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Financing for Climate and Disaster Resilient Infrastructure: Role of Governance and Regulatory Systems, Innovative PPP structuring and Learning from the experience of Climate Finance

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1. Context

In the present global context, we are grappling with multiple economic, environmental and social challenges. Infrastructure is one such dimension that calls for immediate attention, as it is a crucial input to expand and sustain economic activity, ensure a decent quality of life through uninterrupted services and become a key lever to address core development challenges of vulnerability, poverty and inequality. In the present global context, we are confronted with two kinds of infrastructure related issues: retrofitting older and worn-out infrastructure, common in the developed North and building new infrastructure in the developing South. Additionally, we are grappling with massive infrastructure deficits in the developing South, ensuring that the new built infrastructure is resilient to physical shocks and stresses, and we are mindful of new classes of infrastructure potentially emerging due to climate change constraints.

Climate change, manifesting through multiple extreme weather events such as heavy rainfall, floods, cyclones, poses direct risk to infrastructure. While most of the economic loss from extreme weather phenomena stems from physical damage and/or loss of infrastructure, interruption to infrastructure services also leads to severe economic setbacks (*Rahiman, 2019*). For e.g. (some quantitative numbers to underscore the point made). Apart from infrastructure creation contributing to sustained economic activity, we are currently facing massive risk to existing infrastructure (losses and damages) and interruption in economic activities. These are huge numbers and cumulatively impact the development agenda, particularly in the ecologically fragile hot spots of the Global South.

Massive mobilisation and redirection of capital is required to address the infrastructure and the resilience deficit, crucial for driving global economic growth and the linked development agenda. Global Infrastructure Outlook () estimates that …….. Additionally, to put in place local infrastructure (like water, sanitation systems) crucial for sustaining economic and social life, we are confronted with significant additional financial needs. Global Infrastructure Outlook estimates additional financial needs for meeting water and electricity access goals. These are in the range of xxx as a % of GDP.

Studies exploring the finance-infrastructure-growth nexus demonstrate that infrastructure investments are sensitive to prevalent climate conditions and future variations (UNDP, 2011). Further, there exists a two-way relationship between climate change and investments on resilient infrastructures. On the one hand, natural disasters damage and disrupt infrastructure services -incurring economic costs of billions of dollars annually. On the other hand, investment decisions about the type of infrastructure made in the present impact the degree of GHG emissions and nations' preparedness against future natural disasters (IMF, 2021). The lack of attention to climate resilient infrastructure as evident in several

emerging economies, would mean additional public spending and reallocation of resources from productive capital to adaptation, due to the need for emergency and routine maintenance of non-resilient infrastructure over its lifespan. Retrofitting traditional technologies often requires more investments than ensuring climate resilient infrastructure from the on-set (IMF, 2021). Hence, challenges imposed by climate change mandate ramping up global annual infrastructure investment to transform towards climate resilient, net-zero emissions economies.

At this present juncture, we are at a critical point where two important dimensions on infrastructure finance co-exist. These dimensions are particularly relevant for the Low-& Middle-Income Countries (LMICs). In many such countries, *weak infrastructure governance* contributes to a low rate of return on investment, project delays, complex approval mechanisms, and political uncertainty, all of which inhibit investment in infrastructure. At the same time, less developed financial markets constrain its use to mobilise finance for resilient infrastructure. Secondly, challenges imposed by climate change is mandating a rapid transition to *low, zero or negative emission infrastructure*. In this context, mobilising finance for new asset classes will be increasingly challenging (competition in financial allocation). Challenges would magnify in the context of ensuring that the mandated transition, addressing physical and transition risk, should not undermine financial and macroeconomic stability and its ability to ensure delivery on development.

In several Low- & Middle-Income Countries (LMICs), mobilizing private infrastructure finance depends on faster rates of economic growth, leading to accelerated poverty reduction and income growth (Sirimaneetham & Temple, 2009; Shah & Batley, 2009). Private investors seek maximization of risk adjusted rate of return but, in poorer developing country contexts, the prevalence of investment climate constraints lead to lowering of potential returns on investment and increases risk for investors (Fiestas & Sinha, 2011).

Instability in the macroeconomic environment including socio-economic and political uncertainty deters private investments by increasing risk on investments and undermining asset value. For instance, volatility in real exchange rates and high inflation rates leads to challenges in access to credit (Bleaney, 1996; Fischer, 1993). In a time-series analysis of determinants of private investment in 18 African countries (from 1970-1996), monetary, fiscal and financial policy certainty were found to have significant impact on mobilizing private infrastructure investments (Mlambo & Oshikoya, 2001).

Costs imposed on investors through business regulation and licensing are often unnecessarily high; owing to inefficient administration, rent-seeking behavior of multiple embedded actors and poor incumbent institutional arrangements, especially in LMICs. Such institutional barriers (eg. labor and product market regulations) negatively impacts ease of doing business and hence, economic growth. However, quality of regulation through better institutions, can mitigate adverse impacts of regulation on the investment environment (Loayza et al., 2005; Djankov & McLiesh, 2005). Risks and uncertainties accruing to weak institutional and legal systems in LMICs include delays in enforcement of contracts and thus diminish long term infrastructure investment opportunities. There exists strong cross- country evidence that weak governance adversely affects economic growth, property rights, and effective

functioning of judiciary, leading to an unstable investment ecosystem for the private sector (Knack & Keefer, 1995; Rodrik et al., 2004). Whilst taxes are important to redistribute income and finance public infrastructure, evidence from transition economies point towards the highly contractionary nature of tax increases, particularly with respect to negative impacts on investment (Romer & Romer, 2010).

One the one hand weak regulatory and institutional frameworks hamper investments, while on the other, *less developed financial markets* constrain its use to mobilize finance for resilient infrastructure. There is strong empirical evidence that *high costs of capital deter private investments on infrastructure projects*. As developing nations often have more room for improvement in financial systems, the effect of financial market reforms on return on investment tend to be higher in comparison to developed nations (World Bank, 2004; Borlea et al., 2016). Major obstacles in financial markets that obstruct private infrastructure include high interest rates, lack of access to long term finance, collateral requirements of financial institutions and banks, and inadequate financial and credit information (Beck et al., 2006). Incentivising private sector investments on infrastructure requires availability of basic infrastructure services such as efficient transport networks, reliable electricity supply and modern telecommunication services. This availability of complementary infrastructure increases productivity and reduces costs, allowing for business expansion. Studies conducted in Uganda, China, Bangladesh, Pakistan and Ethiopia identify unreliable and inadequate infrastructure as the most crucial factor deterring private investment (Reinikka & Svensson, 2002; Dollar et al., 2005).

Adaptive capacity and resilience of infrastructures especially in resource limited developing countries are determined by access to knowledge, technology transfer and finance (Neufeldt et al., 2018). *Innovations in governance and regulations can play a critical role in de-risking investments in resilient infrastructure*. In nations that are particularly susceptible to disasters, innovative investment approaches have been used to build green and resilient infrastructure. For instance in the United States, Florida and California have used innovative governance models and financial interventions in the form of: green/climate bonds, tax increment financing, public private partnerships, collaborative revenue bonds, event-based insurance, regional resilience trust funds, carbon offset markets, mitigation banking, transfer of development rights, impact development fees, non-ad valorem special assessments, local infrastructure sales tax (O'Connell & Connors, 2019). Globally, the public-private partnership (PPP) model is also vastly used. For instance, the PPP for flood mitigation and city development in Philippines' New Clark City is regarded as a role model PPP that illustrates how PPP may aid in meeting infrastructure needs (ADB, 2019). Private financial sector, it is recognised, must play a substantial role in mobilizing capital and work with public institutions in order to generate investments for infrastructure. Equity funds are also an effective instrument. The Climate Resilience and Adaptation Finance and Technology Transfer Facility (CRAFT), which was proposed as a USD 500 million private equity fund to invest in businesses providing climate resilience solutions for developing countries, is an example of an equity fund created to invest in products and services for climate resilience. According to OECD (2012) there are a range of financing options that aid in expanding developing nations' access to capital to invest in infrastructure and allied sectors . These include blending commercial grants and repayable financing, extending the range of potential borrowers via microfinance, alleviating affordability constraints with output-based aid, mitigating risks with guarantees and insurance, creating grouped

financing vehicles to increase access to finance, increasing direct lending to sub-sovereigns, strengthening the balance sheet via equity injections, increasing transparency in the sector via credit ratings, developing "bankable" projects through project preparation facilities and developing local equity markets. In order to expand the market, supportive government policies, such as tax-exempt green infrastructure bonds are also an effective means to raise capital and is already in use in some OECD countries. In developed nations, green bonds are an important instrument for expanding capital availability in the context of low-carbon climate resilient (LCR) infrastructure.

Having laid out some basic facts highlighting the need for massively upscaling investments in infrastructure and its resilience, the importance of governance and linked institutional framework as a key driver of increased infrastructure investment, some examples where innovative governance and linked institutional reforms have improved financial allocation for infrastructure sector; this position paper will delve deeper into three specific issues. These issues revolve around enhancing the flow of capital to the infrastructure sector, with specific emphasis on private capital.

- Learnings from governance, regulatory and institutional reforms in the power sector, focusing on mobilising capital for the sector and specifically, in the context of expanding capital availability for the development of the renewable energy sector
- Learnings from various Public-Private-Partnership (PPP) models across a range of infrastructure sectors, specifically focusing on governance linked interventions
- Learnings from literature and emerging evidence around the issue of scaling up climate finance and drawing lessons for enhanced capital allocation for the infrastructure sector

2. Scale of the challenge

Infrastructure contributes more than half of the global carbon emissions and is intimately linked to economic growth. Current climate variability is impacting global infrastructure systems negatively. The present value of losses for the global physical infrastructure sector is at USD 143 trillion, is estimated at USD 4.2 trillion by 2100 under a 2℃ global warming scenario. Under a 6℃ scenario, this estimate rises to USD 13.8 trillion (Dodman et al., 2022). Physical infrastructure is generally costly to repair and has significant health and human well -being impacts. Specifically for urban settlements in LMICs, infrastructure risks are of particular concern owing to low levels of resources and adaptive capacity across economically important sectors. Moreover, global climate finance is heavily directed towards mitigation options (>90 percent on an average between 2017-20), despite the significant economic and financial stability impacts owing to physical infrastructure risks due to climate change. To close the investment gap with respect to deployment of mitigation options, global investments need to increase by a factor of 3-6. Closing this investment gap is even more challenging for LMICs, where the investment flows need to increase by a factor of 4-8 (Kreibiehl et al., 2022). Although adaptation finance needs are rising rapidly, current efforts are insufficient in narrowing this gap specifically in developing country contexts (Neufeldt et al., 2021). According to estimates, the global costs of adaptation by 2030 ranges between USD 140-300 billion, while the actual public finance flows in 2019-20 were recorded as merely USD 46 billion (Kreibiehl et al., 2022). The annual economic losses and well-being losses owing to

climate disasters account to USD 300 billion and USD 520 billion respectively (LMICs being the worst hit) (Hallegatte et al., 2017).

In the context of contemporary twin *challenges of achieving net zero emissions while ensuring economic growth,* sustained investment in infrastructure will play a vital role. There exist gaps in financing infrastructure for long-term sustainability. Global investment needs for resilient infrastructure from 2015-2030 amount to USD 90 trillion (Qureshi, 2015). At current rates, the gap between annual projected infrastructure investments and the amount required to meet global demand is estimated to inflate to about USD 15 trillion by 2040 (World Economic Forum, 2019). Bulk of this financing gap exists among developing countries, specifically in middle-income economies- indicative of their rapid urbanization, growth needs and significant infrastructure backlogs. A large chunk of infrastructure needs i.e., around half of the required investment, accrues to the power sector (Qureshi, 2015). Recent studies and policy debates have pointed out that demand for resilient infrastructure cannot be met by public funds alone. Attracting private -sector investment is crucial to closing the global infrastructure investment gaps. Although the public sector is a major investor in infrastructure provisioning, it also plays a significant role in leveraging private capital through governance, institutional and regulatory frameworks that enables crowding-in of private investment and ensures stability in economic demand.

Given the scale of the challenge, mobilizing private investments at scale and to develop resilient infrastructure will depend on multiple enabling conditions at the country level and through supporting international financial frameworks.

Even if we examine climate investments as a proxy for infrastructure investments, to gauge the scale and nature of capital flows, we observe severe disconnect between capital flows and sustainability of infrastructure demand. This gap is crucial because it is linked to ensuring adequate returns on invested capital and largely explains lack of private capital flows into infrastructure. For example, the quantum of climate investments (private and public) has steadily increased in the past decade, but the flows largely showed plateaued trends in the last few years. Out of the total climate finance of USD 632 billion in 2019-20, mitigation finance accounted for 90.1 percent at about USD 571 billion. Although annual adaptation finance increased by approximately 53 percent in 2019-20 compared to previous year, almost all the USD 46 billion of adaptation finance was mobilized by the public sector. The private sector majorly invests on mitigation options of which RE represented 57 percent (USD 324 billion) of the total mitigation finance in 2019-20 (Naran et al., 2021). As the global RE industry is becoming increasingly consolidated and financialised, insights from several countries (especially LMICs) suggest that despite the environmentally beneficial outcomes of utility scale RE projects, the mechanisms and institutions that finance and procure these often fail to account for wellbeing of individuals and communities dwelling in the national and local vicinity. This often leads to contestations and resistance by local communities, trade unions and Indigenous people (Marais et al., 2018; Dunlap, 2018). Other examples from emerging economies, such as South Africa, suggest that the role of governance (processes, institutions, mechanisms, and regulation) is central in ensuring vibrant local economic development along with long-term stable revenue stream for investors in LCR projects. In South Africa, the government's ambitious LCR infrastructure development is observed to be focussed on strategically important goals such as local job creation and promoting black ownership. Although important, this

does not automatically result in a durable and employment generating industry. (Swilling et al., 2022). It is interesting to observe that the recently launched Just Transitions Framework in South Africa elucidate a set of rules imposed on the market by a development-oriented government to create conditions for local (including technological) capacity building and strengthening of local value chains to drive investments in LCR infrastructures.

3. Framing this position paper: Three pathways

This position paper, as highlighted in Section I, aims to do two things: firstly, understand and extract learnings from contexts like global experience with energy sector reforms, PPP structuring and climate finance and secondly, draw lessons from such experiences in the context of financing disaster and climate resilient infrastructure. The core inherent proposition that we are chasing is that if we layout clear 'rules' and improve institutional frameworks around global finance, we will be able to crowd in private investment into infrastructure development or public finance would be able to leverage, significantly, private capital for scaling up infrastructure deployment. This position paper is, further, organised around three broad analytical inquires as an intellectual scaffolding to draw lessons for financing disaster and climate resilient infrastructure (DCRI):

- Examine the role of governance and various regulatory regimes/instrument as a key driver of resilient infrastructure
- Assess existing PPP experiences (specific sectors and geographies) to articulate certain principles as lessons for scaling financing for DCRI
- Drawing lessons from climate finance to understand the mechanics of scaling and de-risking investments for infrastructure sector

3.a Examining the role of governance and various regulatory regimes/instruments as a key driver of resilient infrastructure: drawing from the experience of energy sector reforms

Global trends suggest that most of the private finance is currently skewed towards climate mitigation, specifically towards Renewable Energy (RE) – led energy transitions. With a total of USD 324 billion, the RE sector represented 57 percent of the total mitigation finance in 2019-20 (Buchner et al., 2021). There is, definitely, significant learning in terms of institutional and program design, use of innovative economic and regulatory instruments, and governance reforms in the RE landscape; particularly in the context of making the sector attractive for investors. We therefore examine key regional and global trends in energy transitions, particularly their evolution and assess governance and regulatory innovation that has helped in crowding in massive private capital into the sector.

Global trends in energy sector investments

Globally electricity supply, led by RE, constitutes the largest proportion (70 percent in 2021) of the overall supply side investment (Figure 1). In the face of rapid cost reductions and technology

development, one USD spent on Solar Photovoltaic (SPV) and wind energy deployment produces four times more electricity than a decade earlier. RE investments have been observed to proliferate in markets featuring well established supply chains. In such markets lower costs are supported by regulatory frameworks that facilitate transparency in cash flows and clear revenue streams. Growing demand from the industry to meet sustainability targets have also contributed significantly to increased flow of investments in RE deployment.

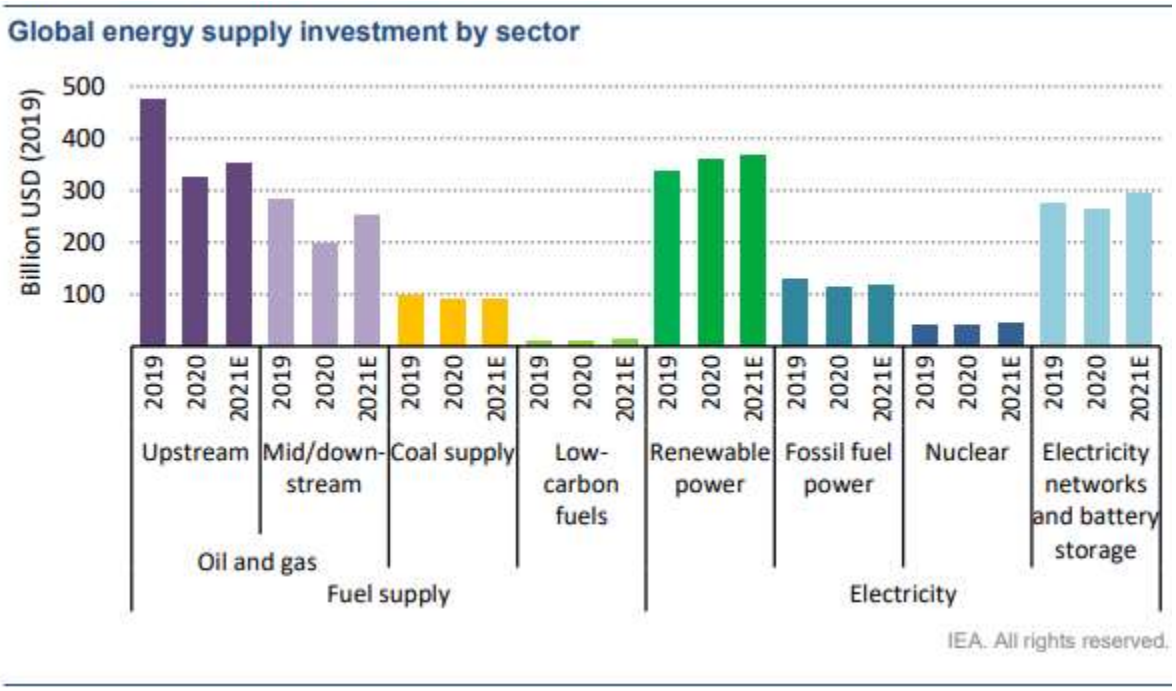

Figure1 : Global energy supply (Fuel and Electricity) investment by sector, 2019-2021
Source: International Energy Agency (2021)

Policy stability is identified as a vital driver for energy investments (especially in the context of the private sector) in several economies. Stimulus spending and dedicated policies have spurred investments across a range of new energy technologies. Economies with wider fiscal space can borrow at lower rates and support the process of energy transition underway. However, several developing nations lack the fiscal space to pursue expansive strategies and are already showing early signs of inflation and thus poses an important challenge of making capital available at reasonable interest rates (International Energy Agency, 2021). Although clean energy investments have increased moderately over the last few years, it remains far short of what is desirable in alignment with the Paris goals (Figure 2). In advanced economies as well as in China, availability of finance for the power sector is not a major constraint. These economies feature a strong competitive market for high quality clean energy infrastructure investments against a backdrop of low lending rates and regulatory pressure to increase adoption of clean energy. However, flow of capital into RE projects is often intermittent owing to time limited subsidies and other administrative and permitting constraints. Unlocking private investments and scaling up these investments for mature technologies including Wind and SPVs hinges on clarity and certainty of investment frameworks.

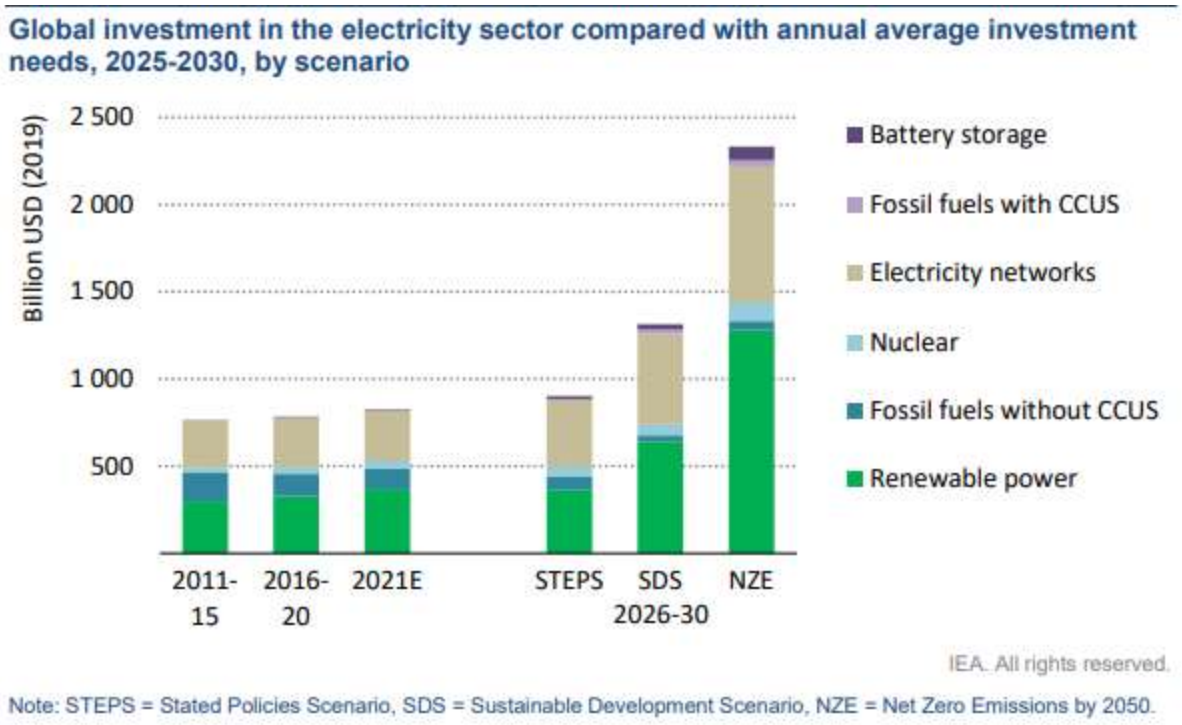

Figure 2: Global investments in the electricity sector compared to annual average investment needs (2025-30) by scenario.
Source: International Energy Agency, 2021

On the other hand, the signals from Emerging Market and Developing Economies (EMDEs) are a cause of concern. The major concern, now, are high costs of capital and shrinking fiscal space due to primacy to development priorities and these have, cumulatively, impacted investments into RE-led electricity sector (International Energy Agency, 2021).

Governance linked (including regulatory interventions) examples from experiences of energy transitions in specific regional contexts

1. European Union (EU)

The EU committed to a reduction of its Greenhouse Gas (GHG) emissions by 40 percent by 2030 in comparison to 1990 levels under its Nationally Determined Contributions (NDC) as part of the Paris Agreement. This has now been revised to 55 percent by 2030 and by 2050, the EU aims to achieve and operationalize a net zero economy mandating energy transitions towards renewables and cleaner sources. In this regard, EU climate policies are specifically strengthened through complementary RE and energy efficiency policies. Transition towards a carbon neutral economic bloc would require massive investments on infrastructure while simultaneously allowing for economic growth and skill development opportunities. According to the European Commission, clean energy transitions in the EU requires an additional investment of 177 billion Euros per annum post 2021. Hence, if investments are not

channelized towards LCR infrastructures now, there is a risk of stranded assets and locked -in long lived high carbon infrastructure soon (Erbach, 2017).

The EU hence, has employed a basket of regulatory and policy instruments to incentivise large scale investments in clean energy. These are highlighted below:

- EU policies focus on formulating **well-designed markets** through **pricing mechanisms** to facilitate low cost of capital and high returns on investments. The EU **Emissions Trading System (ETS),** which is the bloc's **carbon market, has been significantly redesigned to facilitate appropriate signalling for private investment into LCR** energy infrastructure. Specifically, the EU ETS has designed a mechanism to efficiently balance supply and demand of carbon allowances which was not providing sufficient signalling for investment decisions. Revenues from the ETS are planned to be directed towards **compensating transition costs** to vulnerable and energy poor households in the EU.

- Realizing the importance of a **well -functioning electricity market** in incentivising investments in energy efficient infrastructure, the European Commission proposed a new market design to **open the electricity market to flexible demand, storage, and flexibility in generation in response to market signals**. This form of market design is fit for a growing volume of variable RE and protects consumers by allowing active participation in market processes. In the early stages of RE technologies, schemes such as **feed-in tariffs (FiT)** were introduced to secure revenue streams for investors. However, the commission recommended phasing out of the FiT once the technology became mature (for example, Wind and SPV).

- Demand for clean energy investments was ramped up through regulatory instruments such as the **EU eco design rules** that mandates only energy -efficient devices can enter the market. **Transport sector regulations mandate blending fuels**, hence creating a market for biofuels and incentivising investment in this segment. The key here has been to stabilise long term demand for low carbon infrastructure investments.

- **Mandatory building codes, design standards, appropriate regulations, construction, and monitoring norms** have successfully integrated resilience and climate concerns into new infrastructure development. For instance, Sweden introduced enhanced standards for road drainage in 2008 to cope with increasing rainfall. Finland also incorporated a service reliability component to infrastructure development to ensure resilience across the project lifecycle. In 2013, Finland passed the **Electricity Market Act**, which **mandates power distribution networks to be designed, constructed, and maintained in line with climate standards** by 2028, hence minimizing electricity disruptions due to snow or storms (citation).

- Information provisioning (for example, **mandatory energy efficiency labelling** on appliances) also enables investors to make rational decisions. **Removal of administrative and procedural barriers** also played a crucial role in facilitating energy transitions in the EU.

- **Taxation** on negative externalities and **subsidies** for positive externalities as well as incentives for **enabling innovation** are in place in the EU. Additionally, measures to cater to market failures include provisions such as **splitting incentives** between owners of buildings who invest in low carbon infrastructure and the tenants who benefit by it through lower energy bills.

- Measures to reduce risks in the financial sector keep the cost of capital for clean energy investments low. **Assessing climate risk and subsequent disclosures** along various phases of project development (for example, tender submission) allow mitigating risks to infrastructures and avoid investments in probable stranded assets. The European Central Bank (ECB) directs **European Banks to disclose climate and environmental risks**. It supervises and publishes regular assessment reports of the progress of European banks towards meeting supervisory expectations on climate risk disclosure. The ECB sends individual feedback to the banks explaining their major shortcomings and expects them to take decisive action. This would help banks prepare for new regulatory requirements such as the **European Banking Authority's binding standards** on Pillar 3 - **disclosures of environmental, social and governance risks**

- A variety of programs and instruments are established in the EU that fund clean energy deployment. Public sector plays a crucial role in catalysing private climate finance, especially in the RE sector that operates in illiquid markets and has long gestation periods (Georgieva & Adrian, 2022). The **European Fund for Strategic Investment (EFSI)** is the broadest **financial instrument** for encouraging investments in, for example, RE, energy efficiency, smart metering. The **European Energy Programme for Recovery** offered approximately 4 billion Euros for key energy projects running in the EU from 2009 to 2019, while the **Connecting Europe Facility** has a budget of 5.4 billion Euros for energy-related projects, and can leverage other funds using financial instruments, such as **project bonds**. Funding is also available through the **European structural funds**: the **European Regional Development Fund** and the **Cohesion Fund** invested over 21 billion Euros in energy efficiency in public and residential buildings and in enterprises, with a focus on SMEs, and in wind, solar, biomass and other renewable-based power generation in the 2014-2020 programming period (Erbach, 2017).

2. South Africa (SA)

Energy sector in South Africa is still influenced by the nation's apartheid history and by post-apartheid social, economic, and political factors (Baker et al., 2014). The high endowment of coal led to a resource driven, energy intensive economic growth regime, wherein development was pinned on the national energy sector and allied industries. This form of coal-led economic development and redistribution has been supported by SA's industrial policy on mining and minerals and government support through direct and indirect subsidies (Burton et al., 2018). The availability of coal reserves has also captured the interest of international and national investors (Baker et al., 2014). With international consensus on the need for low carbon development and coal investments becoming increasingly uneconomical, the international investment community started de-merging or divesting from coal mining businesses and selling assets to local actors. Some of the large mining companies have capped new investments in coal mining in SA (Hanto et al., 2022).

SA's National Development Plan (2012), Integrated Energy Plan (2003) and the National Climate Response White Paper (2011) laid the foundation of the nation's response to climate change through more equitable and less carbon intensive, sustainable economic growth. However, the RE sector in SA has faced strong opposition as coal is perceived as key to promoting socio-economic development, specifically in highly concentrated coal mining regions. The national discourse around RE is heavily focused on job losses and risks to coal dependent municipalities, given that there is massive employment throughout the value chain of coal. However, with anticipated shift in SA's energy landscape, the transition towards RE is designed to ensure energy security, new industrial development and local socio-economic benefits while reducing GHG emissions. Two major regulatory milestones that facilitated RE infrastructure development in SA while balancing the goals of economic development and energy security are discussed here.

Renewable Energy Independent Power Procurement Programme (REIPPP)

The Renewable Energy Independent Power Procurement Programme (REIPPP) launched in 2011, is an example of a locally developed and operated program for battling climate change through increasing RE capacity. The national target of achieving 7000 MW of RE by 2020 and 17800 MW by 2030 is sought to be operationalized through a public-private cooperation model, which has been dubbed to be the most successful in the last two decades in South Africa (SA). Through REIPPP, amendments were made to SA's Electricity Generation Act to allow introduction of Independent Power Producers (IPPs) through auction mechanisms for large scale RE projects . Successful projects now sell power to Eskom, i.e. the state-owned monopoly electricity utility, which otherwise controlled generation, transmission and distribution (Baker et al., 2015). This public procurement programme not only mandates development of LCR electricity infrastructure through private participation but was designed to ensure simultaneous socio-economic growth and energy security (Fullerton, 2019). By March 2019, REIPPP had committed USD 14.8 in private investments and procured 6.4 GW generation capacity from 92 utility scale IPPs. There have been five bidding rounds so far (IPP office, Republic of South Africa, 2019). The auction design under REIPPP mandates private companies to submit competitive bids below a set ceiling price at which they would sell electricity to Eskom. Additionally, IPPs also need to demonstrate how the project would meet certain socio-economic development goals including- participation of black-owned companies in equity shareholding and structuring of local communities within 50 km radius of the project into the equity with a minimum shareholding of 2.5 percent. This equity is managed by a legally established trust and is responsible for managing a 1.5 percent dividend of projected revenue (Baker & Wlokas, 2015). The bids are evaluated by allocating 70 percent weightage to tariffs and 30 percent on socio-economic outcomes. 38,701 jobs have been created, many of which have gone to young people and women from neighbourhoods close to the IPP plants. Additionally, there have been positive impacts on education, health, and local economic activity.

The REIPPP programme is exemplary in its top-down approach to enforce partial project ownership and local economic development through competitive bidding/ auction mechanisms for utility scale RE infrastructure projects. Table 1 summarises the seven economic development requirements that bidders are obliged to focus on under this auction scheme. Projects are then evaluated based on the REIPPP

scorecard wherein four of these criteria (job creation, ED, SED, and ownership) score the highest if implemented within 50 km radius of the project.

Table1: Obligatory economic development criteria for RE project developers under REIPPP

	Economic Development Elements	Minimum Threshold	Maximum Target	Description
1	Job creation – SA citizens	Various indicators		Number of jobs help by local citizens
	Lob creation (local area)	12% of RSA employees	20% of RSA employees	
2	Local content	DIffers by technology		This refers to the capital costs and costs of services procured for construction minus the finance charges, land and mobilisation fees of the contractor (DoE, 2011b)
3	Ownership (overall black ownership requirement)*	12% of project shareholding	30% of project shareholding	The percentage of company ownershio measured through shares and other instruments that provide the holder with economic benefits such as dividends or interest payments (DTI, 2004)
	Ownership (community ownership requirement)	2.5% of project shareholding	5% of project shareholding	
4	Management control	0	40%	The effective control of a company with reference to 'top management' (DoE, 2011b)
5	Preferential procurement	Various indicators		The procurement of goods and services from suppliers that are BBBEE compliant.
6	Enterprise development (ED)	0	0.6% of project revenue	Supporting the development and sustainability of black-owned businesses.
7	Socio-economic development (SED)	1% of project revenue	1.5% of project revenue	Financial contributions to socio-economic development initiatives that promote access to the economy by black people.

Source: (Wlokas, 2015)

Despite gaining international recognition with an unprecedented take off in 2011, and facilitating involvement of several large RE developers, technology suppliers and EPC companies, REIPPP stalled between 2015-18. Political opposition and refusal of Eskom to sign PPAs under the fourth bidding round was a major stumbling block. The state utility's opposition gained traction and was supported by some factions of government, state owned businesses and trade unions protesting the 'capitalist capture of RE'. This contestation was a result of the just transitions debate, which argued that RE would undermine coal industry jobs (Cloete, 2018). This form of political, regulatory and counterparty risk is associated with failures of the procurement program to adequately benefit and include local communities in the vicinity of projects in SA. Lack of adequate planning capacity of provincial and municipal governments in rural areas, featuring high rates of unemployment and poverty has reinforced the control of powerful stakeholders over vulnerable and marginalized communities in the project vicinity (Nkoana, 2018).

Just transition framework (JTF)

SA reached a landmark with the adoption of the JTF by the presidential cabinet on August 31st, 2022. This framework was coordinated and overseen by the Presidential Climate Commission (PCC), an independent statutory body approved by the cabinet in 2020. The JTF for SA reveals strong emphasis on measures to enable transformation of socio-economic outcomes that shape the energy transitions in the nation. Major policy focal areas while mobilizing finance towards RE infrastructure include (Winkler et al., 2020):

- workforce reskilling and job absorption
- livelihood creation and social protection
- diversification of coal dependent regional economies
- incentivizing new green sectors
- devising labour and social security plans accounting for decommissioning of aging coal fired power plants

With respect to these developmental goals the PCC has recommended several interconnected strategies to mobilize domestic as well as international finance towards just energy transitions.

Financing a just transition in South Africa

- Reviewing existing mechanisms, such as taxes and subsidies, and determining whether they are "fit for purpose" or require adjustments to support a just transition e.g., piggybacking on the carbon tax or developing more avenues for own-source revenues for cities or municipalities
- Revisiting whether and how public resources have been effective in supporting improved service provisioning and in closing the inequality gap
- Creating a business case for just transition projects, with a particular focus on identifying financing mechanisms for infant industries
- Improving the efficiency of public spending, including to just transition projects
- Gradually eliminating perverse and/or regressive subsidies that do not support a just transition
- Applying economic instruments to support a just transition, such as performance-based grants, progressive subsidies, tax benefits, tax rebates, or incentive schemes
- Integrating the just transition framework into the national budget and reorienting state spending in support of a just equitable transition
- Integrating climate-related risks and the just transition imperative into all investment decisions
- Employing a common taxonomy for tracking just transition financial flows, aligned with National Treasury's Green Finance Taxonomy (National Treasury 2022), and disclosing these flows in a manner that supports transparency and optimal policy and economic decisions
- Utilizing green and other thematic bonds to mobilize capital for climate and transition projects, enabling access to large pools of institutional capital
- Expanding the use of blended finance to catalyze new investment opportunities for the just transition, supporting private investor participation
- Encouraging public-private partnerships to deliver capital-intensive infrastructure projects that support a just transition

Source: (PCC, 2022)

3. India

The subsidy-quality trap is a major feature of India's electricity distribution sector. Perpetual low returns on investment and inadequate revenues result from price distorting subsidies and regulated prices that do not reflect prudent costs of infrastructure provisioning. Moreover, widespread pilferage and non-payment of dues further exacerbates this challenge. In 2019, distribution utilities collected revenue that accounted for only 77 percent of the units served to consumers. For several cases the transmission and commercial losses were as high as 40 percent (Khanna & Rowe, 2022). This revenue gap reflects the chronic challenges of non-payment of bills, lack of capacity to bill consumers and poor state of grid infrastructure. Recent studies have highlighted that heavily subsidized retail prices are at the root of dysfunctional power distribution systems in settings like India (Burgess et al., 2020; McRae, 2015). Thus, policy prescriptions to ensure electricity provisioning at fair and equitable (reflecting actual cost of

provisioning) tariffs would eliminate price distortions, increase welfare, and improve financing of electricity utilities. On these lines the recent, Electricity Amendment Bill 2022 in India, has suggested several measures to revamp the electricity infrastructure through empowering regulatory commissions, national and state Load Dispatch Centers and incentivizing private sector actors to invest in distribution infrastructure.

India's transformative vision for the electricity infrastructure is evident in its commitment to achieve 175 GW of RE installed capacity by 2022 (MNRE, 2021). The technological features of RE systems are quite different from the conventional energy systems. Being highly capital intensive accompanied by zero fuel costs, the cost elements of RE are significantly distinct from conventional power (Hirth & Steckel, 2016). In line with the Government's 2022 RE targets, an **investment requirement of $189 billion** is estimated (CPI, 2016). Since the launch of the Jawaharlal Nehru National Solar Mission (JNNSM) in 2009-10, there has been a shift from Centre/ State supported incentive mechanisms for RE investments, to a more competitive, market-based incentive regime. Three most important regulatory interventions that have had bearing on financing the energy transition through private-led investmentinclude - **Accelerated Depreciation (AD); Generation- Based Incentives (GBI) and Viability Gap Funding (VGF)**.

- The AD (a form of tax-based incentive) offers a tax relaxation of 40 percent for renewable energy assets under the Union Budget 2016-17. Until 31st March 2017 the AD was set at 80 percent, but as the RE market became more competitive and financially viable, the rates were reduced to 40 percent (IEA, 2021). This is one of the mainstream **fiscal interventions** to promote investments in RE infrastructure.
- GBIs were introduced with the aim to mobilize independent power producers (IPPs) to generate electricity, by incentivizing per KWh of grid interactive RE generation, rather than just setting up of generating plants (Chaudhary et al., 2014). These incentives were in sync with the **feed-in-tariffs** offered by state utilities to incentivise RE generation. However, as the RE achieved grid parity with thermal power, these incentives were withdrawn while giving way to large utility scale projects through auction mechanisms.
- VGF is an innovative incentive to finance economically justifiable RE projects in case they are not commercially viable. VGF has been largely used by Solar Energy Corporation of India (SECI) to promote private investments in solar energy generation. As per recent statistics, around 785 MW of solar energy tenders have received VGF incentives (Sarangi, 2018).
- A gamut of policy options including **Renewable Purchase Obligations (RPO), Net-metering, maximum and minimum tariffs** set by state regulators and **Renewable Energy Certificates (REC)** are deployed by the Government of India to extend demand for RE, hence ensuring adequate and timely returns on investments.

Additionally, some of the major institutional mechanisms to drive energy transitions through provisioning of alternative funding avenues are discussed hereafter.

- **National Clean Energy and Environment Fund** (NCEEF): The mandate of this fund is to support R&D and entrepreneurship in clean energy technologies, by **mobilizing funds through a coal cess** (Clean Environment Cess) equivalent to INR 400/ ton. The Clean Environment Cess is operational since 2011-12 and is partly used by Indian Renewable Energy Development Agency (IREDA) to lend to banks at a rate of 2 percent interest for financing RE projects at concessional rates (not exceeding 5 percent interest rates). As per 2017-18 data, approximately INR 53, 410 million has been allocated to the Ministry of New and Renewable Energy (MNRE) to support RE transitions.
  In the present context, this fund is being used for purposes other than clean energy and discussions are underway to address this concern. Nevertheless, during the initial phases of its conceptualisation, this fund was useful in creating a viable market for RE deployment.
- **Priority Sector Lending & Soft loans** - Recognizing the need for mobilizing private capital for RE, this sector has been categorized as a priority sector by the Reserve Bank of India (RBI) in April 2015, with a loan ceiling of INR 15 crore per borrower. Although priority lending can improve the ease of doing business in the RE sector, yet a major flaw with this initiative is the clubbing of RE within the umbrella of 'energy'. This results in a large chunk of capital flowing into the conventional energy sector. In addition to the **subsidized debts**, IREDA also extends soft loans to RE project developers through different modes such as direct lending or lending through financial intermediaries and underwriting debts. IREDA also sources funds from international banks and funding agencies to mobilize investments into RE projects. For example, the World Bank and European Investment Bank issued long -term loans of USD 100 million and Euro 150 million to develop RE projects in India. Other financial interventions by IREDA include **discounting energy bills, offering letters of comfort** and **credit enhancement facilities**. Concerns with these financial interventions include regulatory challenges leading to delays in sanctioning loans. For example, delays in sanctioning loans for projects averaged at 66 days beyond the prescribed rule of 90 days (CoPU, 2017).
- **Green bonds/ debt securities**- green bonds/ debt securities are other innovative **fixed-income financial instruments** used to raise funds for environmentally beneficial projects. India ranks among the top 10 global green bond issuers, having issued green bonds worth $3.2 billion as of 2017. Out of this, 70 percent was designated to finance RE in India (Climate Bonds, 2017). To drive up the green bond market by impacting the risk perception of investors, SEBI (regulator) has introduced certain regulatory interventions to be followed by the issuer of these bonds/ debt securities.

Regulatory conditions for issuing green bonds

Statement of environmental sustainability objectives of the proposed green investments in the disclosure documents

Details of process followed by the issuer to determine that the project/ assets fit into the eligibility criteria for green projects as determined by SEBI

Details of procedures employed by the issuer to track deployment of proceeds of the green bonds/ debt securities, including refinancing of existing green assets.

The issuer may appoint an independent third party reviewer/certifier, for reviewing /certifying the above mentioned procedures.

Under continuous disclosure requirements, the issuer should, annually or half-yearly, provide details of utilized and unutilized proceeds of the issue to be verified by an external auditor.

Annual or half-yearly disclosure of quantitative performance indicators of the project including their environmental impacts (wherever feasible). The underlying methods and assumptions of developing these quantitative metrics must also be appropriately disclosed.

Source: (SEBI, 2017)

4. Latin America

Colombia

Energy transitions in Colombia have been anchored around three main goals: Strengthen the transition towards non-conventional RE sources; Revitalize and reform the energy market and strengthen public sector electric power utilities

The **Energy Transition Law** enacted in July 2021 by the Congress of the Republic of Colombia presents certain normative novelties to modernize and draw investments into the energy sector.

Table 2: Regulatory interventions under the Energy Transition Law

Regulatory intervention	**Incentives**	**Description of benefit**
Tax benefits	Deduction of investments	Investments on energy production through non-conventional sources & energy efficiency measures (eg. smart metering) are entitled to 50 percent deductions on total investments for 15 years period

	Accelerated Depreciation	Applicable to assets related to RE generation-including machinery, civil works, equipment and energy efficiency measures such as intelligent metering. Taxpayers have the freedom to define depreciation rate not exceeding 33.33 percent (increased from 20 percent) for a 3-year period.
Speeding up procedures and licensing for electricity projects	Prioritizing environmental licensing and modifications	Evaluation process of Environmental Impact Study for such projects will begin as soon as the investor files it before the environmental authority.
	Relaxation from judiciary inspection	Judges can authorise entry to property and execution of projects in the field of electricity transmission without having to carry out a prior judicial inspection. Police authorities are empowered to guarantee effectiveness of judicial order especially in terms of public easement.

Source: Yáñez et al., 2021

Brazil

Brazil features as one of the cleanest energy matrices in the world, with hydropower contributing a significant share. The transition towards cleaner electricity infrastructure was facilitated through auction mechanism, supported by low interest incentives, fair prices, and financing policies. This has further led to growth in the wind power industry. Presently, the incentivization of decentralized solar infrastructure has recorded strong growth. However, there are looming concerns regarding the regulation and governance of this new asset class, especially in the free market (Wills & Westin, 2019). Under the Paris Agreement, Brazil has committed to reducing GHG emissions by 37 percent below 2005 levels by 2025 and by 43 percent by 2030. Given that Brazil's climate commitments mandate economy-wide changes and focuses heavily on energy transitions, financing options tailored to different maturity stages of RE technologies and the scale of the projects are key to mobilizing finance to meet government's commitments.

Financing mature technologies

The decline in installation costs owing to technology advancements and adoption of procurement mechanisms (auctions) catering to changing market conditions has effectively catalysed investments and capacity development. There are certain interesting examples of mechanisms that support market development and mobilize funding for mature RE technologies in both fuel and electricity sectors. The Brazilian Development Bank (BNDES) and infrastructure debenture bonds are main sources of **debt financing for mature RE technologies** (Figure 3)**.**

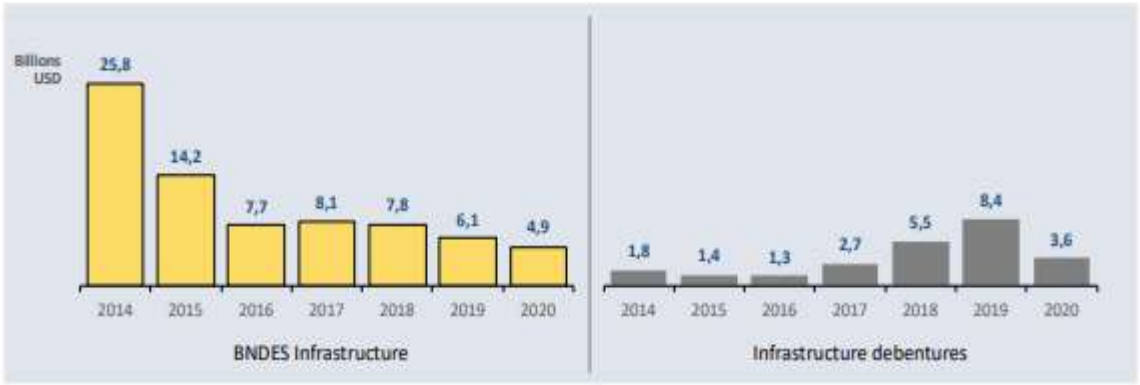

Figure 3: Debt funding – Brazilian Development Bank (BNDES) and infrastructure debentures
Source: (EPE, 2021)

The BNDES was the main source of debt financing for energy infrastructure in Brazil until 2019. It developed a range of financing lines for varying project sizes.

- **BNDES project finance** - This financing line is earmarked for **financial structuring of investment projects** and is supported (contractually) by the cash flow of these projects. The project assets and receivables form guarantee for this undertaking. This structuring is a result of a range of innovations introduced in the Brazilian electricity market (traditionally based on long term PPAs in regulated market) since 2018. The project finance intervention has stimulated **expansion of deregulated market** in Brazil's electricity sector and hence, overcome the challenges of project finance through PPAs in a free market.
- **Infrastructure debentures –** In the recent 5 years, infrastructure debt bonds have emerged as an instrument for funding energy infrastructure projects in Brazil. As energy infrastructure is a strategic priority, these projects are entitled to **tax benefits** and are subject to **long -term funding mechanisms through the capital market** as an alternative to traditional finance streams.
- **BNB (Banco do Nordeste) –** The BNB is an important player in financing micro and small decentralized RE generation infrastructure in the north-eastern Brazil. The credit lines are subsidized via a constitutional fund for north-east funding. There are special conditions for SMES and citizens investing in distributed RE systems.
- **Green instruments –** Sustainable credit operations in Brazil include bonds certified by the Climate Bonds Initiative (CBI) and other instruments such as financial letters, debentures, and loans. In the last five years, sustainable credit operations have amounted to more than USD 1 billion (Mejía-Escobar et al., 2021).

Although there are reasonably adequate funding sources for mature RE and enabling technologies, there are examples that suggest that these mechanisms have the potential for creating a competitive differential in favour of drawing investments into RE infrastructure. For instance, the *Renovabio*

program that combines biofuels production, certification, decarbonization targets and decarbonization credits (CBio) is expected to mobilize USD 200 billion in the biofuels sector by 2030 (EPE, 2021).

Funding intermediate and early-stage technologies

It is often observed that less finance flows into innovation activities to make an emerging technology commercially promising (WEF, 2018). To overcome this barrier, Brazil has certain mechanisms in place to finance innovation in the clean energy sector.

- **Mandatory R&D clause –** Public policy in Brazil mandates R&D investments in every permission, concession and authorization contract for transmission, generation and distribution of electricity regulated by Brazilian Electricity Regulatory Authority – ANEEL (established in 2000). The R&D clause is also mandatory for all development, exploration and production activities related to natural gas and oil, regulated by National Agency of Petroleum, Natural Gas and Biofuels – ANP. This is an important driver of private investments in early-stage and intermediate clean energy technologies (EPE, 2021).
- **Energy Big Push Initiative –** There are several institutions in addition to ANEEL and ANP that finance early stage RE technologies. These include – Ministry of Science Technology and Innovations (National Science and Technology Development Fund), Funding Authority for Studies and Projects (FINEP), National Nuclear Energy Commission (CNEN), Specific financing schemes under the National Bank of Economic and Social Development (BNDES) and the National Council for Scientific and Technological Development (CNPq).

Key emerging lessons in relation to Financing Disaster and Climate Resilient Infrastructure

The main goal, as articulated earlier, here is to enhance capital flows into building disaster and climate resilient infrastructure. From the examples highlighted above, we gain two important insights: firstly, we have to focus on creating an effective and efficient market (with appropriate underlying pricing information), providing adequate cover for investors and ensuring that market creation is expansive in scope and does not cover only one particular aspect (for example, RE policies relevant in the building sector is to be complemented by adequate provisions on building design standards and codes) and secondly, investments in infrastructure cannot be looked at in isolation of the socio-economic development imperative. The socio-economic development framework provides the necessary stability in terms of securing adequate returns to investors.

Three additional emerging insights are as follows:

- It is mandatory to work carefully towards mechanisms and interventions that ensure adequate credit availability and to ensure that the cost of capital is low.
- Public finance will play an important role on multiple fronts: catalysing early-stage market development through concessional finance or regulatory rebates, ensuring that adequate

funding is available for technology research and its deployment and policy certainty is conveyed through structural long-term commitments to a sector.
    - Additionally, public finance (largely through fiscal allocations) has to ensure that adequate returns on investment are ensured through a two-pronged strategy: ensuring that long-term stable demand is created in the system through appropriate economic development agendas and financial incentives are appropriately structured into project financials at various stages of the project cycle.
- Finally, transparent rules of transactions must be created through regulator interventions. This accords a clear and distinct signal to investors (for example, green bond rules in India).

3.b Emerging lessons from multiple Public-Private Partnership (PPP) experiences

Financing disaster resilient infrastructure, PPP mechanisms are well known and well adopted across the World. This section focuses on deep diving into specific PPP cases in the context of social or environmental goals to draw lessons for financing DCRI. This is operationalised through examining the role of guidelines, mechanisms and criteria towards mainstreaming a social or environmental and emphasise the role of good governance mechanisms to create an enabling environment for innovative PPP models to be conceptualised and implemented. There are three specific assessment pathways to draw lessons for the context of facilitating financing for DCRI, which is of interest to us:

- First, how does an interaction between incumbent PPP and regulatory framework deliver resilient infrastructure?
- Second, there are numerous PPP-centric examples (in the broader context of sustainability linked challenges) that have the potential of informing PPP models to deliver resilient infrastructure. What are the avenues of learning from such examples?
- Third, what can we learn from existing PPP arrangements that are specifically aligned with disaster and climate resilience goals; to inform PPP structuring in the context of resilient infrastructure

Environmental and Social goals delivered through regulatory change

We start with the case of governance reforms to enable positive PPP's that are operational in the European Union. An important directive, the Directive 2014/24/EU, on public procurement specifically states that "contracting authorities should be able to require that environmental management measures or schemes be applied during the performance of a public contract". This allows the integration of environmental management measures in the procurement phase itself. Moreover, the directive also pushes contracting authorities to use **"award criteria or contract performance conditions"** to better integrate social and environmental considerations. It stresses that their awards can focus on "for example that the manufacturing of the purchased products did not involve toxic chemicals, or that the purchased services are provided using energy-efficient machines". Moreover, the directive mentions contract performance conditions pertaining to environmental considerations might

include “the delivery, package and disposal of products, and in respect of works and services contracts, waste minimization or resource efficiency”[1].

A second case from the European Union is the Directive 2014/25/EU on procurement by entities operating in the water, energy, transport, and postal services sectors, which has an approach wherein, contracts were awarded based on the economically most advantageous tender (price, cost, quality-price ratio). Here, contracting authority can assess costs using a **life-cycle costing approach** (Article 82 and Article 67 respectively). Life cycle costing may include the costs of emissions of GHG and of other pollutant emissions and other climate change mitigation costs (Article 68 and Article 83 respectively). Furthermore, technical specifications may include environmental and climate performance levels (Article 42, Annex VII and Article 60, Annex VIII respectively).

Another case in the European Union is of the **Green Public Procurement (GPP)** which was a voluntary instrument that was developed to facilitate the inclusion of environmental requirements in public tender documents across the EU member states. GPP criteria were developed for different project groups (e.g., road design, construction, and maintenance) and are applicable for PPPs. Green purchasing is also about influencing the market. By promoting and using GPP, public authorities were able to provide industry with real incentives for developing green technologies and products. In some sectors, public purchasers command a significant share of the market (e.g., public transport and construction, health services and education) and so their decisions have considerable market impact. Moreover, the criteria are formulated in such a way that they can be integrated into tender documents (World Bank, 2022).

For example, in the context of electricity, the GPP criteria is divided into two - core and comprehensive criteria. In the core criteria, the GPP pushes for “purchase of at least 50% electricity from renewable energy sources (RES-E) and/or high efficiency cogeneration.” Moreover, it is explicitly stated that tenderers should indicate the proportion of electricity to be supplied from renewable energy sources. This is in turn verified by relevant documentation from the Guarantee of Origin scheme that must be submitted. Alternatively, there are other proofs listed which may be accepted. To address the question of how the criteria is applied in practice, the GPP demonstrates how **extra points will be granted** in proportion to the electricity to be supplied from renewable energy sources as well as high efficiency cogeneration, over the minimum required in the specification. In the context of comprehensive criteria, the GPP pushes for “purchase of 100% electricity from renewable energy sources (RES-E).” Similar to the core criteria, there is a verification mechanism in place to assess documents. Furthermore, under both the criteria, at the end of each year of the contract, the contractor must disclose the origin of the electricity supplied to the contracting authority[2].

Core	➔ Purchase of at least 50% electricity from renewable energy sources (RES-E) and/or high efficiency cogeneration.

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX%3A32014L0024&from=FR
[2] https://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm

	➔ Verification system in place
Comprehensive	➔ Purchase of 100% electricity from renewable energy sources (RES-E) ➔ Verification system in place

In the context of contracts aligned with social and environmental goals, Bulgaria has integrated environmental and social incentives in the tender document for the Designation of a Concessionaire and Awarding a Works Concession for Airport in Sofia of 5 July 2018 as amended on 29 March 2019 and published by the Republic of Bulgaria, Ministry of Transport, Information Technology and Communications. The document stresses on **"environmental and social programs"** that must be submitted by the bidders and can earn extra points during evaluation in this regard.

The program must cater to at least the following components:

- The development and continuous improvement of the Environmental and Social Management System and the Environmental and Social Management and Monitoring Plans
- A program to guarantee minimizing of the negative effect on the Environment caused by the maintenance, operation, exploitation and expansion of the Airport and Concession Assets and Airport Services, under separate components that include the approach to, but not limited to:
    - Increase the Airport's use and production of renewable energy
    - Reducing carbon emissions because of airport operation
    - Efficient and responsible water management
- Proposals (measures) for improvement of working conditions of the Employees
- Methods, procedures and means, by which the Bidder intends to realize transfer of knowledge and skills related to application of the best international practices at management and operation of the Airport
- Assurance and provision of services to Employees, Passengers, Users and Government Users, which contribute to the normal functioning of the Concession Site and are incidental to a well-functioning modern airport, including, but not limited to, assurance of proper facilities for servicing of disabled persons and for assurance of access to the Airport to disabled persons and people with limited mobility
- Proposals for protection of the health and safety of Employees, Passengers, Users and Government Users

Disaster and Climate Resilience goals enabled through regulatory change

Qualification and selection standards, key performance indicators, and technical requirements, in addition to financial incentives, are typical methods that encourage private sector operators to utilize climate-smart approaches. For instance, specific requirements for climate change adaptation and mitigation are included in the project documentation for the Melbourne Metro Tunnel project (Foerster & Chao, 2021). These include how the project must ensure that "sustainability principles are embedded

into the design of the Tunnel, Stations and Portals" and the design must meet "the outcomes specified in the Melbourne Metro Rail Authority's (MMRA) Sustainability Strategy and support the Sustainability Targets as applicable to the Tunnel, Stations and Portals." In the context of delivering resilient and climate-proof landscapes, the project document also specifies that the project must "demonstrate excellence in the design, construction and management of urban landscapes and ecosystems by applying the principles outlined in the Living Infrastructure Plan."

Few other components in the context of urban climate resilience include:

- The design must integrate measures for all high and extreme climate change risks
- Implement flood adaptation measures
- Achieve reductions in greenhouse gas emissions
- Design must provide a minimum installed capacity of 125kW from renewable sources
- Design must provide the ability to maximize the use of regenerative braking during the infrastructure lifecycle (100 years) to enable a minimum 20% peak energy saving
- Construct at least one tree plot for every tree removed
- Construct ground cover vegetation plots
- Implement Water Sensitive Urban Design (WSUD) measures
- Utilize rainwater and/or stormwater to support vegetation health by applying the principles outlined in the Living Infrastructure Plan

Moreover, in terms of promoting sustainability, the document also mandates to source at least 80% of fabricated structural steelwork from a steel fabricator/steel contractor which is accredited to the Environmental Sustainability Charter of the Australian Steel Institute (ASI). Also, important to note is that climate change projections and scenarios are provided in the MMRA Climate Change Risk Assessment and Climate Change Adaptation Plan, which should be adopted while integrating climate resilience measures.

In the Netherlands, the Rijkswaterstaat (the Department of Public Works of the Ministry of Infrastructure and the Environment, RWS) developed a methodology for infrastructure projects whereby the functional specification of the tender, together with the quality input from the client, ensures an innovative and high-quality solution. The tenderer is asked to respond to specific quality criteria. The RWS uses **the most economically advantageous tender (MEAT) methodology**, including specific sustainability criteria. When assessing sustainability, RWS focuses on two criteria: CO2 emissions and environmental impact. Two instruments have therefore been developed: the CO2 performance ladder and "DuboCalc", respectively. **The CO2 performance ladder** is a certification system with which a tenderer can show the measures to be taken to limit CO2 emissions within the company and in projects, as well as elsewhere in the supply chain. DuboCalc is a life-cycle analysis (LCA) based tool that calculates the sustainability value of a specific design based on the materials to be used. Bidders use DuboCalc to compare different design options for their submissions. The DuboCalc score of the preferred design is submitted with the tender price (OECD, 2016).

The CO_2 performance ladder is used in the tendering procedure as follows:

1. The bidder indicates at which of the five rungs (ambition levels) of the CO_2 performance ladder he/she intends to carry out the work
2. The higher the effort to reduce CO_2 emissions, the higher the rung
3. A commitment to a higher rung results in a greater deduction from the submission price, which increases the chance of winning the contract
4. Each CO_2 ambition level corresponds to a different percentage reduction of the submission price
5. The final amount assessed by the RWS using the CO_2 performance ladder is a deduction of 1% per rung of the submission price
6. The highest level is Rung 5, so the maximum deduction is 5%

Policies, legislation and guidelines which include specific PPP laws or sector-specific guidance can help decision makers consider climate change through various project stages (Foerster & Chao, 2021). A landmark example for this is found in the context of Japan. A report (2017) published by the Global Infrastructure Facility, the Public-Private Infrastructure Advisory Facility, and the Tokyo Disaster Risk Management Hub describes how **disaster resilience has been embedded into the PPP legal framework in Japan**.

Acts	**Description**
PFI Act	➔ Japan introduced the PPP model on a large scale by enacting the PFI Act and making subsequent efforts to promote its spread. ➔ In addition, the Cabinet Office has established a PPP/PFI Promotion Office, which plays an advisory role to the prime minister and other relevant public agencies. ➔ It has developed several guidelines that help local governments understand the process of PPP projects and contracting. ➔ The same office provides the public with information that promotes PPPs and coordinates PPP promotion across various agencies at the central government level.
Disaster Countermeasures Basic Act	➔ The Act was enacted in 1961 and serves as the basis for the DRM system in Japan. ➔ The Act clearly defines the roles and responsibilities of the central and local governments for all phases of DRM such as: ◆ Risk identification ◆ Risk reduction ◆ Preparedness ◆ Emergency responses ◆ Recovery

	➔ Regarding activities related to disaster recovery efforts, the relevant entities of the public and private sectors will work together to implement various disaster countermeasures by ensuring the cooperation of private organizations. ➔ The Act has constantly been reviewed and amended since its enactment, has considered the lessons learned from large scale disasters.

Table 1: Summary of select cases across regions, sectors, thematic and goals

S.No.	Location	Name of the PPP	Thematic	Description	Significant Parameters	Goals
1.	Rwanda, East Africa	Kigali Bulk Water Supply (KBWS) Project	Water	● The project scope involves the development, design, financing, construction, and operation of a 40,000m3/day Bulk Water Facility (BWF) south of Kigali in Rwanda. ● The scope of the BWF comprises of a water treatment plant, a well field with 38 wells, three pumping stations, pipelines and three storage reservoirs.	● The project must submit an environmental and social management plan where it analyses the potential adverse impacts and explicitly illustrates proposed mitigation measures. ● The plan must also specify the implementation schedule of the said measure, responsible person (e.g., contractor, project developer etc.), and the allocated budget for the mitigation measure.	Environment and Social
2.	Cairo, Egypt	New Cairo wastewater treatment plant	Water and Sanitation	● The private partner will design, finance, construct, operate, and maintain a new wastewater treatment plant with a capacity of 250,000 m^3/day. ● The government will pay a Sewage Treatment Charge and electricity costs will be paid by the New Urban Communities Authority (the off taker) as a pass-through item.	● The winning bidder was selected based on the lowest Net Present Value of the overall Sewage Treatment Charge throughout the concession period. ● Bidders were asked to quote their projected electricity consumption levels to ensure energy conservation. The estimated electricity costs were added to the Sewage Treatment Charge to select the winning bidder.	Environment
3.	Roll-out in Uganda, East Africa	Global Energy Transfer Feed-	Energy	● To assist East African nations in pursuing a climate resilient low-carbon development path resulting in	● Premium Payment Mechanism: result-based incentive grant	Environment

		in Tariff (GET FiT) Program		growth, poverty reduction and climate change mitigation. ● The Get FiT Program has been labelled a "PPPP (Public-Public-Private-Partnership)" approach, to which the Government of Uganda, international development organizations and private developers contribute jointly.	● Solar Facility: involves a reverse auction approach ● Standardization of legal documents: experienced law firm was contracted in the review and standardization of PPA, Implementation Agreements and Direct Agreements ● World Bank Partial Risk Guarantee ● Technical Assistance for Ugandan Regulator	
4.	Timor-Leste	Timor-Leste Road Sector Improvement Project	Transport	● Financed by the Asian Development Bank (ADB) ● ADB developed socially inclusive and gender-responsive project design features that are specific to the context of Timor-Leste	● Labour-Intensive Maintenance: 10 contract packages for road maintenance will target small contractors from local communities and train them. ● Involvement of Women: encourage all contractors involved in project implementation to have 30% of all the wage labour force to be women	Social
5.	Melbourne, Australia	Melbourne Metro Tunnel project	Transport	The Melbourne Metro Rail Project involves the construction of a 9km-long tunnel within Melbourne, Australia, connecting the Sunbury and Dandenong railway route.	● Implement flood adaptation measures ● Achieve reductions in greenhouse gas emissions ● Implement Water Sensitive Urban Design (WSUD) measures	Environment
6.	New South Wales, Australia	Royal North Shore Hospital and Community	Health	Under PPP, the private operator designs, builds and finances the new acute health facility, Community Health Facility and	● One of the evaluation criteria is "environmental sustainability and energy efficiency of the design and building elements used"	Environment

		Health Services Project		multi storey car park, refurbishes some existing facilities.	● The Project Company must comply with Environmental Laws.	
7.	Solomon Islands, Oceania	Tina River Hydropower Development Project	Power and Energy	The private partner will design, build, own, operate, and manage the hydropower facility through a build-operate-own-transfer scheme.	Following plans are needed: ● Land Acquisition and Livelihood Restoration Plan ● Gender Action Plan ● Community Benefit Sharing Plan ● Community Development Plan ● Environmental and Social Management Plan	Social
8.	Vanuatu, Oceania	GPOBA Improved Electricity Access Project	Energy	The objective of this project is to increase sustainable access to formal grid-based electricity services within Vanuatu's electricity concession service areas for low-income customers through targeted subsidies.	● Targeted consultation program to reach vulnerable groups, especially women. The project will provide communication material and information on the safe use of electricity to encourage women to apply for the subsidy.	Social
9.	Lao PDR	Nam Theun 2 hydroelectric power project	Energy and Power	The project is governed by a concession agreement that sets out, among other things, social safeguards to mitigate the potential negative social impacts of the project.	● Resettlement to be provided which includes housing, infrastructure, livelihoods etc. ● Land titles are to be issued jointly to husband and wife ● Watershed Protection activities to be undertaken	Social and Environment

Table 2: Summary of select Acts/Regulations with significant consideration and parameters for PPP structuring

S.No.	Location	Thematic	Name of the Act/Regulation	Description	Significant Parameters for PPP	Goals
1.	Philippines	Energy	Philippines Renewable Energy Act of 2008	● Provides the legal and institutional framework necessary for harmonizing policies on the development of renewable energy technologies ● The Act aims to enable the Philippines to move rapidly towards its goal of being 60% energy self-sufficient by 2010 by developing and utilizing resources such as solar, wind, hydropower, ocean and biomass energy	The new law provides following incentives for the renewable energy sector: ● Seven-year income tax holiday and tax exemptions for the carbon credits generated from renewable energy sources ● 10% corporate income tax, as against the regular 30%, is also provided once the income tax holiday expires ● 1.5% realty tax cap on original cost of equipment and facilities to produce renewable energy ● The Act creates a policy framework for net metering	Environment
2.	Viet Nam	Energy	Decision No. 2068/QD-TTg "Approving the Viet Nam's Renewable Energy Development Strategy up to 2030 with an outlook to 2050"	The Government has implemented incentives to promote the development of renewable energy. One such incentive is the Decision No. 2068/QD-TTg.	Decision dated 25 November 2015 provides the following incentives: ● Zero import duty for assets to form the fixed assets of a renewable energy project, and for materials and semi products which are unavailable in the domestic markets ● Corporate income tax exemption or reduction ● Land rental exemption or reduction	Environment

					• Government funding for research and technology of pilot projects	
3.	Lao PDR	Power	Policy Guidelines for the Implementation of Policy on Sustainable Hydropower Development	The Guideline aims to provide policy guidance to the agencies responsible for overseeing the implementation of investment projects in the hydropower sector as well as to inform and encourage project developers/investors to be aware of the Government policy toward achieving sustainable development in Lao PDR.	• A specific definition of "project affected people" is provided • Project developer must provide various reports, assessments and plans, including a gender development plan before the construction and implementation of the project • A social management and monitoring plan has to be implemented to provide sustainable livelihood options	Social
4.	London	Transport	Action on Equality: TfL's commitments to 2020	Gender-responsive PPP procurement initiative to ensure gender-responsive transport planning.	• To undertake an equal pay audit and develop appropriate action plans to address any recommendations • Raising awareness across all levels of staff through communications and training	Social
5.	Namibia, Southern Africa	All PPP projects	Namibia Public Private Partnership (PPP) Policy	Section 11 discusses the pro-poor approach in the design of PPP projects. An objective of this PPP policy is to ensure that the poor benefit from these projects through different means such as output-based aid contracts; subsidies; low-cost mechanisms and other alternate mechanisms.	• Output Based Aid (OBA): use of explicit performance based subsidies funded by the donor to complement or replace user fees, that may be one time, transitional or ongoing, where the subsidies are linked to performance outcomes.	Social

					• Alternate mechanisms, such as potential for the target group to contribute in kind through labour or any other appropriate means	
6.	Uganda, East Africa	Water and Sanitation	Pro-Poor Strategy for the Water and Sanitation Sector	A strategy document created by the Ministry of Water, Lands and Environment (MWLE) and the Directorate of Water Development (DWD). The document summarizes pro-poor strategies and presents both general and specific strategies.	• Empower communities through participation to ensure cross-subsidy (e.g., support in-kind and cross-subsidy for capital and O&M contributions) • A participatory approach empowering the poorest of the poor and especially women will be adopted.	Social
7.	South Africa	Transport	City Policy on Compensation of Minibus- Taxi and Other Operators (Policy Number 13776)	The new MyCiTi Integrated Rapid Transit System will largely displace the current road-based minibus-taxi and scheduled bus operators. This policy sets out the principles involved in determining the level of compensation of existing operators.	• There are three categories of compensation: standard compensation; standard Compensation where different conditions apply such as voluntary exit compensation and special compensation; additional authority compensation; alternative determination of compensation; nominal compensation; and minimum compensation (Floor Price) • The policy also illustrated the methodologies to be used to calculate the compensation	Social

8.	Ghana, West Africa	All PPP projects	Public Private Partnership Act, 2020	The PPP Act regulates the development and implementation of public private partnership arrangements between contracting authorities and private parties for the provision of infrastructure and services	● The Act specifies in Section 10 how "a contracting authority shall ensure that public private partnership projects are structured to facilitate: (a) the use of local content; (b) technology transfer; and (c) the promotion of local industries and the private sector"	Social
9.	Global	All Projects	Skanska Sustainable Procurement	Skanska AB is a multinational construction and development company based in Sweden. In this policy, Skanska is committed to establishing a greater understanding of the diversity of its supply chain and to increasing supplier diversity in their supply chain where possible.	Examples of specific rules for suppliers: ● Suppliers shall open employment, apprenticeship, trainee and work experience opportunities to local residents, students, under-represented groups and people experiencing long-term unemployment. ● Suppliers shall provide opportunities for local organisations (including SMEs, charities and Social Enterprises)	Social

Learnings for Disaster and Climate Resilient Infrastructure

The above presented information helps us understand that, if adequately paid attention to, one could develop certain criteria or mandated outcomes to ensure that a specific performance criterion of an infrastructure is delivered. The key here is to identify what that criteria is and to ensure that the criteria is enforceable through an evaluation process and in terms of ensuring a certain expected performance, is backed by legal frameworks.

Three specific recommendations emerge from here:

- Qualification and selection standards, key performance indicators, and technical requirements, in addition to financial incentives, are useful methods that would encourage private sector operators to mainstream disaster resilience into projects. One clear aspect in this context emerges and that is in alignment with the previous section. The pursuit of disaster resilient infrastructure cannot be isolated from the local social, economic and environmental context. Any PPP structuring that mainstreams disaster resilience has to orient its performance towards project outcomes as well as local social, economic and environmental resilience.

- It is important to create coordinating institutional entities, with a legal mandate, to ensure contract performance and coordination amongst multiple geographical and stakeholder context (for example, the underlying legal framework that is operational in Japan).

- Mandatory inclusion of climate information into project development to be appropriately design interventions that are future-ready and ensure minimum service interruptions.

3.c Understand the mechanics of scaling and de-risking investments into resilient infrastructure

This section focuses on what do we know from the emerging evidence in the context of climate finance, which offers useful lessons for scaling up private finance into the resilience agenda.

We are aware that accelerating rapid, simultaneous, and far-reaching climate-aligned transitions to limit warming to 1.5°C will require a massive increase in resilient low-carbon investments; de-risking these investments and mobilising an appropriate level of funding to build the resilience of the global financial system to climate change; and a systematic reduction in physical risks to assets across the world, by reducing their exposure and vulnerability.

Three kinds of climate investments need to be accelerated over the next decade. First, investments in sectoral and cross-sectoral systems transitions i.e. in the energy system and industrial systems; urban and infrastructure systems; and land and ecosystems service. Second, investments in strengthening

multiple enabling conditions for the climate transition, including climate governance and macro-economic policy, and building institutional capacities within the climate finance sector (IPCC, 2018). Third, investments and safety nets to enable a just transition and mitigate the short-term impacts on adversely impacted countries, populations and vulnerable groups impacting progress on sustainable development, and who could significantly impede these changes (IPCC, 2018).

All three of these investment streams will need to be coordinated nationally and globally, to enable as much synergy as possible. This will help scale up market reforms, pricing signals and technical standards that, in time, could catalyse the decoupling of GHG emissions and energy intensity from economic growth and development, and provide the space for widespread, and where necessary, transformational adaptation.

Sustaining the momentum of all of these systemic changes will also mean dealing with a dual challenge. First, maintaining broad political and public support for climate action, even if it exacerbates short-term economic and social tensions including unemployment, poverty, inequality, competitiveness issues and the loss of economic value of stranded assets (Mercure et al., 2018). Both the spirit and a perception that this is and will be just, would be important to building and maintaining necessary political and public support for a difficult and complex set of actions and measures. Second, of triggering systemic change without inducing economic collapse or exacerbating the 'fault lines' of the world economy (Rajan, 2011) and thereby national and global financial systems (Carney, 2015)

The core question addressed below is what reforms at the various levels of the global financial system are possible and needed to accelerate the triggering of a new growth cycle (Stern, 2013, 2015) through a wave of investments supporting low carbon and sustainable development.

Enabling changes in the macro-economic and policy context

Enabling the climate transition will require an effective systemic response to three linked macro-economic challenges. First, the mobilisation of massive incremental climate finance investments; second, the redirection of global and national savings to fill the current infrastructure gap; and third, the redirection of these infrastructure investments towards new and retrofitted resilient and low-carbon infrastructure.

It is well accepted that infrastructure investments have several multiplier benefits in terms of sustainable development and welfare (IMF, 2014; Gurara et al., 2017). Yet, the shift of savings towards productive mitigation and development-centric adaptation investments in place of other asset classes like real estate or liquid financial assets, is an ongoing challenge.

On Redirecting savings

The low-carbon transition requires a redirection of current and future capital flows towards new and retrofitted resilient infrastructure (e.g. energy, transport and buildings) and to decarbonise the materials and the supply chains that produce these infrastructures. This will require the redirection of a considerable volume of national and global savings from current investment priorities towards these in the next few decades.

On Reducing the mismatch between savings and investment needs

Behind these aggregate figures lies the mismatch between savings and projections of investment and divestments needs. Typically developed economies have aging populations with savings rates ranging from 15% to 30% and established social safety nets. They have the bulk of high investment intensity infrastructures in place but need retrofitting to decarbonise and upgrade them. Developing countries have relatively young populations with a high proportion of workers and a wide range of savings rates from 15% to over 40% of GDP, underdeveloped social safety nets, and relatively low tax rates. Even here, some global geographies such as Asia are responsible for the bulk of recent economic growth and savings (ADB, Asia Development Outlook, 2018). But many experience energy poverty, and poor infrastructure coverage and quality. The opportunity to leap-frog to low carbon infrastructure as urbanisation expands, is significant as two-third of their infrastructure investments are yet to take place (SUPM, Summary for Urban Policy Makers, 2018). The challenge, however, is that most current climate finance is domestically sourced, which constraints transition opportunities in many developing countries (CPI, 2019).

Taken together, this implies the need for the development of domestic and international sources and capital flows from the geographies where the savings are, to other geographies and sectors where the climate transition relevant investments are. This can only be facilitated by large scale changes in the financial system, building largely on the capacities of existing institutions (G20, Making the Global Financial System Work, 2018).

On Tackling chronic under-investment in infrastructure and industry

Filling the large and chronic under-investment in long-term infrastructure assets is a key constraint to accelerating the 1.5°C energy, urban and infrastructure transitions, even in high-income countries (Gaspar et al., 2019; IMF, 2014a).

This under investment in the infrastructure sectors is one of the consequences of the gap between the ‘propensity to save’ and the ‘propensity to invest’(Summers, 2016) and, more fundamentally one of the fault lines of the world economy; and, a key risk driver of stagnation in global economic growth (Krugman, 2014; Blanchard, 2019; Summers and Rachel, 2019).

This gap results from deep seated institutional constraints, in both national and global businesses and financial systems where short-term risk-weighted returns dominate the investment horizon and attracts finance towards short term returns e.g. liquid financial products and real estate, rather than long-term low-carbon assets. There are four tangible and intangible causes for this.

First, most infrastructure and urban assets are relatively illiquid, long-term investments as long as they are not transformed into more liquid financial instruments like stocks and bonds.

Second, important stakeholders who have a strong interest in the transition (cities and local authorities, SMEs and households especially in the informal sector in many low and low-middle income countries) have limited access to capital at affordable interest rates (World Bank Doing Business Report, 2019). This constrains the availability of investment where it is most needed and where the bulk of future growth will come from.

Third, many formal sector firms function within a 'shareholder value business regime' (Roe 1994); (Froud et al. 2000), instead of the 'managerial business regime' that characterised the late-20th century (Galbraith 1967).

Fourth, the expanded role of finance in the economy (Malesky, 2017) and the short-term bias of contemporary financial systems (Miles, 1993); (Bushee, 2001); (Black and Fraser, 2002), has become a serious threat to the stability of the global financial system (Christophers, 2017) (Arezki et al., 2016); WEF, 2019). This is one cause of the 'tragedy of the horizon' that needs to be overcome to systemically address climate change (Carney, 2015).

A key challenge is the development of a suite of new financial instruments to close this gap and inject liquidity into the energy, infrastructure and urban transitions, unlocking new economic opportunities (GCEC, 2014; NCE, 2016). This could be enabled if effective public policies and financing arrangements assist in crowding-in other private investments (Krogstrup and Oman, 2019) that could establish a virtuous cycle of the growth of low-carbon resilient infrastructure that would reinforce sustainable development (King, 2011; Teulings and Baldwin, 2014) and further trigger a new growth cycle (Stern, 2013, 2015).

On Fiscal and financial policies and instruments

The acceleration and deepening of the climate transition can be led by fiscal measures and public finance support. Yet, the sheer volume of investment required and its availability across a diversity of sectors, geographies, types and sizes of assets and enterprises, implies that its success or failure will depend on the ability to mobilise and leverage private finance.

A full suite of financial policies and instruments is necessary across both the supply and demand-side to crowd-in private investment to address climate change (IPCC, 2018). These include: improved

information, appropriate pricing, de-risking instruments, and creating new low-carbon asset classes in the context of increasing pressure on public finance (Gurara et al., 2017).

On De-risking transitions using markets and price signals

National and regional carbon markets provided an early market-based mechanism intended to reduce emissions. High carbon prices were expected to generate more low-emission investments for a given quantum of de-risking and accelerate the energy transition. Yet, after nearly twenty years of experimentation in this space, only 15% of global emissions were covered by carbon pricing in 2016. Three-quarters of this were with prices below USD 10 per tCO2 making this a relatively blunt and ineffective instrument (World Bank, 2016).

Where carbon prices are set low, carbon price signals are easily swamped by other signals (e.g. oil price volatility, interest and exchange rate fluctuation) and undermined by regulatory uncertainty. Thus, to significantly de-risk low carbon investments, carbon prices should be set at a very high level to overcome both the noise of these signals and the fact that low carbon options are often viewed as more risky than conventional ones because of their higher capital cost and lower maturity (Gross, Blyth, & Heptonstall, 2010; Roques, Newbery, & Nuttall, 2008). The 'reward' of carbon prices for these technologies often comes too late. This explains the typically low leverage of the lead instrument i.e. public finance in low-carbon investment (2 to 4) compared with (10 to 15) in other sectors (Maclean et al., 2008; Ward et al., 2009; MDB, 2016).

A key factor in the success of using price signals to accelerate the 1.5oC climate transition will be calibration of carbon price increases with the depth of their being embedded in a consistent set of fiscal and social policies (Stern and Stiglitz, 2017, Michaelowa et al., 2018, IPCC 1°5, 2018). A short- to medium-run focus on cutting risk premia on the low carbon transition would lower the 'switching' carbon cost needed to tilt investment dynamics in favour of low carbon options (Steckel J.C. & Jakob M., 2018, Hourcade et al., 2018)

How to Scale Up Private Climate Finance in Emerging Economies: IMF Global Financial Stability Report

The most recent IMF Global Financial Stability Report has underscored the importance of private climate financing in emerging markets and developing economies to address the climate challenge. The report highlights that boosting private climate financing quickly is essential and it offers a few instruments and strategies to do so: adequate pricing of climate risks, innovative financing instruments, broadening the investor base, expanding the involvement of multilateral development banks and development finance institutions, and strengthening climate information. Lack of an effective carbon pricing mechanisms as a key driver of diverting funds into climate resilient infrastructure alongside weak climate information architecture has been identified as a key barrier.

An important first step that the report identifies is to focus on expanding the available capital base and consider multiple approaches to managing risk. In particular, the role of Multilateral development banks in leveraging equity infusion to leverage significant private finance, which currently are only about 1.2 times the resources these institutions commit themselves.

CONCLUSIONS – What do we learn in the context of enhancing finance for disaster and climate resilient infrastructure

This position paper argues that private sector investments into the asset class of resilient infrastructure cannot be secured until there is policy certainty, transparent revenue models along with simultaneous focus on social development goals and local economic growth (eg. employment, skill development, demand for infrastructure services). Governance will play an additional role in ensuring that the investments generate adequate returns and are secured.

Accelerating investments into new forms of resilience building infrastructure, including ecological infrastructure can have long-term catalytic benefits. A major barrier preventing the creation of bankable, sustainable infrastructure projects that build climate resilience, and consider ecological infrastructure as a substitute, compliment or safeguard to conventional projects, is the inability to clearly identify the revenue streams generated by the ecological component and incorporate it into the overall project financial structure. Not all ecological interventions will be able to generate revenue streams, however they may offer the potential to reduce disaster risks and address societal issues in a multifunctional manner, in ways that gray infrastructure cannot. It is important for project developers to find innovative structures to capture those benefits in monetary terms (e.g. carbon credits, reduced risk premiums) (ADB, 2019).

Globally LCR infrastructure (particularly energy and water) is emerging as an asset class that is embedded within specific local contexts and is subject to the priorities of transnational capital. Literature suggests large scale LCR infrastructure deployment, despite their pro-environmental outcomes, often fails to promote local and national socio-economic welfare, specifically in LMICs that are contextualized by greater inequalities and marginalization. For instance, using insights from the way utility scale RE procurement was designed and implemented in South Africa and Mexico, Baker (2021), points out two competing objectives of energy transitions - securing a predictable, *long-term revenue stream for investors*, and as a *mechanism for socio-economic development and community empowerment.* Thus, there is a need to explore what kind of governance interventions can be used to regulate finance and infrastructure at multiple levels, to deliver on national and local development while contributing to the net zero challenge. This would, in turn, secure stable revenue streams for investors and identify risk in a transparent manner.

What is the normative strategy that should be adopted to scale up finance for infrastructure resilience across countries – drawing lessons from climate finance and with a focus on enhancing private investment flows

- Developing countries: The financial system in many developing countries lacks the financial and institutional capacity to address a conjoint problem: financing sustainable development and the renewables transition, while addressing the growing physical risk of climate impacts and the transition risk to a low-carbon economy. Based on the national context, a mix of strong regulation and public finance led initiatives, disruptive business models, specialised financial institutions to address investment opportunities, creating market and innovation ecosystems to enable this and international partnerships and financial will be necessary.

- Middle Income Countries: would need to use a mix of strategies to address the climate transition, including aggressive financing of renewables and storage, energy efficiency and low carbon infrastructure and buildings as they urbanise. Maintaining development momentum will be a challenge, as will investment in low carbon industrial development and the deployment of sustainable land use and nature-based adaptation options. Behaviour change, especially altering consumption choices may be an important enabling condition and thus, leading to extensive focus on locally led and implemented solutions.

- Developed High-income countries: will need to rapidly decarbonise and retrofit their infrastructure. Addressing the transition risks of established industries and financial institutions will be a major challenge. Financing this may be difficult for the private sector to handle on its own, without a reorientation of domestic markets and the financial sector.