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SUSTAINABLE INFRASTRUCTURE:

Trends ,Challenges and Opportunities

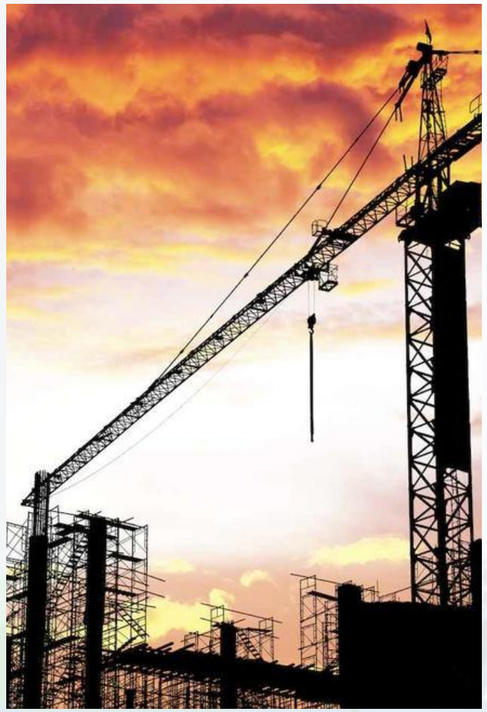
WITH A SPECIAL FOCUS ON ASIA

Dr. Bindu Lohani

12 September 2024, The Soaltee

Kathmandu

INFRASTRUCTURE DEVELOPMENT: ECONOMIC DEVELOPMENT



INFRASTRUCTURE PLAYS A CRITICAL ROLE IN ECONOMIC DEVELOPMENT

- **GDP (%) is a key indicator**
- **PER capita GDP (GDP/capita) is closely associated with the level of infrastructure availability.**
- **A determinant of Infrastructure quality and quantity is its “Investment”.**

HOWEVER,

- **What should be the investment in % of the GDP of a country is not so straightforward.**

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Question 1: HOW DOES THE CURRENT INFRASTRUCTURE STATUS LOOK LIKE IN ASIA?

INFRASTRUCTURE INVESTMENT IN COUNTRIES

- **Infrastructure investment in the Asian countries varies from 2% to close to 8 % of GDP**
- **Countries with more than 5% of GDP include countries like Vietnam, India**
- **China 7-8 %**
- **Countries with less than 3 % of GDP include Nepal and nine other countries.**
- **Global: 3.5 % GDP**

WHAT DOES THE INFRASTRUCTURE STOCK IN ASIA LOOK LIKE?

INFRASTRUCTURE SCORE (OUT OF 100)

- Bangladesh: 31.5
- India: 51.4
- Laos PDR: 34.2
- Nepal: 17
- Pakistan: 35.1
- Sri Lanka: 54.6
- Thailand: 62.2
- Vietnam: 56.2

Note: Capital expenditure and Gross Fixed Capital Formation (GFCF) are “good “ proxies for investments

QUALITY OF INFRASTRUCTURE IN ASIAN COUNTRIES

(WORLD ECONOMIC FORUM, RANKING BASED ON ROAD QUALITY)

INFRASTRUCTURE SCORE (OUT OF 100)

- SINGAPORE (#1 IN ASIA AND SECOND GLOBALLY)
- JAPAN (#5)
- TAIWAN (#11)
- SOUTH KOREA (#14)
- MALAYSIA (#20)
- CHINA (#39)
- INDIA (#51)
- THAILAND (#60)

MOST WELL DEVELOPED DIGITAL INFRASTRUCTURE

(BASED ON GLOBAL SURVEY)

JAPAN

CHINA

SOUTH KOREA

SINGAPORE

UNITED STATES

GERMANY

Source: U.S. News Best Countries rankings and Entrepreneurship subranking. worldhighways.com

TO ME, IN ASIA

- Singapore
- Hong Kong
- Taiwan
- Japan
- South Korea
- Dubai
- Malaysia

Have High-Quality Infrastructure

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INFRASTRUCTURE CONSTRAINTS AND CHALLENGES

ASIAN INFRASTRUCTURE STATUS ; Selected CHALLENGES

- LACK OF ACCESS TO ELECTRICITY AND QUALITY SERVICE (24/7) AND ENERGY TRANSITION
- Inadequate Water Security and Water Resilience
- Transportation conditions need improvement
- Environmental quality (low)
- Climate-friendly and resilient infrastructure is lacking/inadequate
- There is a significant gap in the quality and quantity of infrastructure as compared to developed countries.
- Significant Gap in financing , Technology and Knowledge

INFRASTRUCTURE STATUS : POLICY and GOVERNANCE CHALLENGES

- **INSTITUTIONAL WEAKNESS: REGULATORY PROVISIONS ARE WEAK AND UNDERDEVELOPED, LESS FAVORABLE TO MARKET TRANSACTION**
- **Lack of sound institutional structures for promoting private enterprise and competition**
- **Low levels of government accountability, transparency, and integrity**
- **Inadequate master planning and project preparation & design,**
- **Procurement issues needing reform , lack of capacity in site management and supervision,**
- **financial difficulties of owner and contractor: lead to delay and cost overrun in large projects**
- **Corruption and compromised quality in some developing countries**
- **Disasters/Climate change impacts, COVID-19 pandemic impacts**
- **Displacement and compensation issues**

Question 2 ; What are the INFRASTRUCTURE Financing NEEDS ?

(FINANCIAL NEEDS)

- **$ 11.6 TRILLION GLOBAL INFRASTRUCTURE INDUSTRY.**
  (GII SUMMIT, TOKYO, 2022)
- **$ 9-11 Trillion Annual Need**

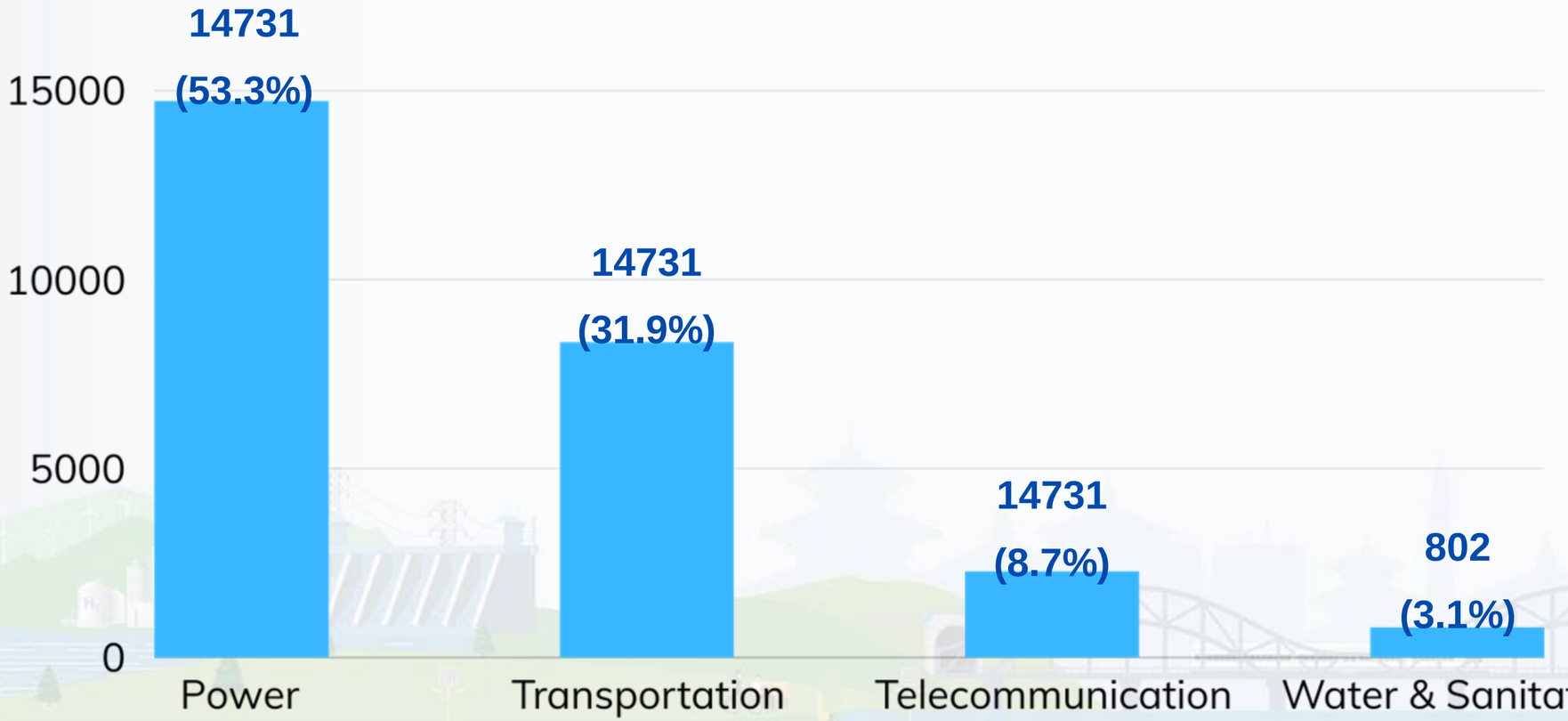
INFRASTRUCTURE INVESTMENT ESTIMATES IN ASIA (2016 -2030)

- **DEVELOPING ASIA WILL NEED TO INVEST $26 TRILLION OR $1.7 TRILLION PER YEAR WITH CLIMATE ADJUSTMENT**
- **Without climate change mitigation and adaptation costs, $22.6 trillion will be needed, or $1.5 trillion per year (baseline estimate)**
- **The region annually invests an estimated $881 billion in infrastructure**
- **Infrastructure investment gap (difference between investment needs and current investment level): 2.4% of projected GDP for the 5 years from 2016 to 2020 when incorporating climate**
- **climate mitigation and adaptation costs (with and without climate adjustment 3.4 Billion)**

Source: ADB, 2017

INFRASTRUCTURE INVESTMENT NEEDS BY SECTOR

Infrastructure Investment Need by Sector, 2016-2030 ($ billion in 2015 prices)

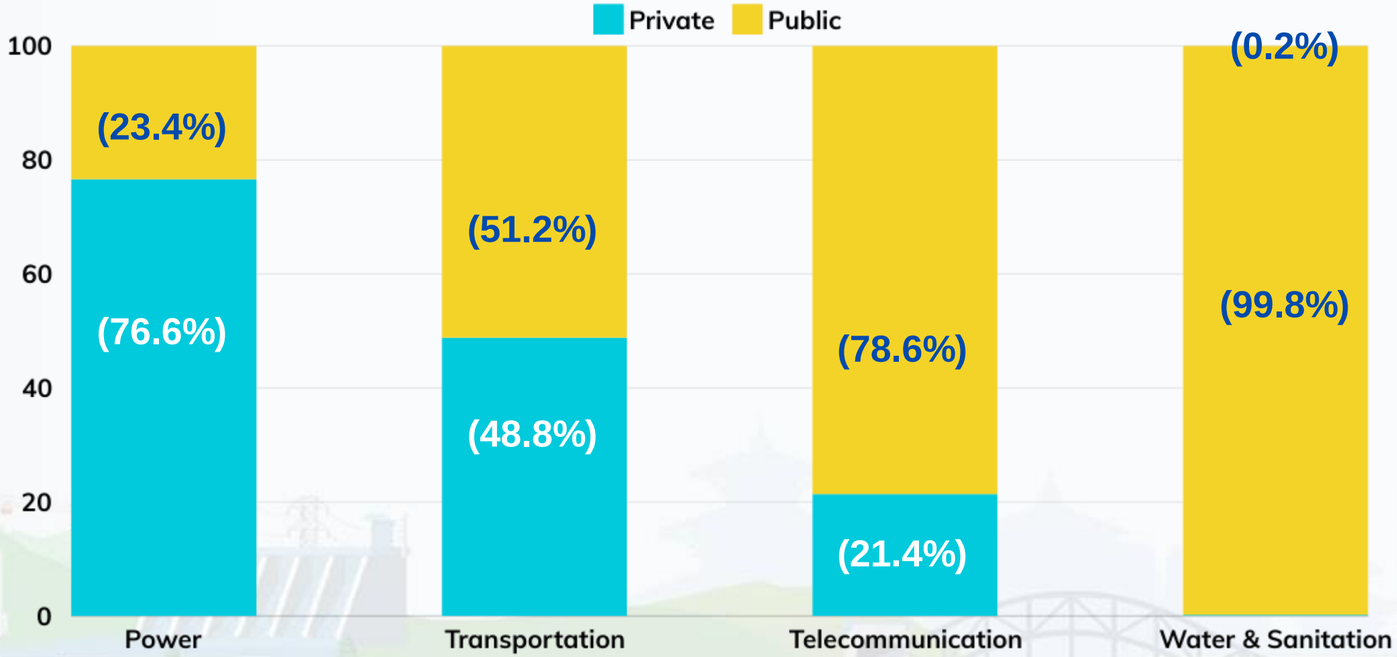


Note: Figures inside the brackets are percentage shares of the total.

Source: ADB estimates

PRIVATE /PUBLIC SECTOR SHARE

Public/Private Share of Infrastructure Investment, 2011



Telecom and Power more attractive to private finance

Source: *ADB estimates based on country sources and Private Publications in Infrastructure Database, World Bank; World Development Indicators, World Bank*

FINANCING NEEDS AND GAP FOR INFRASTRUCTURE IN NEPAL

SCENARIO 1: FOR 5 % ECONOMIC GROWTH

- The need is about US $ 29.72 Billion without climate proofing, or 8.14% of GDP, and US $ 31.62 Billion with Climate Change, or 8.66% of GDP
- Climate Proofing of Infrastructure is US$1.9 Billion

In Nepal, the Transport sector financing need is the highest, followed by the Energy Sector.

(In Asia, the Financing need for the Energy Sector is the highest followed by the Transport Sector)

. Private sector Financing is VERY SMALL.

Financial Needs for 2019-2030 based on Confederation of Nepalese Industries (CNI) & IIDS Study

Question 3 : What are the priorities and THINKING /Renewed thinking needed for SUSTAINABLE INFRASTRUCTURE DEVELOPMENT : Five Priority Focus Areas

1. The Economic and Equity
2. The Urban (Cities) and Regional connectivity /infrastructure issue
3. The Quality and Technology
4. The Environment and Climate Change (resilience) Dimension: Green Infrastructure
5. The Financing (public, private & other financial institutions)

1. THE ECONOMIC AND EQUITY DIMENSION

- **Beyond EIRR/FIRR (environment + natural disaster + climate)**
  - ***Estimating the life-cycle economic costs and benefits of infrastructure projects to ensure that resources are allocated efficiently, investment brings benefit to the country and improves the welfare of its citizens***
- **Inclusiveness/equity is important**
- **Rural investment can lead to higher farm and non-farm productivity, employment, and income opportunity (equitably)**

1.1 SDGS AND INFRASTRUCTURE

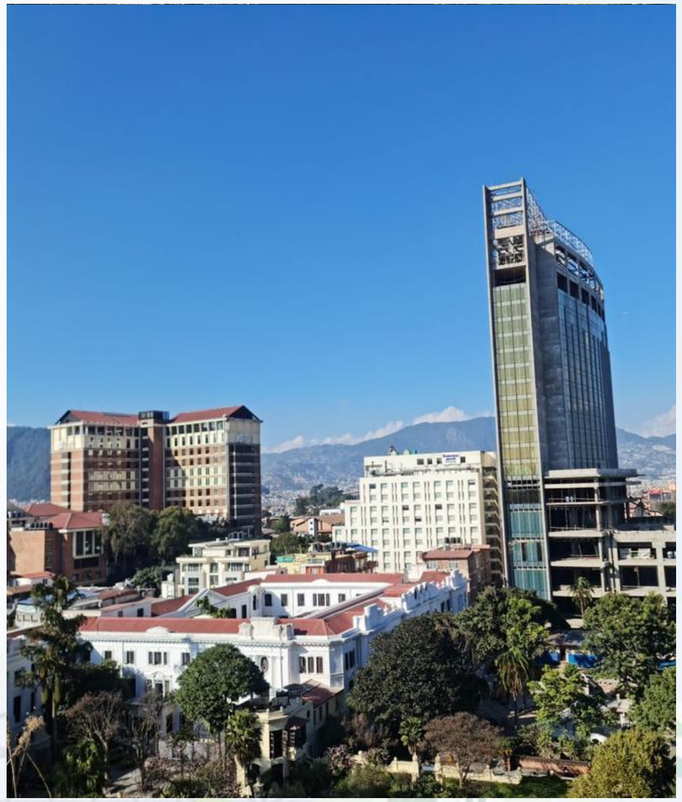
Consistent with SDGs goal

- Adopt integrated approach
- Integrated urban development
- Several other goals related to infrastructure in one way or the other
- Look at various nexus
  - *Goal 6-clean water*
  - *Goal 7- clean and affordable energy*
  - *Goal-9 - Innovation and Infrastructure*
  - *Goal 11- sustainable cities*

Source: unicef.org

2. URBAN (CITIES)

- By 2050, more than 70% of Asians will live in cities in Asia
- 60-70% of GDP will be in Asia
    - Urban poor are sizable in some countries *(Increasing urban poverty and growing inequality)*
        - Out of 1.6 billion urban people in Asia, more than 500 million are urban poor
- 50% of GHGs will be in Asia
- Cities need special infrastructure focus to make cities livable, smart, green, clean, and inclusive (also to address the urban poor)



2.1 REGIONAL INFRASTRUCTURE /REGIONAL CONNECTIVITY

- **Regional infrastructure: regional cooperation in *developing cross-border infrastructure is* critical for enhancing physical connectivity and sharing resources such as energy, capacity, knowledge, and services. This involves “hard infrastructure” and “soft infrastructure”**
- **Regional/Sub-regional program cooperation in Asia programs includes;**
  - **Greater Mekong Region (CAM, LAOS, THA, VIE, MYA, YUNNAN- CHINA)**
  - **ASEAN Region Cooperation**
  - **Central Asian Region (CARs)**
  - **South Asia Regional Cooperation**
  - **Pacific Region Cooperation**

3. QUALITY AND TECHNOLOGY (includes Digital) Dimension

- **Project quality and choice of technology are not often the best**
- **Best technology could be costly in the beginning – life cycle assessment is needed**
  - ***Examples: smart water technology, transportation and energy projects with advanced ICT and low carbon technologies***
- **Technology: Adopt, Adapt, and Leapfrog**

4. SUSTAINABILITY AND CLIMATE CHANGE (RESILIENCE) DIMENSION: GREEN INFRASTRUCTURE

- **Environmental and safeguards issues should be addressed (SUSTAINABILITY)**
- **Climate impacts and vulnerability assessment should be addressed and climate risk assessment should be made MANDATORY (Climate Change Mitigation and Adaptation)**
- **Natural disasters and Resilience issues should be addressed**
- **Impact of Glacier Melting (GLOF)**
- **Carbon neutrality (net zero commitment by 2050 should be supported)**

ECONOMIC IMPACTS OF CLIMATE CHANGE IS HIGH (2100)

- SE Asia: 6.7% of GDP
- East Asia: 5.3% of GDP
- South Asia: 8.8% of GDP
- Bhutan: 6.6% of GDP
- India: 8.7%of GDP
- Nepal: 9.9% of GDP
- Sri Lanka: 6.5% of

ECONOMICS LOSSES due to climate change ARE HIGH

Question 4 : What are the NEW AND EMERGING OPPORTUNITIES

- **Green Infrastructure, Digital Infrastructure, etc.**
- **New Policies, Programs & Regulations will be created to promote green investments**

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COP 21: PARIS AGREEMENT (12 December, 2015)

- 190 Countries participated
- 160 Intended Nationally Determined Contributions (INDCs)
- Diplomatic Success but Lots of follow-up Actions are needed
- 2 degree C target has not been achieved(aspiration to 1.5 degree C above pre-industrial

KEY ELEMENTS

- INDCs (Intended Nationally Determined, NDCS, contributions)
- Mitigation
- Adaptation
- Losses and Damages
- Finance ($100 Billion /year)
- Technology Development and Transfer
- Capacity Building

1. ENERGY/ENERGY TRANSITION

NEW POLICY FOCUS

- Energy efficiency
- Renewable energy
- Energy Mix
- Reducing fuel subsidy/fossil fuel usage
- Reducing some form of carbon pricing or tax and the Carbon market

Source: blogs.adb.org

Worldwide stock surpassed 2 million units in 2016. China, the US, and Europe account for 90% of all EVs sold worldwide. Projected 30 million by 2025 and 150 million in 2040

electric vehicles

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2. TRANSPORT

- **Need to transform the transport sector (public transport, EVs)**

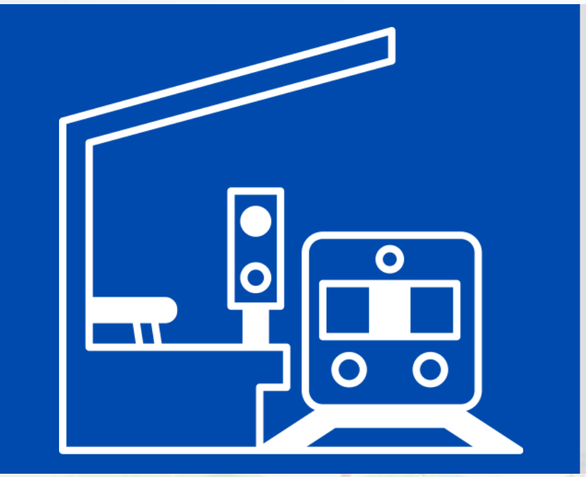
- **Metro projects ,EVs, Railways, Inland waters, Non motorized transport and integrated urban**

- **Need to transform the transport sector (public transport, EVs)**

ELECTRIC VEHICLES

- Worldwide stock surpassed 2 million units in 2016.
- China, the US, and Europe account for 90% of all EVs sold worldwide.
- Projected 30 million by 2025 and 150 million in 2040

New Policies and Programs Will Be Developed to Promote New Ways of Transport Investment



- Reduce motorization: increase public transport
- Bus and rapid transit
- Metro
- E-vehicles
- Intermodal connectivity (last mile connectivity)

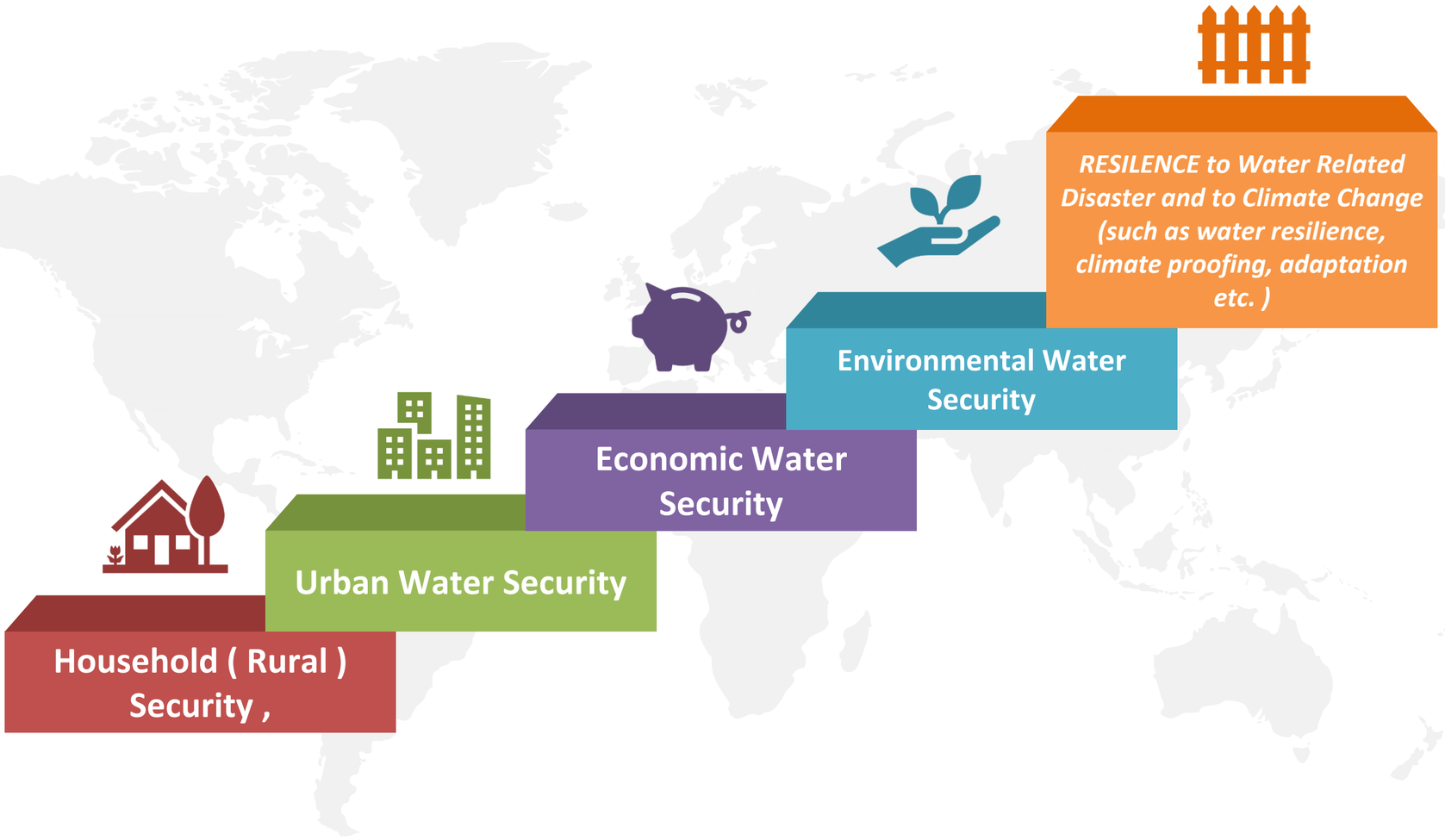
3. WATER SECURITY AND WATER RESILIENTRANSPORT

Challenges of Water Security and Water Resilience

- **WATER SECURITY**
  - **RUWS - are We Water Secured?**
- **WATER RESILIENT/RUWS**
  - **Are We Water Resilient?**

3. WATER SECURITY

Water Security needs to address five (5) dimensions :



3. WATER RESILIENT AND CLIMATE ADAPTATION

- **How can we main-streaming Water Resilience in Water programs and projects in the Asia-Pacific Region,**
- **Challenges of Climate Proofing, Adaptation, and Resilience in Water Development Projects**
- ***Investment in water projects will increase but with an additional focus on water security and Climate Impacts, Adaptation, and Resilience***

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4. URBANIZATION (CARBON NEUTRAL CITY)

Opportunities in Cities

- **NEW REQUIREMENTS AND OPPORTUNITIES FOR RETROFITTING THE CURRENT CITIES FROM CLIMATE IMPACT AND MAKING THEM RESILIENT**
- **DESIGNING CITIES WITH CARBON-NEUTRAL OBJECTIVES**

5. FOCUS ON DIGITAL TECHNOLOGY

- Adoption/adaptation of emerging digital technology (AI etc.) in Infrastructure and management
- Focus on the digital economy could help create “new GDP growth”
- The Digital Nepal framework provides a good reference

CIRCULAR ECONOMY: HOW TO TRANSITION

- New “Thinking Change ” and New Innovative Business
- Circular economy is not just “3R”, “ 4Rs “, It is rethinking, repair, remanufacture, refurbish

Question 5 : HOW CAN WE FINANCE : Modalities and Instruments

- Financing Gap in Asia is huge – about 5% of GDP
- Public Sector (Government) resources are not enough, mobilizing additional resources from the private sector, MFIs, and other Donors are needed
- Private sector resources are limited (Nepal)

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FINANCIAL INSTRUMENTS FOR ATTRACTING RESOURCES FOR INVESTMENT

- ***In addition to the usual instruments*** **like debt, MFI' & commercial bank loans, and equity modalities**
- **Selected few modalities that are becoming attractive for mobilizing additional private sector funds, such as:**
  - **Public Private Partnership (PPP)**
  - **Private Equity Infrastructure Fund**
  - **Institutional Investors and Pension fund**
  - **Thematic Bonds (like Green Fund)**
  - **Blended finance**

1. PUBLIC PRIVATE PARTNERSHIP (PPP)

VARIOUS MODALITIES SUCH AS:

- **Build-Operate-Transfer (BOT), Build- Operate-Own and Transfer (BOOT), Build-Lease-Transfer (BLT), Design-Build-Finance-Operate-Transfer (DBFOT), Operate-maintain-Transfer (OMT), Concessions, Full Divestiture/Privatization**
- **There are many good examples and there are also unsuccessful ones.**
- **Further efforts are needed to make PPP attractive, these include:**
  - **Addressing political risk**
  - **Policy Risk**
  - **Foreign currency risk (lack of a credible Swap market)**
  - **Exit procedures**

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2. INFRASTRUCTURE EQUITY FUND & Special Project Vehicle, SPV (A SIZABLE ONE)

- **THIS COULD BE SOLELY FROM PRIVATE SECTOR RESOURCES OR BY MOBILIZING RESOURCES FROM VARIOUS SOURCES LIKE THE PUBLIC SECTOR, BANKS, THE PRIVATE SECTOR, FINANCIAL INSTITUTIONS, AND EVEN FDI.**

3. Tapping Institutional Investors and Pension fund

4. DEBT CAPITAL MARKET (BONDS)

- **PROMOTING DEBT CAPITAL MARKET AND ISSUING LOCAL CURRENCY BONDS**
- **Issuing Thematic Bonds *(like Green Bonds)* and CAT Bonds should be looked into *(many countries have already done/doing*)**

5. BLENDED FINANCE

1.BLENDED FINANCE (TAPPING ALSO FUNDS LIKE GCF, AND OTHER CLIMATE FINANCES), ESPECIALLY FOR GREEN AND CLIMATE-FRIENDLY PROJECTS AND FOR MITIGATING THE COST OF CLIMATE IMPACTS

- **Blended financing for attracting private sector resources**
- **Blended concessional finance**
- **Combining concessional funds with the private sector, Development Finance Institute (DFIs), and commercial financing**

- **Blended Finance: Valuable Tool for climate-friendly, low-carbon, green infrastructure**

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5.1 Blended Finance: Valuable Tool for SDGs and Climate change agenda

BLENDED CONCESSIONAL FINANCE FOR PRIVATE-SECTOR PROJECTS IS ONE OF THE MOST VALUABLE TOOLS FOR:

1. Tapping donors and other development partners for financing development, especially for Sustainable Development Goals (SDGs) and climate change agenda
2. And, for tapping green funds like GCF, etc

We need to look at these modalities and instruments for resource mobilization for infrastructure development

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TO CONCLUDE

INFRASTRUCTURE WILL REMAIN AN IMPORTANT AGENDA FOR THIS CENTURY

BUT PRIORITIES AND THE WAY WE THINK, PLAN, BUILD,

AND FINANCE INFRASTRUCTURE WILL CHANGE!

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FIVE TRENDS IN INFRASTRUCTURE IN 2050 (PREDICTION)

1. INCREASED USE OF RENEWABLE ENERGY

(solar, wind, hydrogen etc. and will reduce dependence on fossil fuel)

2. GREATER EMPHASIS AND MANDATORY REQUIREMENT OF SUSTAINABILITY ,CLIMATE CHANGE AND RESILIENCE
3. SMART TECHNOLOGY THAT CAN ADJUST TO CHANGING DEMANDS AND CONDITIONS(GREATER USE OF DATA , ICT)
4. INCREASED USE OF ELECTRIC AND AUTONOMOUS VEHICLES AND THE WAY WE DESIGN TRANSPORTATION WILL CHANGE
5. BETTER INTEGRATED INFRASTRUCTURE ACROSS SECTORS SUCH AS ENERGY, TRANSPORTATION, WATER etc.

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