Collaboration (UfC) signed on 7 January 2017 among Knowledge Holding International (KHInt), Nepal Tunneling Association (NTA), Independent Power Producers Association of Nepal (IPPAN) and, Youth Community for Nepalese Contractors (YCNC) with special advisor Er. Shiv Kumar Basnet, former Project Director, Bheri Babai Diversion Multi-Purpose Project (BBDMP), Government of Nepal.

TuPIN is taken forward with the high importance of energy generation as a primary resource for development, with keen attention on the need and desire to make a significant contribution to hydropower development, best utilization of knowledge and skills of experts with collaborating persons and entities. TuPIN has internalized that innovation is much needed in the process of construction to accelerate the development of hydropower tunnel-based projects in Nepal.

Collaborative and innovative mode of construction of tunnels for hydropower projects is now imperative. Breakthrough innovation in tunneling process focusing on hydropower development in Nepal is the outcome of discussion among the interested officials of collaborating institutions for joining hands to explore, identify and demonstrate the potential hydropower projects to construct based on the Process Innovation in Tunneling to achieve economies of scale for use of TBM. The

initiative is expected to open an innovative business model for utilization of high-end equipment for smarter construction of large projects in Nepal and elsewhere.

TuPIN: Idea, Analogy and Innovation

TuPIN Timeline: Looking Back

The knowledge product of TuPIN as a technical document was made ready for publication and



presented in the Nepal Infrastructure Summit - February, 2017 Souvenir (NIS 2017). Later, the work was cited in Nepal Infrastructure 2030, Investment and Financing Needs (CNI, 2019).

Idea / Analogy to Innovation		Outcome: Technically Possible
Idea / Analogy Making Hole in Wall	Hole Drilling Machine (HDM)  Multiple Hole on Wall with single HDM	TuPIN Initiative It is Technically Possible to use One TBM for Constructing Multiple Tunnels Collaboration is needed among the multiple developers of each independent Hydropower Projects Collaborative Process Innovation for Tunneling is TuPIN
Potential Innovation Transformation of idea for Making Tunnel for Hydropower Project	Tunnel Boring Machine (TBM)  Multiple Tunnel with single TBM	

The knowledge gained was also shared at the two major events of the collaborating agency, IPPAN and NTA, presented at the Himalayan Hydro Expo 2018, organized by IPPAN, 6 January, 2018 and at the Annual General Meeting (AGM) of Nepal Tunneling Association (NTA) on 3rd March 2017.

In March 2019, International Tunneling Association (ITA) published “ITA Tech Guidelines on Rebuilds of Machinery for Mechanized Tunnel Excavation” (ITA 2019) which provides guidelines for reuse of pre-used Tunnel Boring Machine (TBM). A pre-used TBM may now be Remanufactured or Refurbished following the provisions of the guideline. The ITA guideline has enhanced the TuPIN concept of using single TBM for multiple projects having varied diameters.

Though at an early stage, reuse of TBM for multiple projects is already in practice in Nepal. The TBM that was used to successfully construct Bheri-Babai diversion tunnel (12 Km long, 4.2 m finished diameter) is to be reused for tunneling of Sunkoshi Marin diversion tunnel (13 Km long, 5.5 m finished diameter) after rebuilding to meet the technical

requirements. Presently, the TBM is in the process of assembly at site and is expected to start excavation by the end of September 2022.

Perceptions on moving Forward

Preliminary assessment made by the TuPIN expert group indicates that Tunneling for Multiple Hydropower with single TBM is possible in Nepal, and that there exists sufficient inventory of projects to follow the TuPIN concept. Resolving remaining issues is not seen as a major challenge as developers need to work collaboratively in each river basin.

TuPIN is now seen as demonstrating Tunneling Process Innovation in Nepal – an example of Collaborative Innovation, the process is expected to replicate rapidly once one set of projects starts construction.

ITA coming out with the guidelines for reuse of TBM and Sunkoshi Marin diversion tunnel adopting pre-used TBM after rebuilding to meet requirements and specifications are testimonies that support the concept of TuPIN.

The TuPIN expert team believes there are multiple possibilities to explore and identify varieties of business models for value added utilization of high-cost construction equipment for TBM . Moreover, numbers of Road and Railway tunnel projects are under planning/studying in various geological regions. Use of single TBM for multiple projects is realistic in the near future in Nepal.

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Municipal Access to Green Finance: USEFUL RESOURCES FROM THE GREEN FINANCE GUIDEBOOK

| Sudridh-NURP

Introduction to Green Finance and Green Finance Guidebook

Green finance is an investment that supports green projects. Green finance can come in many forms, including but not limited to, (i) direct grants, (ii) market rate/concessionary loans, (iii) green bonds, and (iv) public-private partnerships. Green finance is usually provided by national and local governments, private and philanthropic donors, and multilateral funds and banks.

As a part of initiatives promoting investments and increasing access to climate finance, Sudridh-Nepal Urban Resilience Programme (NURP) prepared a Green Finance Guidebook as a useful and user-friendly resource for target municipalities to design and implement green projects that advance their goals for sustainable economic development. This Guidebook aligns with the Green, Resilient, Inclusive Development (GRID) framework set by the Kathmandu Declaration and adopted by NURP. The primary purpose of the Guidebook is to assist the municipal government in understanding the purpose of green projects and in mobilizing finance to fund green investments. The Guidebook was prepared in consultation with numerous stakeholders, including the Government of Nepal, government authorities at the federal and local levels, and representatives from the private and public sectors, think tanks, and non-governmental organizations. The Guidebook provides latest information on green projects, green finance opportunities, and step-by-step instructions to develop green projects and and key resources. NURP has been facilitating municipalities to access

various funding mechanisms and guiding them in the process of applying for additional funding – e.g., Cities Developing Initiative for Asia (CDIA). So, the objective of the Guidebook is that at least one project per municipality will be selected to be piloted through the evaluation process for suitability of green financing.

The Guidebook features information on the following sub-topics:

What are Municipal Green Projects?

Municipal green projects are sustainable development initiatives that provide environmental benefits. The type of green project that a municipality decides to pursue would be determined by the types of environmental problems it is currently facing now or anticipates in the future. These projects are typically initiated by a municipality or the private sector in close collaboration with the municipality. They support municipal development objectives targeted at reducing pollution, avoiding greenhouse gas (GHG) emissions, building resilience to climate change impacts, conserving biodiversity, and combating land degradation. An example of a green project supported by NURP would be pond conservation in Janakpurdham. NURP has been supporting Janakpurdham Sub-Metropolitan City to develop a methodology and a guideline to restore, conserve,

Figure 1. Steps to define green projects and access green finance opportunities

manage and maintain the city's ponds as an inseparable part of the urban ecosystem, which aligns with the green development objective of environmental protection and conservation of natural resources.

By incorporating green objectives in core development investments, municipalities may be able to tap green financing resources that will help

to improve the environment and address climate change, they can support other development objectives at the same time. For instance, green projects can be designed to provide jobs, support economic development, or help address gender inequality. Green projects can also improve and expand low-emitting public transit and develop more compact and walkable urban zones. Green objectives do not need to be developed through a separate process. Rather, it can be more effective

Figure: Framework of Steps to Develop Green Projects and Access Green Finance



them grow sustainably while creating a good quality of life for citizens, promoting healthy communities, and protecting their natural environment.

How can Municipalities Use Green Finance?

In order to utilize green finance, municipalities can identify opportunities to align their development objectives and plans with green objectives.

While the primary purpose of green projects is

to integrate a municipality's environmental goals into its overall development plan. This approach helps ensure that green initiatives are well aligned with the municipality's overall vision. The NURP-supported Inclusive Local Economic Development Strategy and Action Plan (ILED&AP) supports inclusive local economic development in Pokhara in order to increase income and production capacity of local people through promotion of economic opportunities and employment creation. The



ILED&AP is underpinned also by the need to enhance provision of infrastructure and services through green development approaches that can support the transition to a low-carbon urban economy.

Municipalities can also look to national climate change goals to identify projects and financing opportunities that can help achieve them. In fact, the Government of Nepal has established strong environmental goals for pollution reduction, climate-resilient and gender-responsive adaptation plans, greenhouse gas reduction, and energy efficiency.

What are the Steps to Access Green Finance?

Defining a green project and accessing green finance can be understood as a five-step process, which has been fine-tuned to contextualize with the local planning processes of Nepal entailing seven phases of its own. Starting with small environment projects that is manageable through current municipality resources can help establish a track record of solid environmental performance and help build capacities and expertise to take up more ambitious programs in the future. Throughout the whole process, it is also critical to involve stakeholders and potential partners to learn

about their perspectives and engage them in setting priorities and designing the project. Stakeholders will include community members, women's groups, youth organizations, local businesses and business associations, civil society organizations, non-governmental organizations, and others.

Conclusion

Several ministries under Government of Nepal as well as national and international financial institutions provide information, guidance, technical support on project preparation, and finding for initial assessments and feasibility studies. Global city networks and knowledge sharing platforms also provide opportunities to learn from the experience of other local governments. Using these available resources and the Green Finance Guidebook developed by NURP, municipalities can plan for adopting suitable green projects and accessing funds related to green finance. The Green Finance Guidebook will also have a key role in developing the knowledge and understanding among various actors at the municipal, provincial, and federal levels.



Urban Infrastructure for Livable Cities in Nepal

Abha Sharma and Nidish Nair

PwC India, Urban and Rural Economic Services



Urban areas are powerhouses of economic growth. As centers of innovation, entrepreneurship and opportunity, urban areas drive economic growth and act as a platform for addressing many of the current global challenges ranging from poverty and unemployment to environmental degradation and climate change. With unplanned urbanization, governments are faced with enormous challenges of addressing the consequences including environmental degradation and poor quality of life, in addition to provision of basic services and infrastructure. Urbanisation though provides a great opportunity and can act as a significant tool to guide sustainable development as cities account for substantial share of carbon emissions and resource use.

The United Nations (UN) estimated that over two-thirds of the global population will live in cities by 2050. The rapid increase in the urbanization rate has cascading impacts on environmental

degradation, economic activities, income disparities and infrastructure systems of a city. Livability of a city depends on the quality of life that the city offers. The factors affecting livability include safety and stability, culture and environment, access to basic infrastructure services, healthcare, and education. To ensure integrated urban infrastructure development and develop livable cities, it is imperative to prioritise long-term sustainability over short-term economic gains. As the urbanization rate of Nepal grows gradually, it is starting to face considerable challenges in its infrastructure provision and delivery, despite decentralizing its urban governance structures. While there have been numerous efforts to address these bottlenecks, they seem to persist. The purpose of this note is to examine these key challenges, look at how Nepal's South Asian counterparts handled similar challenges and prescribe corrective steps to tackle them in the context of Nepal.

Nepal and its South Asian Neighbours

Nepal is one of the least urbanized countries in the world with only 21% urbanisation as of 2021. While carrying out a peer comparison to select countries in South Asia (Table 1), it is noted that the urbanisation growth rate of Nepal is second highest just slightly behind Bangladesh. However, it ranks second last in the Human Development Index just ahead of Pakistan. The urbanisation process in Nepal is distinct in a way that it is

South Asia's performance in general is mediocre compared to the rest of the world; Nepal's SDG score ranking is 98 out of 163 countries. Further, poor rankings in the Ease of Doing Business and Logistic Performance Indices further indicate larger urban infrastructure gaps prevailing in Nepal that may be restricting it from attaining higher levels of human development.

Table 1: Comparison of Nepal with select South Asian countries

In accordance with the 2015 constitution of Nepal,

Parameters	Countries					Source
	Bangladesh	India	Nepal	Pakistan	Sri Lanka	
Human Development Index (2019)	0.632	0.645	0.602	0.557	0.782	UNDP Human Development Report
Urbanisation (2021, % of total population)	38.95	35.39	21.01	37.44	18.86	World Bank Databank
Average annual urbanisation growth rate over past five years (% change)	2.11	1.30	2.09	0.66	0.60	World Bank Databank
Average annual growth rate of gross fixed capital formation as % of GDP over past five years (% change)	0.53	0.22	0.99	-1.98	-0.52	World Bank Databank
SDG score (2022)	64.22	60.32	66.18	59.34	70.03	Sustainable Development Report
Ease of Doing Business Index (2020 ranking out of 190 countries)	168	63	94	108	99	Doing Business Report 2020
Logistic Performance Index (2018 ranking out of 207 countries)	124	51	144	163	121	World Bank

Status of infrastructure in Nepal

mainly attributed to the expansion of municipal boundaries, designation of new municipalities and high levels of urban-bound migration rather than economic initiatives to drive urban infrastructure growth (Prasad & Sharma, 2016). Nepal does have the highest growth rate of gross fixed capital as per cent of GDP (a measure for infrastructure investment) relative to the rest of the countries. Nepal's Sustainable Development Goals (SDG) performance is one of the best in the region, scoring the second highest in this metric behind Sri Lanka. It is important to note, however, that

the Local Government Operation Act, 2017 was enacted which classified urban areas as municipality, metropolitan city, and sub-metropolitan city. This classification is based on population size, annual income of residents and provision of services and suitability of infrastructure. The urban areas are further classified into three ecological regions, namely the hills (with highest levels of urbanisation at 22%), Terai (15% urbanisation level) and mountains (2.8% urbanisation level). Nepal is also classified into five development regions, Central

Development Region has the highest level of urbanization at 23.5% followed by Eastern and Western Development Region, both accounting for 17-18% each. Share of urban population in the remaining two regions (Mid-Western and Far Western) is relatively low. Over one-third of the total urban population is concentrated in just 16 urban centers (MoUD, 2016).

Kathmandu valley is the most populous and one of the fastest growing urban regions, accounting of almost one-fourth of the total urban population, with the capital Kathmandu being the largest metropolitan city in the country.

Pokhara, located in the central hill region is the largest and fastest growing medium-sized city. Medium-sized cities (population between 100,000 and 300,000) are mainly the market or border towns located along either the east-west highway or the five north-south corridors.

Small cities (population less than 100,000) are developing as urban growth nodes along the major highways and close to the India border.

The number of municipalities has been increasing rapidly from 58 in 2011 to 190 in 2014 and 293 in 2017, with total population residing in urban municipalities now risen to more than 60%. Of the 293 municipalities, 6 are metropolitan cities, 11 are sub-metropolitan cities and 276 are municipalities.

This number of urban centers has grown with increase in accessibility and construction of new roads and highways in different regions of the country. However, there are other factors like natural disasters which led people from the hills and mountain regions to resettle in the Terai region during the 1960s. Further, development of growth centers with focus on urban and regional planning has led to increase in connectivity, development of growth axes across major regional roads and increase in trade through movement of goods and services (ADRA, 2018).

Despite the growth in number of urban areas, vast majority of urban population lacks access to basic services and infrastructure. This is evident from the status of service levels of water supply, sanitation, solid waste management, housing, and urban

transport. As per the 2019 economic survey, 90% of the total population has access to basic drinking water facilities but only 51% of the population is provided with piped water connection, while the remaining rely on un-piped or privately operated systems. Only 33% of households in urban Terai have access to piped water supply as compared to 81% in urban hills, demonstrating the disparities across geographical and ecological regions.

However, the quality and quantity of water supply in urban areas is inadequate across the country (MoUD, 2017). Kathmandu, the largest city, gets only about 50 to 60 lpcd of water supply. Further, about 88% households have access to toilets and 52% of urban residences are connected to septic tanks, many of which are not designed properly. In Kathmandu Valley, 98.1% of the households had access to sanitation, and 99.3% had toilets. Huge investments are being undertaken in the valley in on development of sewer network and augmenting sewage treatment capacity. In urban hills, sanitation coverage was 41.6% while in urban Terai this number was the lowest at 33.2% (MoUD, 2017). 62% of municipal solid waste was collected, with collection rate varying substantially across various municipalities (World Bank, 2019). Inadequate solid waste management systems have resulted in clogging of drains with garbage. There is also severe inadequacy in availability of sanitary landfills and practices of controlled dumping of waste. Despite some large programs and investment in the water and sanitation sectors, service delivery is inefficient, which has compounding effects on public health as well as socio-economic and environmental conditions of people.

It is estimated that around 10% of the urban population live in informal settlements with issues including lack of affordable housing and increasing slums. Some cities like Dharan have more than 10% population living in informal settlements (MoUD, 2017). The average urban road density in Nepal is 3.26 km/sq.km., which is extremely low and poor road coverage exhibits semi-rural characteristics in the case of most municipalities. Furthermore, 82% of the feeder roads are also in bad condition with

Table 1: The Bangladesh context

Sector	Gap observed in infrastructure	Government initiative to bridge the gap	Expected and realised outcomes
Water supply and sanitation	More than 1.8 million and 36 million people lack access to improved water and sanitation facilities respectively (Bangladesh's Water and Sanitation Crisis) (water.org, n.d.)	- National Strategy for Water Supply and Sanitation (2014) - Establishment of Policy Support Branch (PSB) for WASH sector development, policies and coordination under MoLGRD&C¹ - Development of Implementation Plan of Arsenic Mitigation – Water Supply (IPAM- WS) (2018) - Institutional and Regulatory Framework for Faecal Sludge Management (IRF-FSM)-2017 - Pro-Poor Strategy for Water and Sanitation Sector 2020	Bangladesh has made significant progress in improving water and sanitation facilities. There is almost universal access to improved water services. However, the water quality is poor and remains a major challenge in Bangladesh
Solid Waste Management	55% of solid waste remains uncollected in urban areas	- Solid Waste Management Regulation, 2021 - Dhaka Structure Plan, 2016 - National 3R Strategy, 2010 - Building Zero Waste Communities for a Pollution-free Environment in Bangladesh	- First Waste to Energy is setup in Jashore and has become a role model in garbage recycling - Building Zero Waste Communities for a Pollution-free Environment in Bangladesh” has been undertaken by the Environment and Social Development Organization (ESDO) to turn three different localities into zero waste zones

1. MoLGRD&C - Ministry of Local Government, Rural Development and Cooperatives

countless potholes, poor drainage systems etc., posing threat to the lives and safety of commuters (MoUD, 2017).

The urban environment in the country faces challenges with regards to air and water pollution, urban decay, inadequate green spaces which are

rapidly depleting. Kathmandu has a mere 0.48% of open spaces while Lalitpur as 0.06% (MoUD, 2017).

Urban Infrastructure Condition Index (UICI), a comparison of infrastructure condition across 58 municipalities shows that Kathmandu has the

Sector	Gap observed in infrastructure	Government initiative to bridge the gap	Expected and realised outcomes
Urban transport	Decreased accessibility, level of service, safety, comfort, operational efficiency. All of this led to increased costs, loss of time, air pollution and psychological strain (Asia Development Bank)	Strategic Transport Plan, 2005 and Revised Strategic Transport Plan, 2015	• Still only 50 percent of urban population have access to public transport. Numerous bus stoppages creating loss of time and congestion (Alam, 2018) • Quality and reliability of urban transportation was still rated as very low (ibid) • Traffic fatalities have reduced considerably (ibid) • Operational costs are still quite high, though there are improvements
Affordable housing	Majority of urban dwelling units are temporary, unsafe and overcrowded (Sarkar, Hafiza, & Shahriyer, 2019). Over 2 million people in Dhaka alone live in slums (ibid). Majority of houses are unaffordable, as monthly housing cost exceeds 30% of a family's monthly income (ibid).	• National Housing Policy, 2016 • Increased PPP participation to develop affordable housing in cities. • Connecting housing schemes to export processing zones, as thousands of workers from middle-income segment are employed there.	• While there certainly are improvements in affordability, 80 per cent of Bangladesh's urban population continues to live in rented properties because they can't access mortgage finance (Funnell & Khan, n.d.) • The cities of Bangladesh are still facing considerable difficulty in building houses to match its rapidly growing urban population (Funnell & Khan, n.d.)

highest value of UICI whereas Gulariya is at the bottom of the index list (MoUD, 2017). Nepal is also located in a sensitive and hazard prone Himalayan region and is largely impacted by severe climate induced disasters. The catastrophic

earthquake of 2015, which was the strongest earthquake that hit Nepal in 80 years, resulted in damage to various buildings and structures, with urban municipalities bearing 40% of the damage (Government of Nepal, 2021).

Table 2: The Indian context

Sector	Gap observed in infrastructure	Initiative by the Government to bridge the gap ¹	Expected and realised outcome
Water supply and sanitation	• 26.8 million urban households lack piped water connection (Sitharaman, 2021) • Only 27% of the total generated wastewater is safely treated in the country	• National schemes - JJM; AMRUT; SCM; SBM; AMRUT, Namami Gange Mission • Power tariff policy, 2016 for utilization of treated wastewater	• Aims to provide universal coverage of all urban households through functional taps. • STP capacity creation has been increased from 709 MLD to 1170 MLD through Namami Gange programme (Ministry of Jal Shakti, 2022) • Other missions such as SBM, AMRUT and SCM aims to provide better coverage of sewerage network and access to sanitation facilities • The use of treated sewage water mandatory in thermal plants as per the provision in power tariff policy, 2016.
Solid Waste Management	97% of the total waste generated is collected and only 47% of it is treated (Central Pollution Control Board Delhi, 2022)	• National schemes - SBM; SCM • Swachh Sarvekshan – Annual survey of cleanliness	• Processing of Municipal Solid Waste has improved from 18% in 2014 to 72% in 2022 (Ministry of Urban and Housing Affairs, 2022)

1. JJM (Jal Jeevan Mission) - to provide universal coverage of water supply to all urban households through functional taps.
 SCM (Smart Cities Mission) - to promote sustainable and inclusive cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions.

AMRUT (Atal Mission for Rejuvenation and Urban Transformation) - to provide basic civic amenities including water supply and sewerage network to all urban as to improve the quality of life;

SBM (Swachh Bharat Mission) - to eliminate open defecation and improve municipal solid waste management.

Namami Gange programme - to accomplish effective abatement of pollution, conservation and rejuvenation of National River Ganga.

Green urban mobility scheme - to promote innovative urban transit modes, strengthen Intelligent Transport System (ITS) facilities;

PMAY (Pradhan Mantri Awas Yojana) - to provide affordable housing to urban poor

Sector	Gap observed in infrastructure	Initiative by the Government to bridge the gap ¹	Expected and realised outcome
Urban transport	There is a huge bus supply gap of 1,42,500 buses in 7,935 towns / cities (Ministry of Urban and Housing Affairs, 2019)	• National schemes - FAME-II scheme, National Mission for E-Mobility • Green Urban Mobility Scheme • Metro Rail Policy	• Tier 2 and tier 3 cities will be provided with MetroLite and MetroNeo systems. • Monorail projects being developed in Mumbai, Chennai, Pune, Thiruvananthapuram, Bengaluru, Thane, Delhi, Port Blair, Dehradun, Chandigarh etc.
Affordable housing	25 million houses are required by 2030 to meet the demand (RICS-Frank Knight)	• National schemes - PMAY • Exemption of 100% income tax for Affordable rental housing projects	• A total of 122.69 Lakh houses have been sanctioned and 79% of it is grounded and 47% the houses are completed.

Federalization and the new Local Governance Act, endows the provinces and the municipalities with the legal and regulatory powers to undertake infrastructure development, however, they lack adequate capacity and financing mechanisms to effectively develop and manage these. Nepal needs an investment of NRs 373 billion to provide for the infrastructure deficit in 58 municipalities, while NRs 918 billion is required for the 159 new municipalities, based on the existing condition and desired service levels (MoUD, 2017).

Case studies

This section investigates how Nepal's neighbours, Bangladesh (Table 1) and India (Table 2) have tackled infrastructure constraints across relevant sectors such as water, sanitation, waste management, transportation, and housing.

Key challenges and issues

Nepal is highly prone to disasters and climate induced hazards; and is ranked 4th, 11th and 30th in relative vulnerability to climate change, earthquakes and flood hazards respectively. Going forward, it will be imperative to build the resilience of infrastructure projects and incorporate aspects of climate proofing in urban development. Another important challenge to Nepal's urban development

is posed by the uncertain and inconsistent policy regime. Lack of clarity in defining urban areas and municipalities leads to uncertainty in planning and funding for the development of these areas. The key challenges across critical urban infrastructure sectors that are constraining the overall urban development are as follows:

Access to drinking water: Community drinking water schemes in Nepal face several challenges such as technical problems, gender equity, cost recovery and affordability, operation and maintenance, institutional and legal framework etc. It is also observed that the availability of drinking water is decreasing due to source and groundwater depletion.

Sanitation services: Lack of skilled resources, limited private sector participation, inadequate cost recovery, lack of community participation, social issues, etc. also account for impending overall urban development.

Transportation: The difficult terrain results in mobility restrictions and challenges in new infrastructure development. Traffic congestion with increasing vehicle ownership, narrow roads, fragile geology, natural disasters are some of the major challenges in transportation sector in Nepal.

Urban housing: Delay in recovery of urban houses post disasters, can be attributed to challenges with respect to access to finance; variances¹ in land ownership and related legal implications, compliance with heritage norms, etc. Issues of informal settlements and increasing slums with unplanned urban sprawl are also increasing.

Way forward

In terms of infrastructure, livability of a place can be expressed as measure of service delivery and service levels through access to safe water, sewage networks and sanitation services, housing, transport. These aspects are critical for ensuring the future of a city's economic performance and thus its livability. In order to make cities and urban areas livable, there is a need for a cohesive and comprehensive approach focusing on sustainability, resilience, equity, health, happiness and involvement of all relevant stakeholders including the community. The challenges posed by the key urban infrastructure sectors in the context of Nepal also provide opportunities and areas of intervention that can be taken up to achieve interactive and vibrant neighborhoods, accessibility, sustainable mobility, robust local economy, inclusive and integrated development. The rapid pace of unplanned urbanisation coupled with economic and institutional barriers, highlight the need for long-term programs across the nation with a focus on sustainable and livable cities. Nepal needs a specific stakeholder centered approach and priority actions to achieve the desired urban infrastructure development.

The government needs to explore programmatic approach for infrastructure development to strengthen the technical, financial and managerial capacities of the local governments. There is also a need to create an enabling environment for transferring powers to the local government while handholding them and building their capacities to ensure these powers can be smoothly devolved. Considering the size and scale of towns, availability of resources and geography, the government also needs to define norms for provision and delivery

of quality infrastructure, extend policy support to local bodies through design and implementation guidelines and ensuring adequate funding support mechanisms to meet the infrastructure investment requirements. Technology and knowledge transfer from good practices from similar geographies should be explored and replicated.

PPPs should be encouraged in order to leverage the efficiencies and technology expertise of the private sector. However, this needs to be coupled with a robust ecosystem and regulatory environment with standardized concession agreements, PPP acts and legislations that clearly recognize the roles of various entities involved to attract private players. Lack of skills in market has been a key challenge in Nepal, hence, local enterprises capacities may be nurtured and supported (through skill development and financial support) to manage services. Participatory planning, community involvement in decision making, decentralized and community-



led urban infrastructure solutions, community driven data collection and innovative PPP models with community involvement can be explored to encourage collaborative efforts and effective public engagement which has benefits such as efficiency in planning process, better decision making, transparency and accountability.

¹ Variance is deviation from municipal rules. Property owners request variance when the planned use of properties deviates from local zoning laws

Provincial and local governance needs to be strengthened through decentralization of power from center to provinces and local governments, mainstreaming local governance in all areas through development of a coherent framework, empowering the local governments to become better administrators and city managers who can make the urban areas financially self-sufficient and thereby delivering high quality of urban services. Academia, research institutions, NGOs, civil societies, and industry leaders should also contribute to infrastructure development through research, development, innovation, and cost-effective futuristic solutions that are scalable and replicable. Local resources and enterprises can be involved to contribute to infrastructure development as this has a local multiplier effect through use of local resources and manpower which positively impacts the local economy.

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Capital Markets for Infrastructure and Growth

Deepesh Kumar Vaidya
CEO, NMB Capital Ltd.

Infrastructure development, with its varied forms, is imperative for the economic growth of Nepal. All member countries of the United Nations have adopted the agenda of 2030 for the Sustainable Development Goals (SDG). Nepal being one of the adopting members, the agenda of developing a resilient infrastructure for inclusive and sustainable growth is one of the commitments and priorities of the country. For achieving the target of developing sustainable infrastructure within the timeline, Nepal needs to improve its capacity to build and operate such infrastructure projects and most importantly raise funds for such developments.

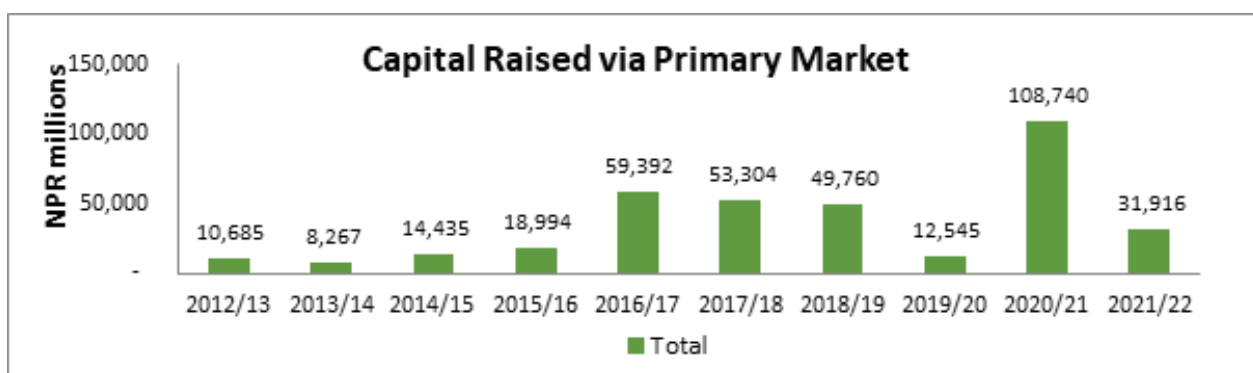
To fund infrastructure developments, countries require big investments and commitment from the government, private sectors or public private partnership. It can be argued that the capital markets of Nepal can trigger interests for such investments by connecting the dots of confidence of domestic investors to the confidence of international investors or lenders to pave the way for big infrastructure investments. This article highlights the optimistic trend exemplifying that with the right narrative and demonstration of institutional capacity for the infrastructure development, capital markets of Nepal can be a major confidence driver and, hence, a catalyst for raising capital required for the infrastructure investments and development in Nepal.

I would like to raise this issue in parallel to the presentation made during Power Summit 2013 on the title 'Raising Capital for Hydropower Projects Capital Markets of Nepal', where it was argued that hydropower developing companies should



consider capital markets as a source of capital for their projects. At the time of presentation, FY 2069-70 (2012-13), there were only four hydropower companies listed in the stock exchange which had raised around NPR 2.5 billion¹ (including promoters' investments), and the market capitalisation of the Hydropower sector amounted to 6% of the total market capitalisation. As of July 16, 2022, hydropower sector comprises of 51 companies listed in Nepal Stock Exchange, with listed par value of NPR 90 billion (including share value of shares of promoter group) and amounting to around 11% of market capitalisation. The hydropower sector has become one of the major industrial sectors in Nepalese Capital Markets. Similar sentiments can be generated for other

1. Note: USD to NPR exchange rate as of August 29, 2022 is NPR 128/USD



Secondary Markets Sector Market Cap (Source: Nepal Stock Exchange)

infrastructure sectors as well to raise capital from the Capital Markets of Nepal.

Capital Markets of Nepal – Primary Market

Given the limited participation of real sector companies in the stock market, it is worthwhile to point out how the market has performed in the last decade in regard to fund collection. In the last fiscal year 2078-79 (2021-22), capital equivalent to NPR 32 billion was invested via IPO and Rights Issue, debentures and new fund offerings of Mutual Funds combined. The total invested amount in the FY 2020-21 was around NPR 108 billion. In the last 10 years, capital markets have invested total of around NPR 368 billion via primary market.

In tandem with increase in the risk investment raised directly via capital market's activities, the paid-up capital of listed shares has increased from NPR 126.5 billion in FY 2069-70 (July 2013) to NPR 667.7 billion in FY 2078-79 (July 2022). It can be argued that the increase in paid up value of listed companies by a CAGR of 17% can be attributed to the liquidity assurance/confidence provided by the Capital Markets of Nepal to the promoters.

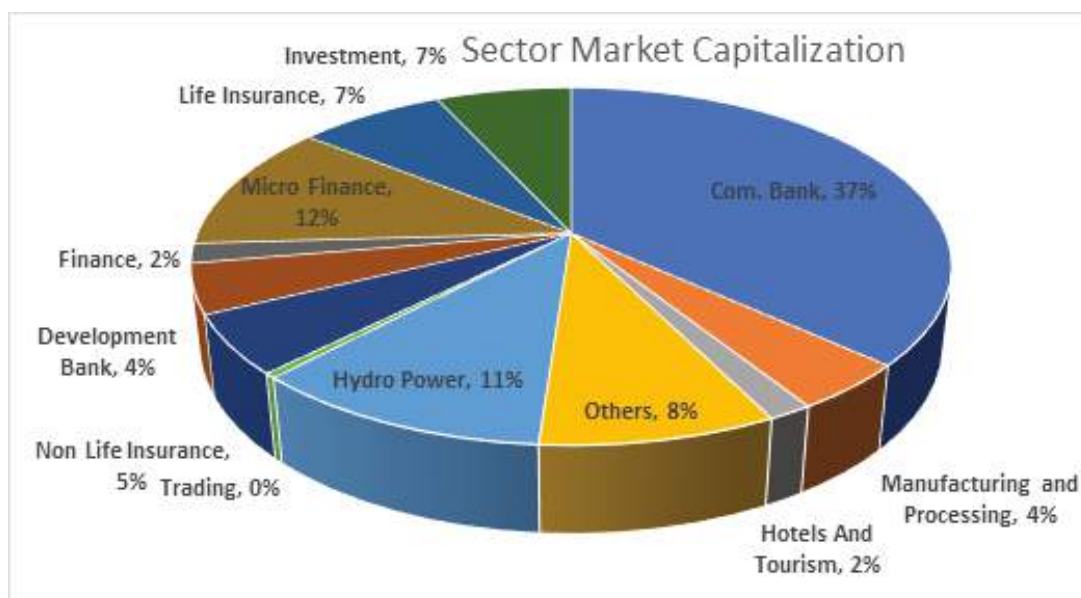
Capital Markets of Nepal – Secondary Market

Another important indicator of interest of investors in the capital markets especially equity markets is the market capitalisation. The market capitalisation

has been greatly appreciated in the recent years. It reached NPR 2,869 billion on July 16 2022 from NPR 514.5 billion in July 15 2013. The market capitalisation on July 15 2021 was around NPR 4,010 billion. This surge in market capitalisation is driven by increase in price of existing shares as well as an increase in number of shares of the listed companies. The annual turnover was NPR 22.048 billion in 2013 and it rose to NPR 1,454 billion in 2021 and NPR 1,202 billion in 2022. It indicates the interest of investors in the capital markets, and the demand of the public for investment opportunities. The surge in the last two years is primarily driven by the introduction of online trading in the secondary market and availability of credit at historic low rate.

Capital Markets of Nepal – A Recent Development in Ecosystem

Being aligned with the growth in the capital markets, the market stakeholders have become large in number and more specialised. Eighty-one licensed Depository Participants have made it possible to have 5.37 million beneficial owners of demat accounts and around 4.47 million beneficial owners have access to online meroshare accounts (online subscription platform for demat account holders) and can apply for any public issues within few clicks. This number, however, does include multiple demat accounts by the same individual. These numbers are astounding as a percentage of total population, which stands at around 18% of the



Trend of Initial Public Offerings in last decade (Source: SEBON)

population of Nepal. For the secondary market transactions, around 1.4 million people have a broker account and around 92% are connected to the broker account via an online account. As of institutional players, there are 30 merchant bankers, 50 stockbrokers, three credit rating agencies and 34 different mutual funds with total Asset Under Management (AUM) of NPR 33.9 billion. Recently, Securities Board of Nepal has registered 116 qualified institutional investors eligible to participate in the price formation process as qualified institutional investors in the recently introduced IPO through Book Building process. Further, SEBON has issued licenses to 2 institutions under its new capital markets service license, Private Equity/Venture Capital Fund Management, under Specialized Investment Fund Regulations, 2075. They are yet to issue their PE/VC fund schemes for subscription. The evident facts reflect that the ecosystem is surely being expanded to enhance the depth and breadth of Capital Markets in Nepal. With the right moves by the regulators, both opening investment opportunities and protecting the interest and right of investors, the Capital Markets will be bound to be mature and develop, and contribute to the investment needs of the country.

Capital Markets as a driver for Infrastructure Development

Capital Markets of Nepal have attained a substantial participation of domestic investors. At its hay day, any typical IPO would be subscribed by more than 2.5 million applicants. The number of applicants in recently have gone down to 1.5 million. But, considering the awareness about the level of investment risk of most investors, some level of assurance from the credible sector is a must to generate interest of the public in new sector investments. The success of the hydropower sector in Nepalese Capital Markets attributes to the successful IPO and performance of Chilime Hydropower project. Due to the commitment to complete the project and favourable government undertaking, Chilime Hydropower project paved the way for other hydropower companies to raise capital from the public and use IPO as means of social security and local buy-ins for the project.

Hence, for other infrastructure investments, interest of investors depends on the commitment from the developer to complete the project at pre-conceived time, quality, and costs and similar facilitation from the government to back up the project as final undertaker in case of any fallback.

These two assurances, besides other project specific financial feasibility, are must to make infrastructure investments a favoured long-term investment by the domestic investors. If confidence and interest of domestic investors can be maintained, it can be used to attract non-domestic investments in the infrastructure developments.

Market Perspective

The lessons that could be drawn from the experience of the banking sector in the capital market can be valuable for other industries to follow. It is a market signal for other industries to seek capital market as a source of long-term

The number of companies listed on NEPSE have reached 234 in 2022 but it still accounts for less than 20 percent of the companies registered on Office of the Company Register as public limited companies. Most of the companies are listed in stock exchange due to legal and regulatory provisions, because the concentration of banks and financial institutions remains very high. As a result, the monetary policies and regulatory action of the Nepal Rastra Bank tend to affect the capital markets' performance. The diversification of listed companies has become essential for safeguarding investors' interest as well as mobilising available funds into productive sectors.



funding. The hydropower sector must, to some extent, utilise the opportunity.

In addition to aforementioned evidence, various reforms have been introduced in the Nepalese Capital Markets. Dematerialization of shares, IPO application via online platform, and allowing online trading in the secondary markets have made transactions from IPO application to secondary market transactions, faster and smoother. The transparency has increased, and the transaction costs have also come down. The trading volumes and the investors' confidence and service standards have also risen.

However, resources are always scarce and so are the available investments in Nepal. Infrastructure sector development is a necessity of the country and so it should get a good portion of scarce domestic resources. However, infrastructure investments, besides hydropower, being new for Nepalese Capital Markets, expects certain assurance to enhance trust and interest of investors.

Regulatory Framework

The efforts of SEBON have been instrumental in bringing the capital market upfront in policy

discussions. The dominance of the banking industry in the stock market resembles that of any developing or under-developed country. There is a general perception that the banking industry is safe as it is heavily regulated. The other real sectors are not as regulated as financial institutions. Securities Board of Nepal should play a role of regulatory authority for those companies that do not have specific regulatory authority(ies).

Institutional Capacity of Developers

An effort is required to build trust that the big infrastructure projects can be undertaken by developers to complete the project on time, within the committed budget, and with committed quality. Nepal does have few examples of such successfully completed big infrastructure projects and only few are encouraging in this regard. Hence, it is the responsibility of professionals engaged in this sector to showcase expertise to establish the trust as a developer. In addition to the capacity to win trust, the sector also needs to assure investors regarding the capability to maintain the trust with the shareholders via standard corporate governance practices.

Government Support

It is the role of the government to allow, foster, and facilitate institutional capacity to be developed by domestic developers organically or via technology transfer. Until that capacity is demonstrated, it should be the role of the government to ensure as the custodian for the financial feasibility of such investments, be it in terms of minimum revenue guarantor or assured purchaser of the services. This would help build the confidence, experience of the developers, and safeguard the interest of investors.

Undertaking by the Financial Industry

General investors at large are not technically savvy and may not have the reach and skill to analyse required information to gauge the risk of any

infrastructure investments. Hence, technically advanced and resourceful financial sectors should act as an honest opinion maker in such projects. Such opinions can be expressed via financial closure by financial institutions like commercial banks and other BFIs. In addition to this, it is the duty of the Investment Bank (merchant bank) to create awareness among investors regarding the project and its economic and financial metrics, assumptions, risks and potential risk and return profile from the investments based on the financial metrics of the projects.

Conclusion

Capital Markets of Nepal have attracted interest of individuals and institutional citizens and have made them willing to bet on their own economy. However, with constrained depth of the investment opportunities, in terms of lack of representation of various industries contributing to the economy in the capital markets, investors are losing the chance of having diversified investments portfolio and probably at less market price multiple. On the other hand, the economy is quenching for risk capital to match its growth aspiration and hence looking for institutions to play that intermediating role. Like for banking & financial institutions and to extend the hydropower sector, capital markets can be a supplementary medium for mobilising savings to investments. To bring these changes and enhance the role of capital markets, the government as the facilitator, Securities Board of Nepal as regulator and market participants like bank and financial institutions, merchant bankers and other players of the financial ecosystem need to play a cohesive role collectively and effectively.

The opinion expressed in this article is the opinion of the writer and does not necessarily reflect the opinion of the company the writer is associated with.



MCC Nepal Compact Programme for Infrastructure Strengthening

Khadga Bahadur Bista
Executive Director
MCA-Nepal

The transformation of Nepal from a country that once imported electricity to the one that now has started exporting it, is evident. The increased investments from the state and the private sector in generation projects have made this progressive change possible. The selling of electricity, after fulfilling domestic demand, has been the vision of Nepal for many years. Today, India receives the green energy from Nepal, and in future Bangladesh can be included too. The export of electricity will thus contribute towards a sustainable and much required export revenue for Nepal.

To realise Nepal's aspiration of exporting power, the development of transmission infrastructure should be proportionate with the increase in the generation capacity. The Transmission Development Master Plan prepared as early as 1995 and subsequent plans and the latest plan of 2017 of the Government of Nepal (GoN) has envisaged cross-border connection at several locations with both our neighbouring countries—China and India for the same reason.

Inadequate infrastructure has been a major obstacle in meeting overall development goals of Nepal, and it is equally true for power transmission line. Significant investments have been made in power generation projects but due to the absence of power transmission infrastructure not all the generated electricity have reached potential markets. Clearly, transmission lines are a vital link to ensure evacuation of power from the 3,000 MW (under construction) and additional 3,000 MW (at various stages of development) projects to load centres. The investments in power generation will be at risk if transmission lines are not constructed on time and will negatively impact the country's economy.



In this context, Millennium Challenge Account Nepal Development Board (MCA-Nepal) and a Government of Nepal (GoN) agency, is building a segment of the line as envisaged in the Transmission System Development Plan of Nepal. Around 315 km electricity transmission line from Lapsipedi, Kathmandu via Ratmate to New Butwal, Nawalparasi at the border with India, and Ratmate to New Hetauda will be constructed under the MCC Nepal Compact Fund, a USD 630 million programme, co-funded with a grant of USD 500 million from the Millennium Challenge Corporation (MCC) and USD 130 million as contribution from the Government of Nepal (GoN). The programme focuses on implementing two projects namely the Electricity Transmission Project (ETP) and the Road Maintenance Project

(RMP). The programme aims to increase the availability and reliability of electricity, maintain road quality, and facilitate Nepal's power trade with the regional countries and help spur investments and accelerate economic growth in Nepal. The ETP will construct up to 315 km of 400 kV double circuit Quad Moose overhead electricity transmission line and three new substations at Ratmate, New Damauli, and New Butwal. This line will be able to carry more than 3000MW of generated power. In addition to the transmission line and substations, the project also has components of power sector technical assistance to NEA (Nepal Engineers Association) and Electricity regulatory commission, and a partnership programme to share project benefits with local communities. The RMP will contribute to the maintenance of up to 77 km road segment of East-West Highway and includes technical assistance to the Department of Road and Roads Board Nepal. The proposed 400 kV transmission line to be built by MCA-Nepal is a part of Nepal's transmission

backbone. The initial section between Inaruwa to Hetauda is now under construction by NEA and NEA has plans for another line going west from New-Butwal substation. MCA-Nepal's transmission line will connect the Inaruwa-Hetauda section of the line at the New-Hetauda substation with the New Butwal substation via Ratmate and New Damauli substations, which are the major collection hubs for generated power in the nearby river basins. Ratmate substation will be further connected to Lapsipedi substation, North-East of Kathmandu valley to collect power from Upper Tamakoshi and Bhotekoshi river basins, to complete a loop. The line intends to collect electricity generated from hydropower projects in various river corridors in the project vicinity and deliver it primarily to load centres within Nepal through various substations planned or under construction. The construction of the transmission line, in addition to enhancing the evacuation capacity of Nepal's power system, will also improve the reliability and the quality of the supply, and at the

Technical details of Sub-stations to be built by MCA-Nepal	
Sub-stations	Details of Sub-stations
Ratmate Sub-station	The Ratmate Sub-station, to be built at Belkotgadhi Municipality-7, Nuwakot will be a 400 kV gas-insulated sub-station (GIS) and a 220 kV Gas Insulated Sub-station (GIS). It will include seven, 1-Ph, 400/ $\sqrt{3}$ /220/ $\sqrt{3}$ /33 kV, 167 MVA, Autotransformers, and related control and protection systems.
New Butwal Sub-station	The New Butwal Sub-station, to be built at Sunwal Municipality-13, Nawalparashi (Bardaghat Susta West) will be a 400 kV gas-insulated sub-station (GIS). It will include two, 3-ph 400/220 kV, 315 MVA, Autotransformers and related control and protection systems.
New Damauli Sub-station	The New Damauli Sub-station, located at Vyas Municipality-13, Tanahun, will be a 400 kV gas-insulated sub-station (GIS). It will include seven, 1-Ph, 400/ $\sqrt{3}$ /220/ $\sqrt{3}$ /33 kV, 167 MVA, Autotransformers, and related control and protection systems.

Transmission Line (TL) Segments		
Transmission line Segments	No. of Towers	Length (km)
New Butwal – Nepal/India Border	52	18
New Butwal – New Damauli	248	90
New Damauli – Ratmate	249	90
Ratmate – New Hetauda	142	58
Ratmate – Lapsipedi	163	59
Total	854	315

same time facilitate the export of excess power. MCC Compacts around the world allot enough time to the project preparatory phase so that all conditions for successful project delivery are met prior to the implementation activities. Accordingly, the preparatory and implementation phases of the MCC Nepal Compact are two distinct stages in the execution of the Compact project. Since the projects must be completed within an agreed timeframe of five years with no provisions for time extension or cost increase, MCC has adopted a two-phased implementation model, i.e., the preparatory phase and implementation phase. The preparatory works ensure readiness for the implementation phase.

The programme, the largest grant assistance provided by the US Government to Nepal during its 75 years long bilateral relationship, has many unique features. Like other development assistance from other bilateral and multilateral development partners, the grant was received upon the GoN's request to invest in infrastructure projects as per the need identified by the Nepal government. The contractors for the construction of the projects will be selected competitively based on free and fair international bidding process in line with

international practices. The procurement process follows a very transparent approach, and the key documents are made public. The books of account are subject to audit by the Office of the Auditor General, Government of Nepal, in addition to MCC audit.

The successful implementation of the programme will be a game-changer and present a model in infrastructure project management for Nepal in terms of timely completion, following stringent environment and social safeguard practices.

In addition to enhancing the power evacuation capacity of Nepal's transmission system, new technology such as Full Depth Reclamation and Super-pave will also be introduced for road maintenance in Nepal.

The project will use climate-smart, sustainable technology to recycle asphalt and create a safer transportation network that is easier to maintain. The Department of Roads is a key partner in MCA-Nepal's project to maintain the quality of roads and help Government of Nepal address its long-term maintenance needs.

A snapshot of both projects is given in the infographics below.



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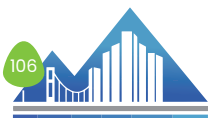
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