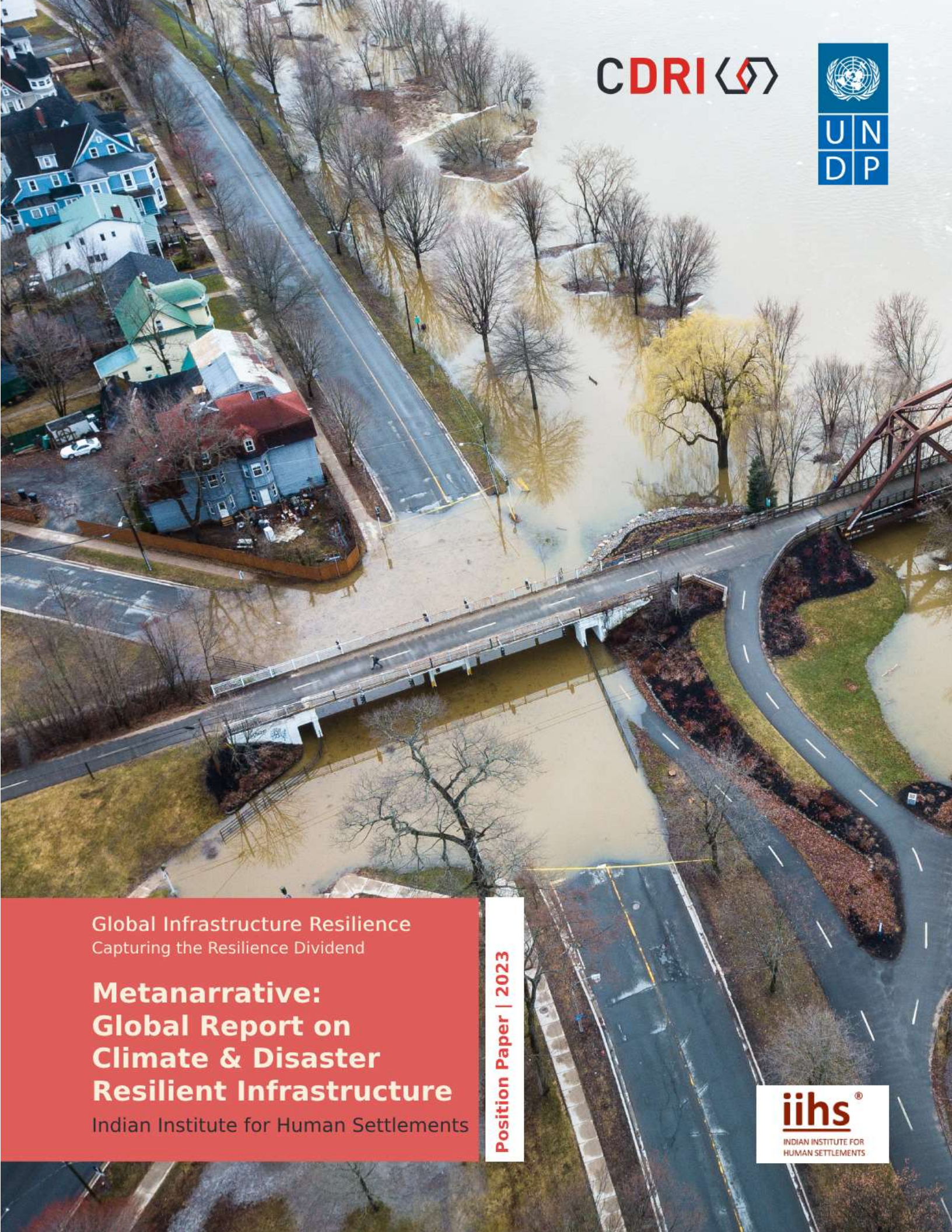

CDRI

UNDP

Global Infrastructure Resilience
Capturing the Resilience Dividend

Metanarrative: Global Report on Climate & Disaster Resilient Infrastructure

Indian Institute for Human Settlements

Position Paper | 2023

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INDIAN INSTITUTE FOR HUMAN SETTLEMENTS

Pillar 0 Metanarrative: Global Report on Climate & Disaster Resilient Infrastructure

Context

The lack of widespread, sustainable, and cost effective resilient local and strategic infrastructure systems and services negatively impacts economic growth and development. Lack of strategic and local infrastructure services severely undermine the potential of countries to deliver the Sustainable Development Goals (SDGs). Resilient, cost effective and accessible services are closely linked to multiple welfare and wellbeing measures including poverty reduction, food, energy and water security and human development. Resilient and cost-efficient levels of services, even amidst situations of shocks and stresses, are closely linked to multiple welfare dimensions such as sustained employment, poverty reduction and enhanced human development. Globally, a substantial number of people still live in poverty (Table x). The resilient infrastructure agenda, therefore, needs to be closely linked to the prospects of economic growth and employment. Careful choices made in the present moment on resilient infrastructure enhancement could have the most welfare enhancing impact.

Table 1

The need to invest in infrastructure that is both low-carbon and climate-resilient comes at a time when government budgets, the traditional sources of infrastructure funding, are under significant pressure, yet infrastructure investment is important for stimulating economies and growth. Governments face the challenge of enacting policies and leveraging public spending to both: (i) attract private capital to invest in infrastructure; and (ii) ensure that the infrastructure is consistent with a green and climate-resilient economy[1]. Public investment, a proxy for government investment in infrastructure, is found to be more effective than other types of public spending in increasing economic output, particularly over the medium term. A recent analysis from the Global Investment Hub[2], assessing more than 3,000 estimates of fiscal multiplier from more than 200 academic studies over the last 25 years, found that public investment has an average fiscal multiplier of about 0.8 within 1 year, and around 1.5 within 2 to 5 years. These multipliers are higher than those found for public spending across both timeframes. It was also found that the multiplier effect tends to be larger – at around 1.6 – during the contractionary phase of the economic cycle, suggesting that public investment is generally less likely to 'crowd out' private economic activity in times of recession. Infrastructure investment, therefore, can and should become an important element of medium- and long-term economic stimulus package to help drive sustained economic growth and enable an economic rebound in the post Covid World.

[1] Corfee-Morlot et al., 2012, Hall et al., 2012

[2] Cite

In developing nations, infrastructure disruptions are an everyday concern. When infrastructure fails, it undermines businesses, job creation, and economic development. With rapidly growing populations and a changing climate increasing the frequency and intensity of natural hazards, the need to adapt and invest in resilience should be an urgent priority. Disruption to infrastructure costs households and firms in LMICs at least $390 billion a year, and the indirect effects place a further toll on households, businesses, and communities[3].

Infrastructure should not be viewed as individual assets, such as a power plant, a hospital or a water network, but as part of a system with a portfolio of assets that collectively hold great potential to deliver the three pillars of the SDGs: economic, environmental and social sustainability. When it comes to the **economy,** infrastructure dividends range from the jobs created during construction and maintenance to the ability for infrastructure to generate economic activity (such as a bridge that links a rural village to urban markets). By connecting communities to cities, education and employment, infrastructure such as transportation and telecommunications underpins national economic goals. When equitable access is assured**, society** benefits from infrastructure since it delivers the services (such as power supplies, healthcare services and sewerage networks) that are essential for sustainable development. Whether by providing the public transport that makes it easier for women in rural areas to participate in the workforce or the clean water and sanitation that reduce maternal mortality, infrastructure also advances gender equality.

Building a resilient multi-level infrastructure system contributes to enhanced economic activity that can generate the financial resources to sustain current operations and maintain the future infrastructure investments, prevent service disruptions, and maintain near universal access. Motivation behind creating resilient infrastructure should not be limited to minimizing losses and damages but should be aimed at addressing core elements that characterizes risk such as exposure, vulnerability and thus reduces risk, in general and avoids creating pockets of new, incremental risks. Such an approach would enable operational continuity, uninterrupted economic activity and secure demand dimensions of services delivered through infrastructure.

In an interconnected World, systemic and compounding risks often cascade across geographies and sectors to have significant economic, social, and environmental costs. It is equally important to recognize that despite efforts, globally, towards risk reduction, it is being outstripped by risk creation and much of this risk is driven by structural dimensions of vulnerabilities such as widespread poverty and inequality. The world is not on track to reducing risk. If current trends continue, the number of disasters per year globally may increase from around 400 in 2015 to 560 per year by 2030 – a projected increase of 40% during the lifetime of the Sendai Framework and existence of systemic risks are undermining prospects of sustainable development[4]. Examining the Average Annual Loss (AAL) data with respect to incremental GDP and capital formation between 2018-219, we observe a significant compression across various income category countries (See Table xx). It is noteworthy to observe that lack of resilient infrastructure is undermining incremental economic growth, which could have serious implications for development. These trends have intensified over the most recent past. For example,

[3] (Hallegate et al., 2019)

[4] GAR 2022

between 2018 and 2019, AAL for Advanced Economies as a percentage of incremental economic growth was of the order of 1/5th.

Table 2

Assessing AALs as a percentage of GDP values in 2019, we observe a significant amount of economic compression in emerging market economies (about 1.4%). Region wise, we observe a nearly 3.2% economic compression in the Americas, alarming number. Oceania region also indicates a very high value of economic compression, nearly 1.8%. In value terms, a 0.1% economic compression in Africa and a 0.2% economic compression in Asia is significant and undermines the region's ability to address widespread development challenges such as poverty reduction (See Table xx and Table xx below).

Table 3

Placeholder: the biodiversity links and its ability to address risk

The C&DRI challenge and identifying opportunities

Global economic growth is forecast to slow to 2.7 percent in 2023, the weakest growth profile since the 2008 global financial crisis. Inflation is higher than in past decades, financial conditions are tightening in most regions. The Russia - Ukraine conflict, and the lingering impact of COVID-19 pandemic all weigh heavily on short to medium term economic outlook. A significant economic growth slowdown and contraction in some regions and countries, will put pressure on availability of incremental financial resources for infrastructures.

Global inflation is forecast to rise to 8.8 percent. Upside inflation surprises have been most widespread among advanced economies, with greater variability in emerging market and developing economies. Policy paths in the largest economies could continue to diverge, leading to further US dollar appreciation and cross-border tensions. More energy and food price shocks might cause inflation to persist for longer. Global tightening in financing conditions could trigger widespread emerging market debt distress. A resurgence of COVID-19 or new global health scares might further stunt growth and geopolitical fragmentation could impede trade and capital flows, further hindering climate policy cooperation.

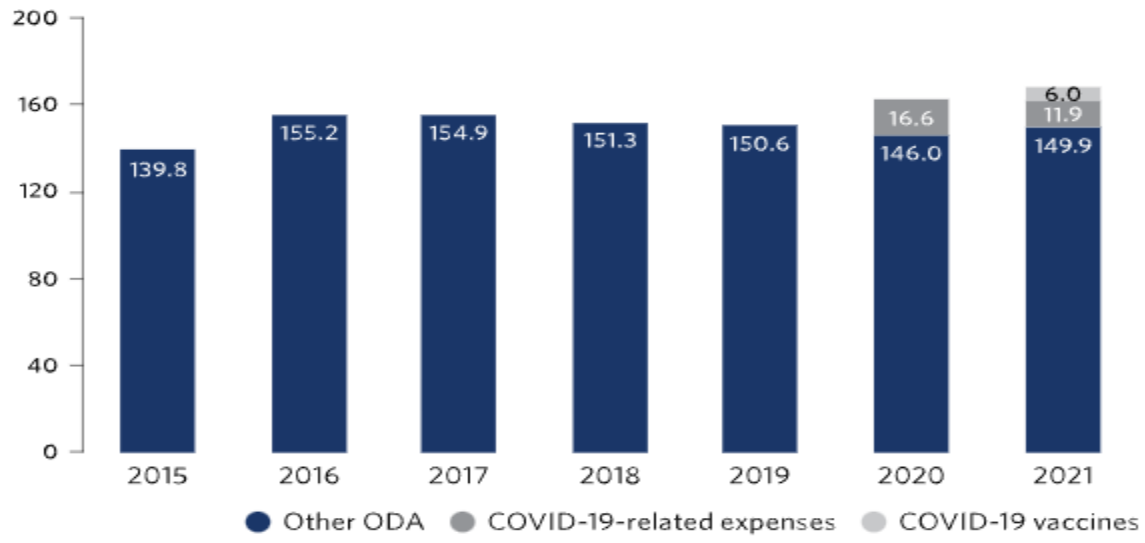
The COVID-19 pandemic precipitated the worst economic crisis in decades and reversed progress on many dimensions of sustainable development. The global economy has begun to rebound in 2021, bringing some improvement in employment, recovery remains elusive and fragile. Many developed economies are experiencing a more robust recovery, while LDCs continue to struggle with weak economic growth and labor market fallout due to large enterprise closures.

Many developing countries are struggling to recover from the pandemic despite a record-high level of official development assistance (ODA) and a strong rebound in global foreign direct investment (FDI) and remittance flows. The reversal in development progress, owing to COVID-19, is consuming available and additional financial resources and constraining investments into both physical and service infrastructure.

In addition to other challenges, developing economies are burdened with rising cost of capital, record inflation and widening fiscal gap. Economic recovery is proving to be harder for these countries due to the challenge of securing progress on SDGs and at the same time, building back better from the crisis. A full-scale transformation of international finance and debt architecture is indispensable for achieving this. International cooperation is key and mandates urgent scaling up to stay ahead of the crises at multiple dimensions - social, economic, health, environmental and peace.

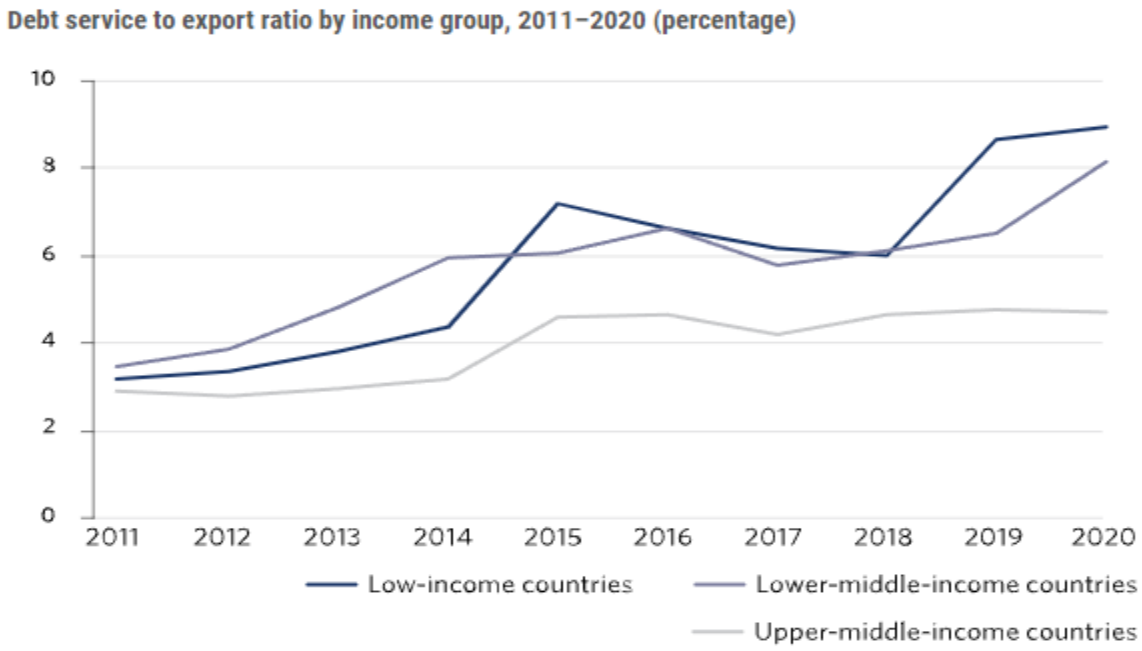
ODA flows in 2021, which are at 0.33 percent of the doner's combined GNI, fall short of the 0.7 percent target required to get developing economies on track to achieving the SDGs. The increase in net ODA flows is mainly attributed to COVID 19 related activities (Fig 1).

Components of net official development assistance flows, 2015-2021 (billions of constant 2020 dollars)



The net ODA flows have risen by 20 percent since 2015, peaking in 2020 and 2021. However, the ongoing Russia-Ukraine conflict is directly impacting ODA flows in 2022, with increased spending on refugees. This sudden reshuffling of budgets threatens the poorer nations by denying them access to development aid at a time when it's most needed. This may have serious implications for infrastructure improvements in poorer countries of the World.

The COVID 19 crisis has added to the looming debt burdens of LMICs. In 2020 the total external debt shocks for LMICs, rose by 5.3 percent, amounting to $8.7 trillion. Most of this was driven by a 6 percent rise in long term debts. As the rate of debt accumulation exceeded the growth of export earnings, a further deterioration of external debt ratios impeded recovery in LMICs post pandemic (Fig xx).



In low-income countries, the total public and publicly guaranteed debt service to export ratio rose from an average of 3.1 per cent in 2011 to 8.8 per cent in 2020 (See Table xx for a perspective across regions). The worsening of debt indicators was widespread and affected countries in all geographic regions. Countries in sub-Saharan Africa have seen the most pronounced deterioration in debt indicators: the ratio of debt to GNI rose from an average of 23.4 per cent in 2011 to 43.7 per cent in 2020, and the average debt-to-export ratio tripled over the same period.

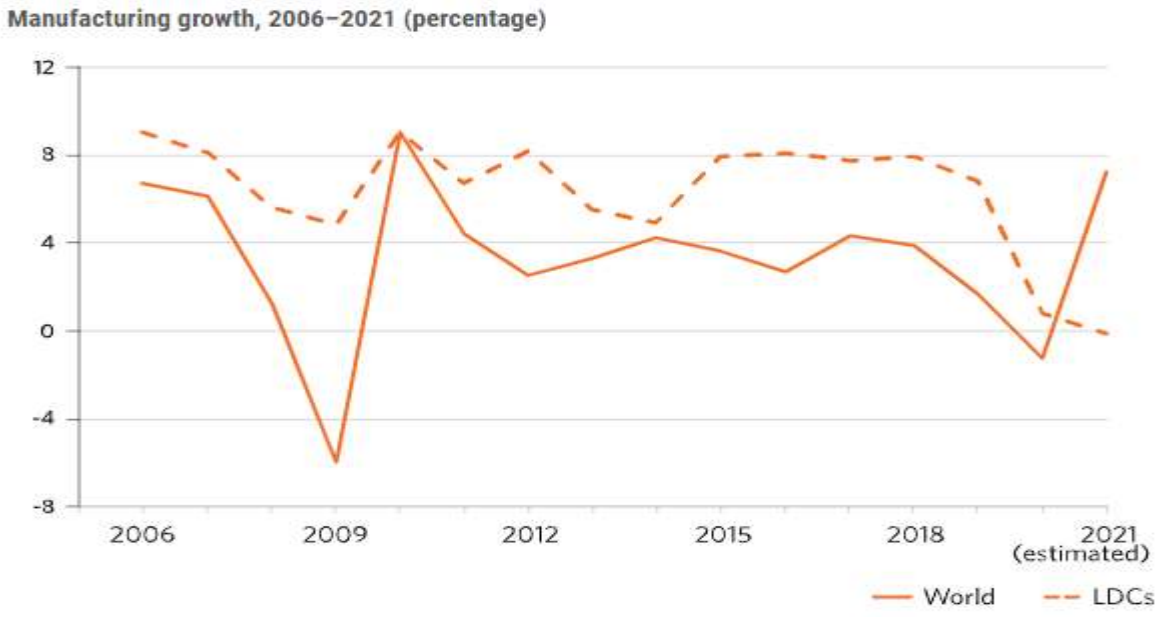
Table 4

Global foreign direct investment rebounded strongly in 2021 but flows to the poorest countries showed only modest growth, reaching $1.58 trillion, an increase of 64 per cent compared to 2020. Recovery was highly uneven across regions, however. Developed economies saw the biggest rise, with FDI reaching an estimated $746 billion in 2021 – more than double the 2020 level. FDI flows in developing economies increased by 30 per cent, to nearly $837 billion. Flows in LDCs saw a more modest growth of 13 per cent.

Inflows to LDCs, landlocked developing countries and small island developing States combined accounted for only 2.5 per cent of the world total in 2021, down from 3.5 per cent in 2020. International investment in SDG-related sectors in developing countries increased by 70 per cent in 2021. However, most of this is attributable to energy sector projects, particularly focusing on renewable-energy and energy-efficiency. However, the share of total SDG investment in developing countries decreased from 19 per cent in 2020 to 15 per cent in 2021.

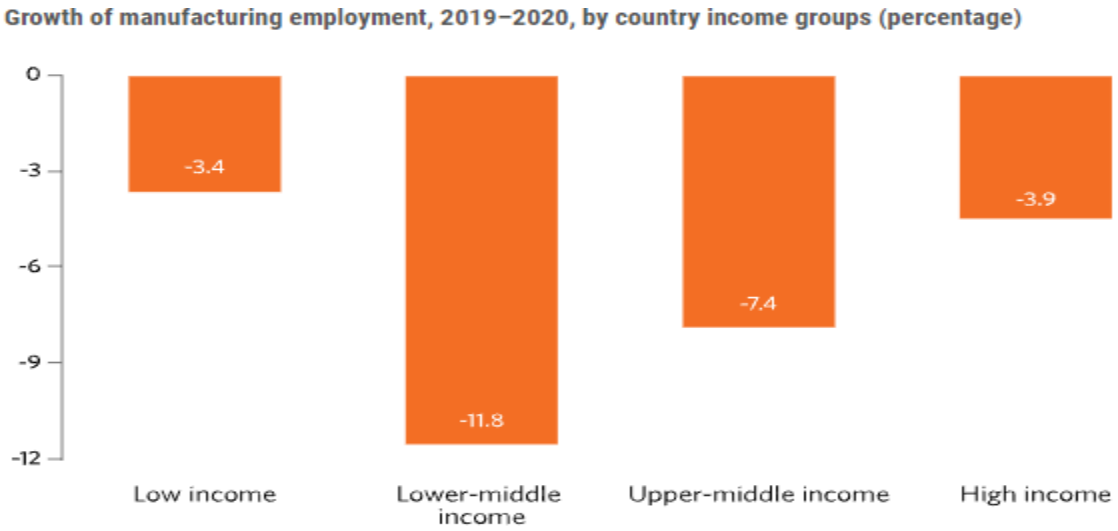
The COVID-19 pandemic has demonstrated the importance of industrialization, technological innovation, and resilient infrastructure in achieving the SDGs. Economies with strong infrastructure and service provisioning (including internet connectivity, transport, and utility services) systems along with a diversified industrial sector sustained less damage and experienced faster recovery post pandemic. Although in 2021, the manufacturing sector has rebounded, the growth has been uneven,

with LDCs being worst hit by the crisis. Almost one in three manufacturing jobs have been negatively impacted, with youth, women, and low and middle skilled labour having suffered the most losses. The manufacturing sector is a strong proxy to assess the functionality of infrastructure in place. It is also a strong proxy to assess domestic revenue buoyancy for countries undergoing structural transformation, particularly in the Global South. A healthy manufacturing and industrial sector indicates stability in economic system and becomes a strong basis for infrastructure investments.



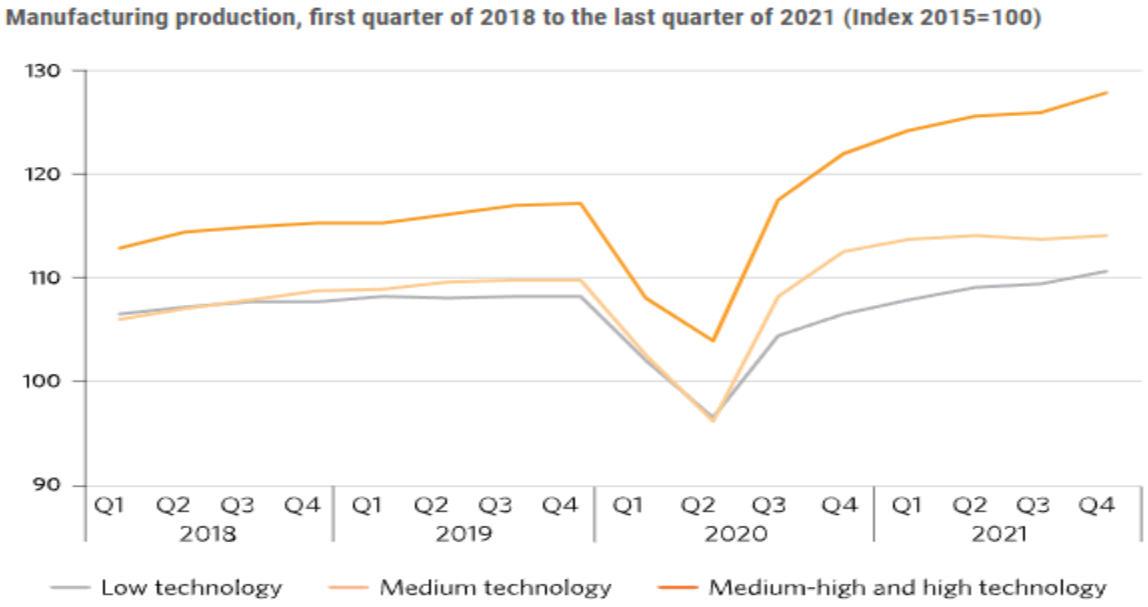
After experiencing a drop of 1.3 percent, the global manufacturing output grew by 7.2 percent in 2021 (See Fig xx). High income economies experienced a much faster recovery due to efficient industrial policy supporting households and firms. On the contrary, the global trade disruption, volatile and subdued global demand and contractionary domestic economic policies have led to a sluggish growth in LDCs.

Middle income countries have long leveraged their embeddedness in global production chains as a source of growth and employment. Thus, the negative impacts of the pandemic on manufacturing sector jobs have been more profound in these economies, with a decline in manufacturing employment by 8.9 percent in 2020. High income economies experienced a decline of 3.9 percent, followed by low-income countries, with a decline in manufacturing employment by 3.4 percent (Figure xx). Nexus of manufacturing led economic growth, infrastructure, economic growth, and employment – all are connected in a global landscape and crucial for sustained economic growth.



The vitality of government support for the survival and recovery of *Small Scale industries* (SSI) during and post crisis became evident during the pandemic. SSIs are more vulnerable to economic crises due to their scale, greater dependance on supply chains and limited access to financial resources. Thus, the SSIs suffered a hard blow, with many of these enterprises collapsing due to lack of access to credit and government support related to COVID19. The situation was even worse for informal small-scale enterprises. Government support in the form of economic stimulus, although crucial for survival of SSIs, is rarely available in low-income countries. Only 15.7 per cent of small-scale industries in Africa received formal credit, compared with 44.2 per cent in Latin America and the Caribbean. This would put an additional strain on domestic budgetary resources and potentially impact availability of capital for infrastructure investment.

The role of *industrial policy and technology and innovation policy* is crucial in making economies resilient. The COVID19 demonstrated that high-tech manufacturing industries are more resilient as compared to low-tech industries, hence noting a faster post-pandemic recovery (Fig xx).



Most medium and high-tech industries (for example, electronics, computers, and pharmaceuticals) barring motor vehicles and other transport equipment manufacturing, have already returned to pre-pandemic production levels. The supply chain disruptions of intermediate goods and resources have led to slow recovery of the motor vehicle manufacturing sector. In contrast, low-tech industries including coke and refined petroleum products, clothing and textiles are yet to rebound back to pre-pandemic levels of output. 2019 data suggests that the proportion of medium and high -tech industries in total manufacturing was 47.7 percent in North America and Europe, while this share was 21.4 percent in Sub-Saharan Africa and 10.5 percent in LDCs. This partially explains the higher resilience of the manufacturing sector in high income countries compared to LMICs and how crucial the nexus between economic growth, infrastructure and employment is. Low tech industry proliferates in the Global South, with some serious progress in putting up high tech industries. In the short to medium term, ensuring that low tech industries, owing to their employment generation potential, remain functional would be crucial and the role of infrastructure in sustaining these would be crucial.

Global financial stability risks have increased, with the balance of risks skewed to the downside. Amid the highest inflation in decades, because of uncertainty about future performance, markets have been extremely volatile. With financial conditions tightening, key gauges of systemic risk, such as dollar funding costs and counterparty credit spreads, have risen. **There is a risk of a disorderly tightening of financial conditions that may compound existing financial sector vulnerabilities, making the availability of capital increasingly volatile. Hence, the ability of buoyant public resources and its potential in crowding in private capital would be a key driver of short to medium term infrastructure investments.**

In emerging markets, rising rates, worsening fundamentals, and large outflows have pushed up borrowing costs notably. The impact has been especially severe for more vulnerable economies, with 20 countries either in default or trading at distressed levels. Unless market conditions improve, there is a

risk of further sovereign defaults in frontier markets. Large emerging market issuers with stronger fundamentals, by contrast, have proved resilient thus far.

In China, the property downturn has deepened as sharp declines in home sales during lockdowns have exacerbated pressures on developers, with heightened risk of spill over to the banking, corporate, and local government sectors. In many other countries, the housing market is still showing signs of overheating and there is a risk of a sharp fall in house prices as mortgage rates rise, affordability falls, and lending standards tighten.

Infrastructure investment trends

In **emerging markets, capital formation is reasonably high but linked to private investment (See Table below)**. Sustaining the flow of private capital into resilient infrastructure needs appropriate underlying supporting governance frameworks and institutional capacity. While there may be sufficient capital available globally to finance infrastructure, it remains unclear how these capital flows can be facilitated and, in some cases, redirected to disaster and climate resilient infrastructures. Return on capital, thus, becomes an important constraint on investment.

Table 5

Two broad trends underpin the investment dynamics. Firstly, we do not see substantial increase in revenue mobilization (See Table xx below) within countries which means that the external financial architecture will be key for infrastructure investments. It appears, and owing to Covid shock, most of the present and incremental domestic resources will be redirected towards addressing development setbacks. Secondly, combined total of private and public investment into infrastructure as a per centage of gross savings is on the decline, which is alarming. It appears that some of this money is going into short-term investment choices and not directed at infrastructure. There is an alarming decline from a peak of nearly 1.6% to about 0.4%, and we require a stable money flow regime that ensures that global savings are appropriately redirected into infrastructure and domestic governance regimes are attuned towards ensuring that these investments generate reasonable financial returns,

Table 6

In Low-income countries, capital formation is low, driven by private capital but with very little domestic resource mobilization. This is important because **domestic resource mobilization is directed to addressing basic development needs and servicing debt**. **High interest rates exacerbated by infrastructure risk and growing debt servicing, continue to constrain infrastructure investors.** **I**nadequate private capital is flowing to Africa, largely due to high risk attributable to local infrastructure governance conditions.

Table 7: Regional distribution of xxx

Real public capital stock growth remains low in Advanced High-Income Economies and is the highest among LIDCs. **PPP investment flows are highest in low-income countries on average but have fallen since the financial crisis in all countries**. These investments cover spending on various infrastructure services, including energy, water, transport, and telecoms. PPP investment flows remain highest in low-

income countries on average but have fallen since the financial crisis in all countries. These investments cover spending on various infrastructure services, including energy, water, transport, and telecoms.

To compare and analyses we have used the normalized GDP in Billion US Dollar reported by IMF and infrastructure investment in 7 sectors. It has been found that, in year 2020, low income developing countries have 0.08% of infrastructure investment as compared to emerging market economies at 1.3%. By 2040, It is expected that advanced economy will gradually increase the infrastructure investment at 1.06% from 0.7% in 2010.

Sustained global and regional economic growth and macroeconomic stability and lowering effective cost of capital is critical to finance infrastructure and sustainable development. Domestic resource mobilization within low- and many middle-income countries is not sufficient to finance resilient infrastructure due to lack of revenue buoyancy, debt repayments, limited growth enhancing infrastructure, inefficient institutional capacity, and appropriate governance mechanisms.

Global capital could possibly be attracted towards creating new capital infrastructure in advanced economies and thereby, reduce availability in the low income and emerging economies. Private capital becomes a key feature to finance infrastructure, which requires effective governance to guarantee adequate returns.

Infrastructure Investment needs

Building on the analysis undertaken by the Global Infrastructure Hub and Global Infrastructure Outlook following are the broader emerging trends.

A 0.5% of global GDP is necessary to fill the infrastructure gap. Current annual infrastructure investment is 3% of global GDP, i.e., USD 79 trillion between 2016-2040. The investment gap is USD 15 trillion between 2016-2040 period, which is approximately 20% less compared to current rates of investment.

Over half of global infrastructure investment needs are in Asia. Three of the five countries with the greatest infrastructure need are in Asia (China, India and Japan), with those countries comprising 39% of global infrastructure investment needs. China alone is expected to need $28 trillion in infrastructure investment, which is more than half of Asia's total needs and 30% of global needs. The Americas and Africa are forecast to have the largest infrastructure gaps, at 32% and 28% of their needs respectively, while Asia and Oceania are close to meeting their needs.

Significant variations in investment gaps across regions. North America: The US's $3.8 trillion infrastructure gap is the most significant of any country. Africa: Most African countries have very large infrastructure needs and face significant investment gaps. South Africa, Nigeria and Egypt are forecast to meet 69% of their infrastructure need. Oceania: Australia and New Zealand are broadly on track to meet more than 90% of their infrastructure needs.

The majority of global infrastructure investment gap is in the road and electricity sectors. Outlook estimates an $8 trillion infrastructure investment gap in roads, which represent more than half of the total global infrastructure investment gap. Although the electricity sector represents the second largest infrastructure investment gap at $2.9 trillion, most of that gap is in developing and emerging countries.

Table 8

Given fiscal constraints, the public sector can raise barely half of that amount. Private investment is essential for bringing in the required resources and is expected to fill the gap. Given their relatively stable long-term cash flows and low correlation to other asset classes, infrastructure investments could also be very attractive to the private sector – especially to institutional investors, such as pension funds, insurance companies and sovereign wealth funds.

Table 9

The Challenge of Sustainable Development Goals

It is reasonably clear that the Covid shock has stretched many countries on the SDG implementation agenda. Massive amounts of capital would need to be mobilised, both domestically and internationally, to address core development challenges. The most recent estimates indicate that Goal 3 (Health), particularly on universal health coverage, suffers from an annual investment gap on USD 257 billion while reversing the gains on education would require an additional fiscal outlay of nearly USD 193 billion annually. These additional capital requirements have two implications. Firstly, amidst constraints on domestic revenue mobilisation and its buoyancy; most of the domestic allocations may potentially be directed towards addressing core human development dimensions: health and education. This would reduce capital availability for infrastructure and would again emphasize the need for crowding in private capital for infrastructure. Secondly, priority of countries on infrastructure would be spend on local infrastructure improvements such as on improving water access and sanitation or enhancing access to modern energy. See Box below that indicates the necessity to focus on local infrastructure to improve development outcomes in a local context.

The most recent financial assessment around SDGs implementation indicate that it would require significant fiscal outlays as well as private investments, potentially leaving very little room for investments into strategic infrastructure. The assessment indicates that the governments of Low-Income Developing Countries (LIDCs) will require a substantial increase in fiscal (budget) revenues, far beyond what they can achieve by their own fiscal reforms. For this reason, SDG financing will require substantial international cooperation to enable the LIDCs to finance their SDG fiscal outlays.

Box 1. Progress and Challenges on SDG 6 and 7

Goal 6: WATER

Universal access to drinking water, sanitation and hygiene is critical to global health. ***To reach universal coverage by 2030, current rates of progress would need to increase fourfold.*** Achieving these targets would save 829,000 lives annually. This is the number of people who currently die each year from diseases directly attributable to unsafe water, inadequate sanitation, and poor hygiene practices. 2 billion people were without such services, including 1.2 billion people lacking even a basic level of service. Eight out of 10 people who lack even basic drinking water service live in rural areas, and about half of them live in LDCs. ***At the current rate of progress, the world leaves 1.6 billion people without safely managed drinking water supplies and 2.8 million people without access to safely managed sanitation services.***

Goal 7: ENERGY

Progress in electrification has slowed with the challenge of reaching those hardest to reach. The global electricity access rate increased from 83 per cent in 2010 to 91 per cent in 2020. Over this period, those without electricity shrank from 1.2 billion to 733 million. ***But the pace of progress has slowed in recent years, due to COVID-19 and the increasing complexity of reaching those hardest to reach.*** If current trends continue, only 92 per cent of the world's population will have access to electricity in 2030, leaving 670 million people unserved***. A major push is needed to reach those living in least developed and in fragile and conflict-affected countries.***

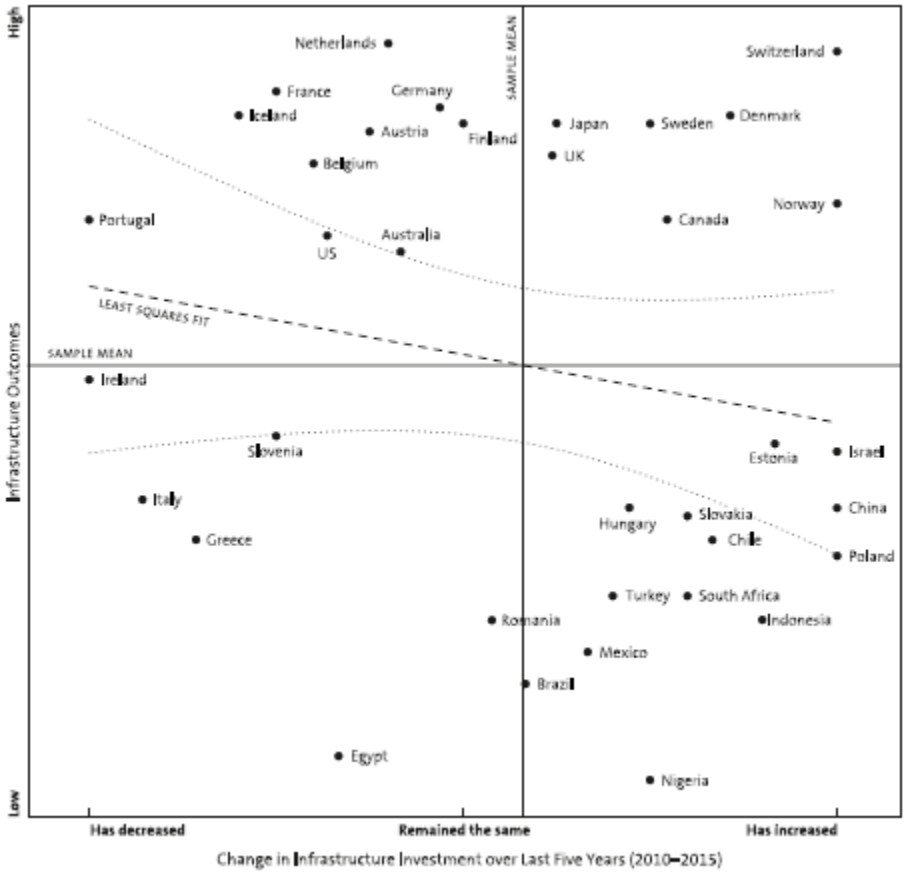
According to the recent estimates, the average SDG financing gap per year for all 59 LIDCs is of the order of $400 billion between 2019-2030. This is a huge sum, of course, from the point of view of the world's poor countries (See Table xx below for sector wise estimates). The total SDG financing needs, globally, are around USD 874 billion annually. ***Yet it is a manageable sum when viewed in the context of global production, constituting roughly 0.4 percent per annum of Gross World Product, and roughly 0.7 percent per annum of the combined GDP of the world's advanced economies.*** What is therefore needed is an international mechanism that facilitates money flows for development, utilizes this development financing opportunity to build resilient infrastructure systems and link back development progress to increased economic activity. It is also a reasonable investment to tackle urgent and complex issues such as climate change, biodiversity loss, healthcare, education, social protection, water, sanitation, and green infrastructure in the world's LIDCs.

Table 10

Infrastructure governance: a key challenge and driver of resilient infrastructure

Increased spending on infrastructure does not necessarily translate to better infrastructure outcomes. **Fragmented governance and lack of investments in establishing predictable institutional arrangements and regulations have led to infrastructure systems and services failing to become resilient and meet their societal objectives.** In countries such as China, Poland, Israel, and Estonia, where investments have increased in the past five years, it can be noted that the outcomes remain relatively low. In contrast, countries like Portugal and Ireland are considered to have better infrastructure outcomes, although investments have declined in the past five years (See Figure xx below).

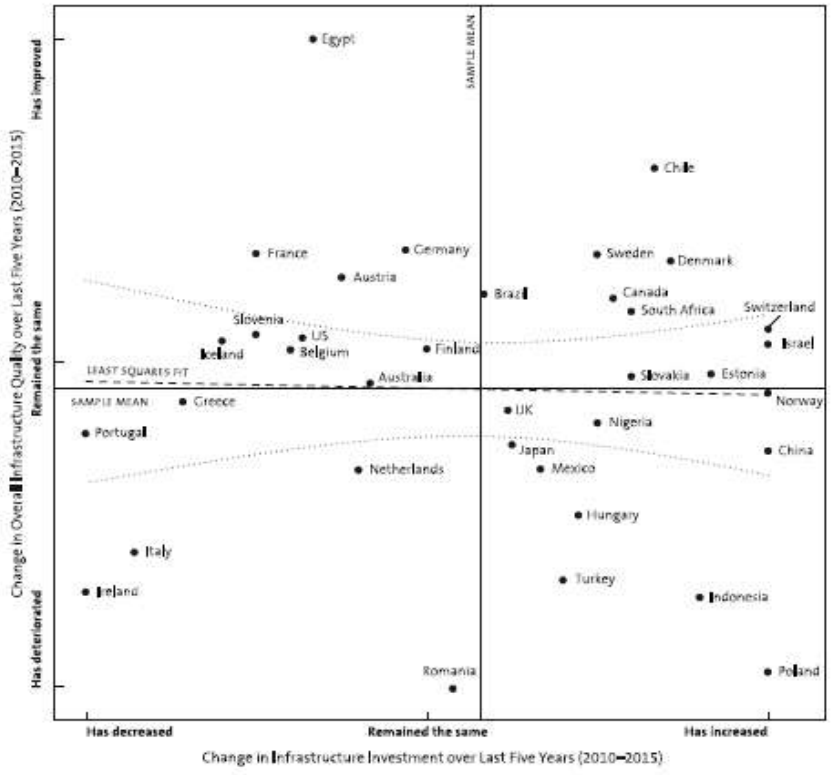
Figure xx: Change in infrastructure spending over the last 5 years and infrastructure outcomes performance



Source*: The Governance Report, 2016*

Similar trends were observed between changes in infrastructure investments over five years as reported by the Herti School-OECD survey and a country's quality of infrastructure as measured by the World Economic Forum's Global Competitiveness Index (GCI). The GCI ranks countries based on the quality of their roads, railroads, ports, and air transport infrastructure and on the reliability and stability of their energy and telecommunications networks. Figure xx, below, shows that an increased spending has not necessarily improved infrastructure quality. While numerous countries have increased their spending in the past five years, only a handful of countries like Chile and Sweden have managed to increase the overall quality of their infrastructure services. Most countries (e.g., Poland, Indonesia, Turkey) experienced little to no improvements in quality despite increased investments. In sharp contrast to this, countries like Egypt experienced an improvement in quality despite decreasing investments.

Figure xx: Change in infrastructure spending and overall infrastructure quality over a five-year period (2010-2015)



Source: *The Governance Report, 2016*

A **Government's ability to implement resilience-building depends primarily on whether it has effective systems in place to finance, and also implement, manage, and maintain infrastructure assets.** In many cases infrastructure systems are not designed to keep up with the ever-rising demand or are a result of poor management and maintenance, with climate change and disasters exacerbating these issues. The

first step to make infrastructure systems resilient is to make them reliable in 'business-as-usual' conditions through appropriate infrastructure design, operation, and maintenance.

Improving resilience of infrastructure systems is often associated with the implementation of structural measures that could reduce or avoid possible impact or exposure. Similarly, merely increasing the availability of investments does not provide high quality infrastructure that is resilient to climate change and disasters.

Building infrastructure resilience extends significantly beyond climate change and disaster resilient engineering to full cycle and lifecycle resilience, that involves appropriate governance, institutional arrangement, policy, regulation, and managed supply of value chains and extended infrastructure. This requires imaginative resilience thinking and resilience building among stakeholders, across the whole infrastructure lifecycle.

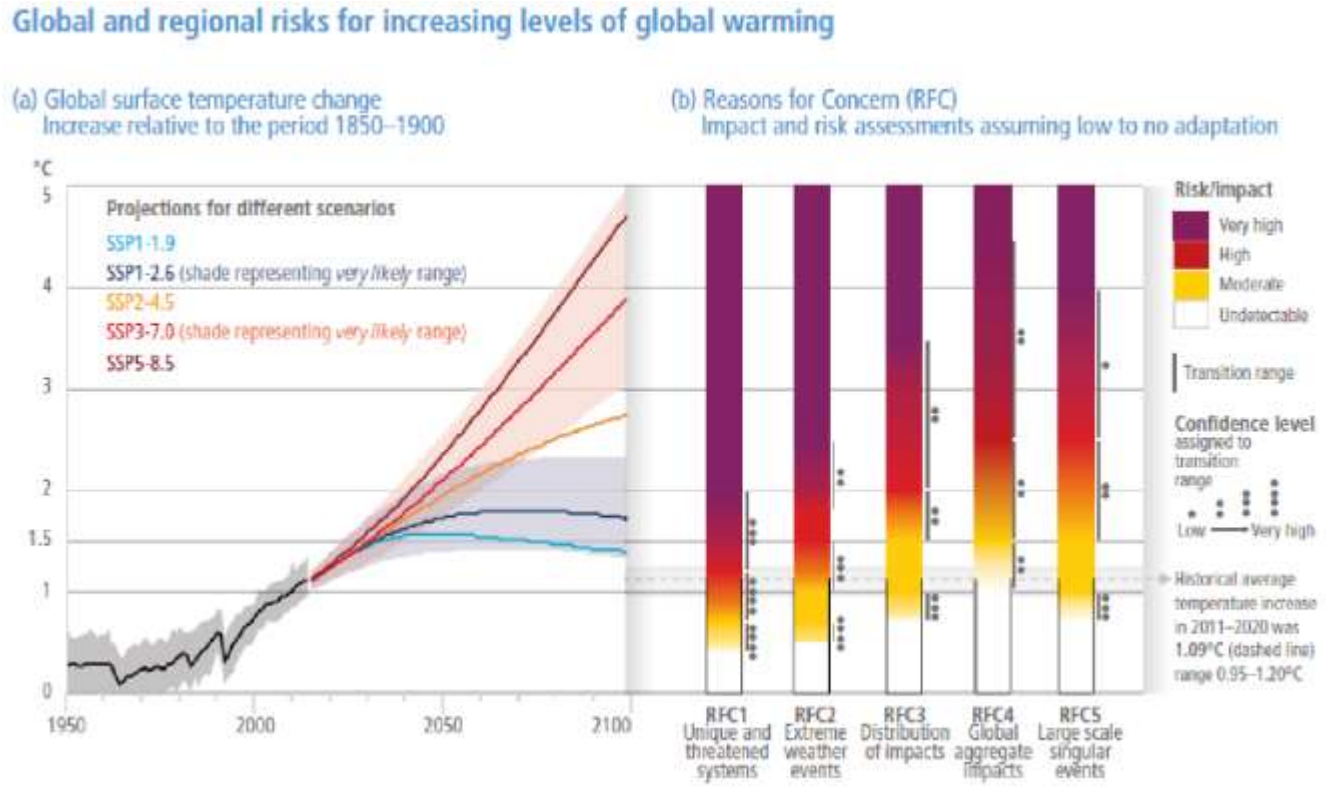
At each stage, there exists opportunities to enhance the resilience value of an infrastructure system and to ensure the resilience value that was built into the system in the earlier stages is retained. Given the complexities, infrastructure governance is then not a linear process that is controlled by a specific actor or a set of actors. Rather, governance is the interaction of numerous actors, each with their own mandates and strategies to achieve them. Thus, to enhance the resilience of an infrastructure system it becomes pertinent to understand the numerous stakeholders and actors involved and the role they play across the whole infrastructure lifecycle (CDRI, 2021).

Improved infrastructure governance is a key driver of directing adequate capital allocations into building resilient infrastructure. Infrastructure planning, its management, delivery of outcomes are key dimensions that define the landscape of infrastructure governance. Infrastructure planning attempts to understand the mechanics of informing government policy making. It involves generation of sufficient and adequate information that assists in making decisions about planning and funding infrastructure projects. Infrastructure management captures governments' coordination and regulatory capacities, including demonstratable control and oversight over project and decision-making processes and effective coordination across multiple actors and organizations with diverse interests and goals. Infrastructure outcomes capture the government's delivery capacity in terms of the ways in which they implement policies.

Political risk is the main reason why some investors, even when urgently seeking investment opportunities, will simply not consider infrastructure assets in emerging and developing countries. Of course, a well-designed system of regulation is advantageous for society, and infrastructure investors have no problem with regulation per se. Rather, their concern is that laws and regulation can change unexpectedly; that is how political & regulatory risk arises, and the risk applies particularly strongly to infrastructure investments. Such investments typically involve a very long asset lifetime and contractual relationship, and payback well beyond the term of any individual government. Given this mismatch between political cycles and the infrastructure cycle, infrastructure investors are understandably cautious.

Climate Change Investment Dynamics

With every 0.1 C rise in global warming, the severity and frequency of weather and climate extremes has and would intensify, with implications for infrastructure systems and by extension, development. These trends underscore the importance of creating resilient infrastructure and to ensure that existing infrastructure systems are retrofitted for resilience.



Increasing weather and climate extreme events "have exposed millions of people to acute food insecurity and reduced water security", with the most significant impacts seen in parts of Africa, Asia, Central and South America, small islands, and the Arctic. Approximately 50-75% of the global population could be exposed to periods of "life-threatening climatic conditions" due to extreme heat and humidity by 2100. Climate change "will increasingly put pressure on food production and access, especially in vulnerable regions, undermining food security and nutrition".

Climate change and extreme weather events "will significantly increase ill health and premature deaths from the near- to long-term". There are warming signs that if global warming passes 1.5C – even if overshooting that global average temperature temporarily before falling back again – "human and natural systems will face additional severe risks", including some that are "irreversible".

Gaps **exist between current levels of adaptation and levels needed to respond to impacts and reduce climate risks**. These gaps are "partially driven by widening disparities between the estimated costs of adaptation and documented finance allocated to adaptation", adding that the **"overwhelming majority" of global climate finance has so far been targeted at climate change mitigation.** Looking at the

landscape of climate finance in 2019-20, majority of the finance went to mitigation (USD 571 billion/ 90.1 %), while adaptation finance totaled USD 46 billion (7.4 %). Further, 2.5 % of the total climate finance (USD 1.5 billion) went to projects with dual benefits (adaptation and mitigation) in 2019-20.

A broad-based approach to deploying energy sector mitigation strategies can reduce emissions in the next decade and set the stage for deeper emission reduction post 2030. However, near term options will not be sufficient to limit warming to 2°C or to 1.5°C with no or limited overshoot. Illustrative Mitigation Pathways (IMPs) to limit warming to 2°C or lower include a significant role of Carbon Dioxide Removal.

The above scenario, broadly, entails substantial energy system changes over the next 3 decades. Strategies include reduced fossil fuel consumption, increased production from zero and low carbon energy sources and an increase in use of electricity and alternate energy carriers. The challenge of deploying resilient infrastructure would need to be aligned with the imperative of the 1.5C pathway.

If **investments in coal and other fossil fuel infrastructure continue, the energy systems will be locked-in to higher emissions, making it more difficult to limit warming to 1.5°C or 2°C.** Energy system transition strategies include reduced fossil fuel consumption, increased production from zero and low carbon energy sources and an increase in use of clean electricity and alternate energy carriers.

Net-zero CO2 energy systems entail: a substantial reduction in overall fossil fuel use, minimal use of unabated fossil fuels, and use of CCS in the remaining fossil fuel system; electricity systems that emit no net CO2; widespread electrification of the energy system including end uses; energy carriers such as sustainable biofuels, low-emissions hydrogen, and derivatives in applications less amenable to electrification; energy conservation and efficiency; and greater physical, institutional, and operational integration across the energy system. CDR will be needed to counterbalance residual emissions in the energy sector. The most appropriate strategies depend on national and regional circumstances, including enabling conditions and technology availability. **This indicates new categories of infrastructure asset class, would require resilience thinking to be imaginative within the unfolding energy transition and the ability to navigate through complex multi-level governance and institutional dynamics.**

A low carbon energy transition would create new economic opportunities and shift investment patterns. Between now and 2050 a significant chunk of growing investment share would be in emerging economies, particularly Asia and would be dominated by renewable led electricity generation.

In mitigation scenarios, aligned to the Paris Agreement, total energy investment needs would rise over the coming decades. However, these increases would be far less pronounced in comparison to the anticipated reallocation of investment flows across subsectors. For example, from fossil fuels without CCS towards RE, nuclear power, electricity networks and storage, and end use energy efficiency. Between now and 2050 a significant chunk of growing investment share would be in emerging economies, particularly Asia. The opportunity emerging from global efforts towards creating an institutional mechanism that facilitates redirection would enable capital flows and these capital flows have to be leveraged to mainstream resilience into new infrastructure systems.

Economic, regulatory, social, and operational challenges increase with higher shares of renewable electricity and energy. The ability to overcome these challenges in practice is still evolving and would be critical in ensuring that clean energy investments catalyze economic and social development.

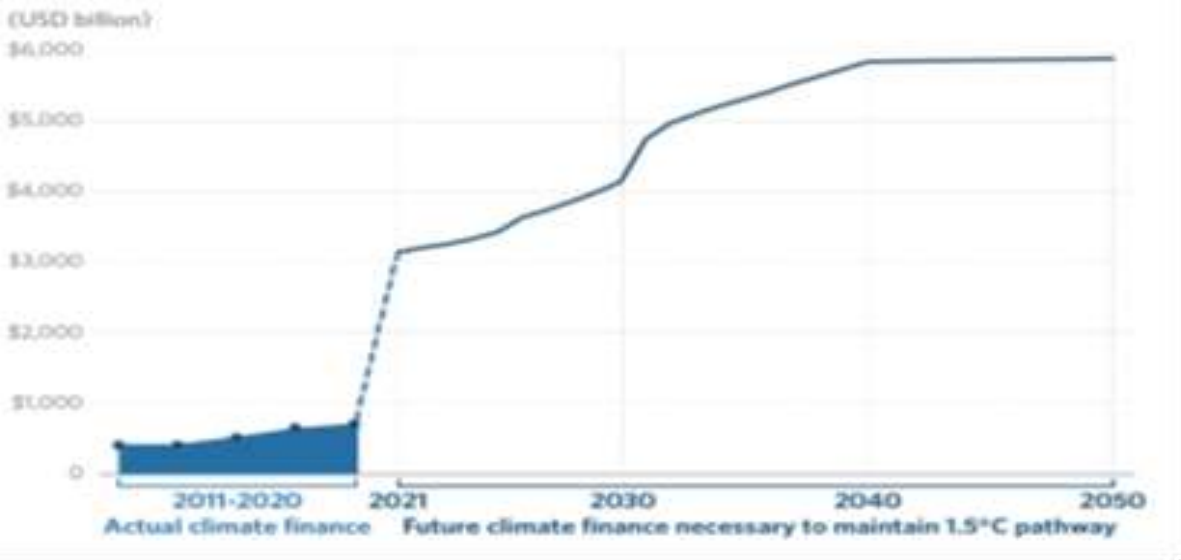
Electricity systems powered predominantly by renewables will be increasingly viable over the coming decades, but it will be challenging to supply the entire energy system with renewable energy. Large shares of variable solar PV and wind power can be incorporated in electricity grids through batteries, hydrogen, and other forms of storage; transmission; flexible non-renewable generation; advanced controls; and greater demand-side responses. Because some applications (e.g., aviation) are not currently amenable to electrification, it is anticipated that 100% renewable energy systems will need to include alternative fuels such as hydrogen or biofuels. Economic, regulatory, social, and operational challenges increase with higher shares of renewable electricity and energy. The ability to overcome these challenges in practice is not fully understood. The links between the ability of clean energy transition in catalyzing economic and social development would be crucial. This would enable buoyancy in revenue systems, create a stable demand environment that warrants improved governance regimes and would, incrementally, generate resources to maintain existing infrastructure and create new infrastructure systems.

Increased buoyancy of climate finance can be leveraged to deliver greater investment in resilient infrastructure. Lack of financial flows into managing physical risks and substantial financial needs for mitigation need careful attention.

Current approaches to risk mitigation have predominantly focused on deploying **financial risk-sharing instruments** to transfer part of the risk premium associated with specific transactions. While these mitigation products are being deployed more regularly in emerging markets, they impose a financial cost onto a transaction, which is invariably passed on to the end-user through higher tariffs. Sometimes, even public finance providers or impact investors consider the risks too high or too hard to assess. Adopting a broader, more comprehensive approach to risk mitigation is required to improve the attractiveness and business environment of countries, sectors and projects for private capital. Risk mitigation needs to be understood as going beyond just financial risk mitigation products, towards a broader concept of **non-financial risk mitigation measures.**

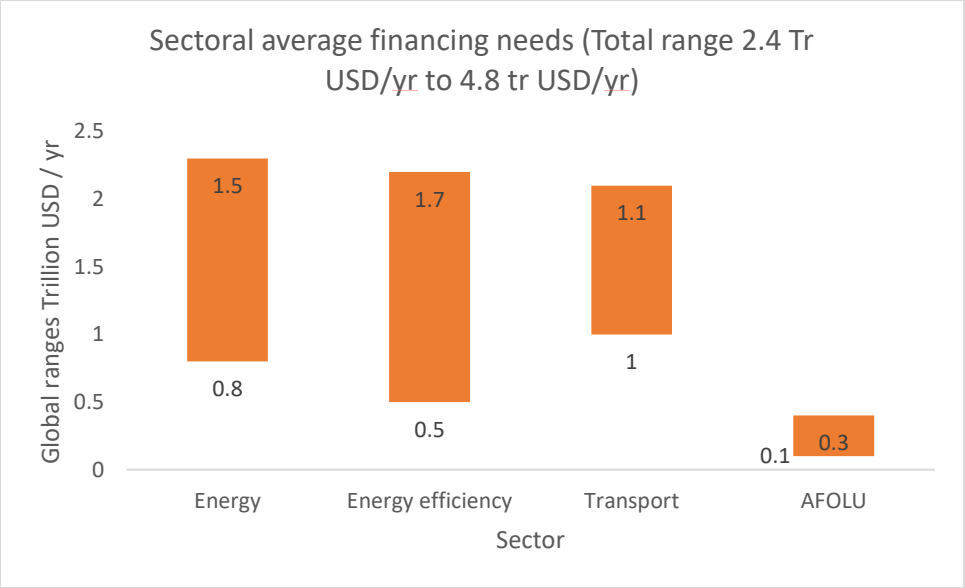
Tracked financial flows fall short of the levels needed to achieve mitigation goals across all sectors and regions. Fossil fuel investments exceed USD 850 billion and continue to flow in key sectors hence neutralizing the impact of new climate (adaptation and mitigation) finance.

Conservatively estimated climate finance needs amount to USD 4.5 to 5 trillion annually (Buchner et al., 2021). See Figure xx below. High-emissions investment continue to flow in key sectors. Scaling up mitigation financial flows can be supported by clear policy choices and signals from governments and the international community. Accelerated international financial cooperation is a critical enabler of low-GHG and just transitions and can address inequities in access to finance and the costs of, and vulnerability to, the impacts of climate change. Climate finance commitments also need to reflect in the real economy, thus aligning all private and public sector investments with net zero and Paris goals would imply sustainable macroeconomic pathways.



Total mitigation investments (public, private, domestic, and international) would need to increase dramatically across all sectors and regions. Average annual investment needs for 2020 to 2030 in scenarios that limit warming to 2°C or 1.5°C are a factor of 3-6 times greater than current levels. See Figure below for some sectoral estimates. A significant share of investment needs exists in heavily regulated sectors including public transport, electricity, and telecom. There is, therefore, a need for emphasis on regulatory interventions such as increasing market access, enabling adequate returns, guarantees and flexibility in ownership regimes.

There has been a lot of debate around the regulated ownership of private sector (European Commission 2017), which resulted in restructuring of the electricity market, leading to low investments in baseline electricity capacity and research and innovation. Such interventions lead to barriers to market entry, uncertainty of investment, and potentially limit market competition, ultimately leading to restricting new investments (Joskow 2007; Grubb & Newbery, 2018). This is especially a challenge in developing nations (Foster & Rana, 2020).



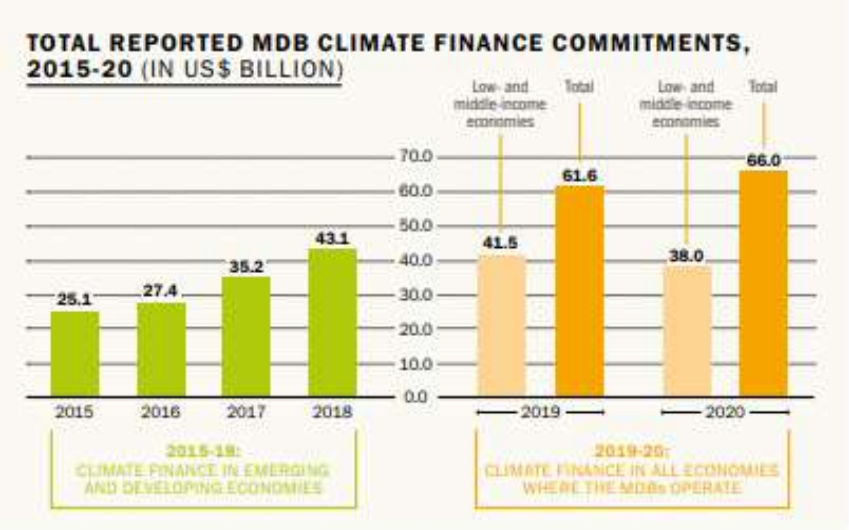
Sustainable infrastructure investments like other infrastructure investments offer significant development opportunities. Options to scale up mitigation in LMICs include increased levels of public finance and publicly mobilized private finance flows from developed to developing countries, increased use of public guarantees to reduce risks and leveraging of independent private capital. Clear signaling by governments and the international community, including stronger alignment of public sector finance and policy, investors and financial intermediaries, central banks, and financial regulators can support climate action and can alter the systemic underpricing of climate-related risk. This would also enable the creation of a conducive macroenvironment for investment flows for resilience building.

Transformation of the global energy system need not require a major increase in total investments. A pronounced reallocation of the investment portfolio is inevitable. The NDCs will not provide the impetus for this structural shift. To chart a course toward 2 °C and 1.5 °C, annual investments in low-carbon energy will need to overtake fossil investments globally by 2025 or before. These inevitable investment flows could help fill the infrastructure investment gap and help accelerate the incremental marginal investment to create resilient infrastructure. Such a structural shift would help create a stable demand environment for resilient infrastructure creation.

Accelerated financial support from developed countries and other sources to LMICs is a critical enabler for the creation of low energy assets. Financial flows can be aligned with funding needs through greater support for technology development, a long-term role for multilateral and national climate funds and development banks, lowering financing costs for underserved groups through green banks, and funds and risk-sharing mechanisms. **Economic instruments which consider economic and social equity** and distributional impacts, gender-responsive programs & enhanced access to finance for local communities and Indigenous Peoples and small landowners and public-private partnership are also

crucial to mobilize and scale up infrastructure investments. This would create a mechanism to create resilient infrastructure as a new and emerging asset class.

The public sector continues to provide almost all the adaptation finance, while the private sector provides most of mitigation finance. Debt at market rate, through corporate/ project finance was the largest financial instrument used to channel climate finance in 2019-20. Market rate debt at USD 337 billion per annum accounted for 53 percent of the total climate finance, followed by equity investments (33 %) and grants (6%). Climate finance provided in the form of low-cost project-level debt reached USD 47 billion annually in 2019/2020, **94% of which came from DFIs**. **This represents a decrease from the USD 65 billion from the 2017/2018 annual average. These structural dimensions indicate a necessary**



shift in investment flows into managing physical risks and enhanced equity inflow into project funding landscapes. These shifts would be necessary to enable creation of resilient infrastructure regimes.

Key Issues that underpin the resilient infrastructure transition

Leveraging the cost of capital

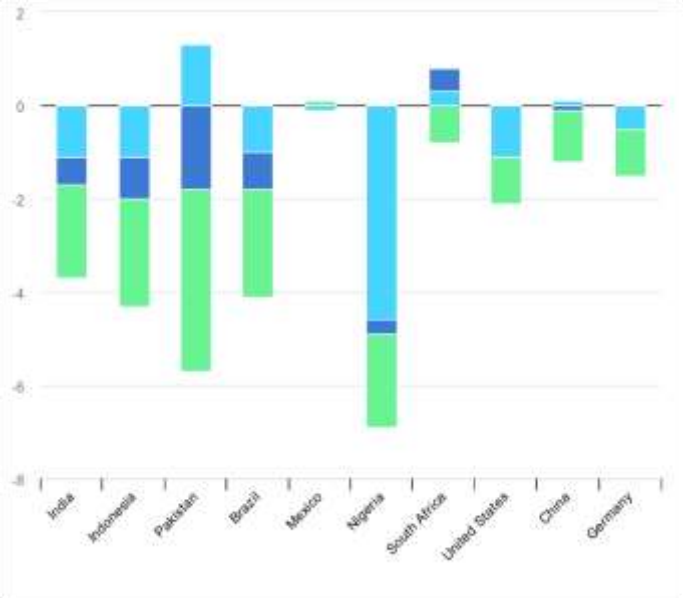
The cost of capital offers a critical benchmark to assess the risk and return preferences of investors and the pricing of investment in infrastructure. Inappropriate assumptions around the cost of capital can lead to potential under- or overinvestment. Thus, mispricing of risk that underpins the creation of infrastructure has implications for the orderliness of the infrastructure transitions.

Achieving net zero emissions largely depends on a considerable increase of capital intensive clean energy assets (e.g. Wind, EV, solar PV and hydrogen electrolysers). These infrastructure feature high upfront investment costs and lower fuel and operating expenditures in the long run. The cost of capital serves as a critical lever for financial flows to influence choices and prices in the real energy economy.

About 70 percent of clean energy investment over the next decade will be made by private financers, developers, and consumers. Rapidly increasing demand along with an investment gap in this sector implies enhancing access to low-cost financing, especially in LMICs.

Debt financing costs have declined due to a fall in benchmark government bond yields across many economies. This decline results from more accommodative monetary policy, a trend which continued in the second half of 2020 despite an uptick during the height of the Covid-19 crisis.

Equity market risk premiums have also fallen in many countries. In 2021, market trends point to somewhat higher levels of cost of capital, however, as bond yields in global benchmark economies, such as the United States, have crept upwards in response to inflationary pressures. Cost of capital for utility-scale solar PV and onshore wind range from 3-6%, depending on the region, while offshore wind is assessed at 4-7%. For the end-use sectors, baseline cost of capital assumptions can be much higher and vary widely within buildings (5-25%), industry (4-15%) and transport (4-15%), reflecting the differentiated nature of investors and assets (from households to large corporations) across regions.



Accelerating and deepening private finance

Private finance is key to achieving net- zero and the linked resilient infrastructure transitions. Public budgets are strained in the wake of the COVID-19 crisis and borrowing conditions in emerging markets have tightened. Establishing the right policy environment to attract private finance would be crucial, as stable policies and equitable arrangements incentivize private investment, which in turn helps achieve policy objectives.

The market for sustainable finance in emerging markets and developing economies is advancing fast, particularly in Asia. Private investors are increasingly looking for investment opportunities with a positive climate impact, but a lack of investable green projects make it complex. Environmental, social, and governance (ESG) investments have grown rapidly, but their climate impact is unclear. Emerging

market and developing economies are at a disadvantage because of systematically lower ESG scores and hence, low investment allocations from ESG funds.

Despite these challenges, there are various opportunities to scale up private climate finance. Innovative financing instruments, such as emerging market green bond funds, can attract the necessary private institutional investors. Outcome-based debt instruments, such as sustainability-linked bonds, can also benefit emerging market issuers—if the key contractual aspects are set appropriately.

Private investment in infrastructure projects in primary markets is almost back to pre-pandemic levels, but growth rates are low or stagnant. Private investment in infrastructure projects in primary markets has been stagnant for eight years running at the USD 172 billion level in 2021. The **level of investment in middle- and low-income countries continues to decline.** The gap between private investment in high-income countries and that in middle- and low-income countries keeps widening.

In 2021, private investment in infrastructure projects grew by 8.3% in high-income countries, while investment in middle- and low-income countries fell by 8.8%. In 2021, 80% of private investment in infrastructure projects occurred in high-income countries and 20% in middle- and low-income countries. While the declining trend in infrastructure investment in middle- and low-income countries began before the pandemic, it was exacerbated during the crisis, and investment levels remain significantly lower than those seen in high-income countries.

The renewables sector continues to attract the most investment, garnering almost half of total private investment in infrastructure projects in 2021. Private investors in 2021 are showing a growing interest in telecommunications and social infrastructure, sectors that have historically attracted very low levels of private investment.

In the last decade, returns on private infrastructure debt increased strongly. This trend temporarily stalled during the pandemic, and global economic shocks negatively impacted returns in the first half of 2022 due to rising interest rates. Returns on private infrastructure debt were consistently positive over the preceding decade up to the onset of the pandemic, given the low-interest-rate environment. In 2020 and 2021, index levels remained resilient notwithstanding the pandemic, but in the first half of 2022, rising interest contributed to a decline in demand for and return on private infrastructure debt. Still, the asset class remains attractive for private investors as its inflation-hedging potential is stronger than that of other investment options.

The amount of private capital available for infrastructure more than quadrupled from 2010 to 2021. The availability of more private capital for infrastructure has resulted in an increase in infrastructure investment by funds. The capital committed by investors and available to fund managers, known as dry powder, but not yet invested or allocated, has quadrupled from USD 72 billion in 2010, to USD 298 billion in 2021.

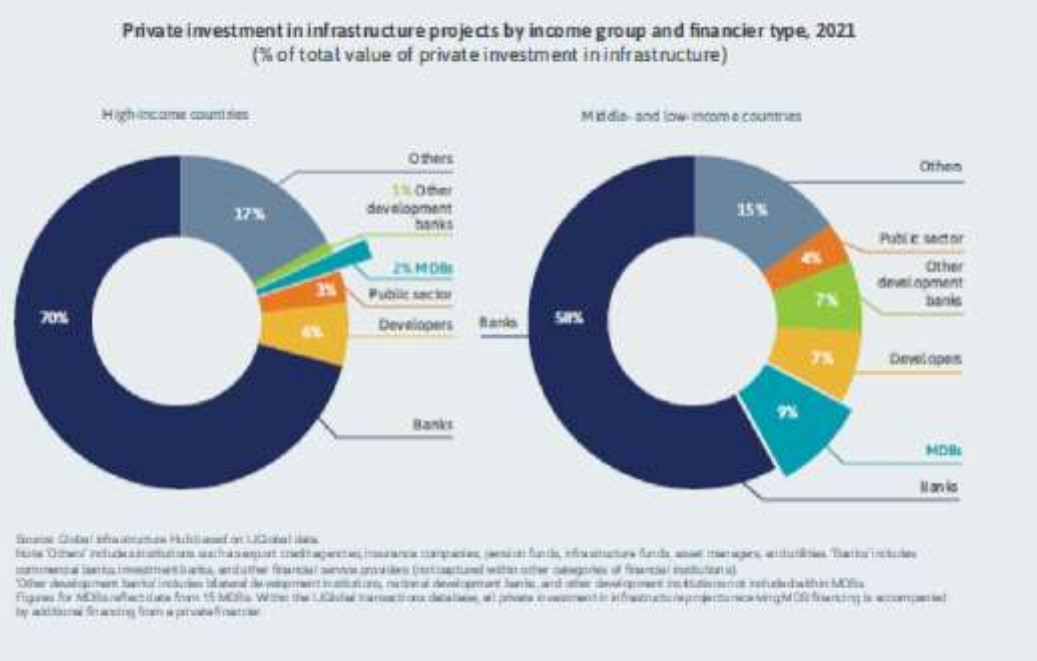
Available funds are not fully deployed for several possible reasons, including: the limited availability of bankable infrastructure projects creates a level of demand that exceeds supply of projects. A globally uneven distribution of bankable infrastructure projects exacerbates the shortage of projects. High hurdle rates of infrastructure funds constrain fund managers from investing in infrastructure assets.

Trends in hurdle rates have not aligned with trends in returns over time. An analysis of 25 funds established from 2005 to 2021 inclusive, reveals that hurdle rates remained at 8% for over a decade across regions and sectors.

Critical role of the MDBs

Multilateral development banks and development finance institutions are crucial to the development of climate resilient projects in low-income countries. MDB participation is an important step in reducing investment risk as it signals project viability, stability, and creditworthiness.

Private capital flows and reserves of Multilateral Development Banks (MDBs) would be critical to the goal of realizing large-scale deployment of resilient infrastructure across the world. This would require an effective, efficient, and equitable governance regime to guarantee adequate returns. In the face of poverty, inequality, and conflict MDBs play a critical role in financing new infrastructure in low and emerging economies, by crowding in private capital.



MDBs support private investment in infrastructure in several ways. One way is direct financing of private investment in infrastructure projects, a role that is particularly critical in middle- and low-income countries where other sources of support are less available. Over the past decade, MDBs have increasingly focused on middle- and low-income countries, and in 2021, they were the second-largest type of financier in these countries (behind banks). MDBs have played a critical role in the global transition towards net zero emissions, with significant financing channeled into renewable energy projects. While financing of non-renewables still occurs, it is anticipated that it will decline to achieve global net-zero goals.

In 2021, 27% of private investment in infrastructure in middle- and low-income countries involved an MDB as a co-financier. Transactions involving an MDB as a co-financier tend to be larger than those financed by the private sector alone, as MDB involvement can reduce risks associated with larger projects. MDBs also have significant potential to indirectly mobilise private financing for infrastructure projects, without being directly involved in the project itself. Levels of private indirect mobilisation tend to be significantly higher than levels of direct mobilisation.

The architecture for scaling up finance for resilient infrastructure

1. Global financial architecture, where G20 has to play a key role
2. Monetary, Fiscal and FDI policy – to get in money
3. Cross-sectoral industrial policy
4. Sectoral policies
5. Role of government, firms and households

Annexure

Table 1: Proportion of population below the international poverty line of US$1.90 per day, both sexes (%)

Regions	**2000**	**2005**	**2010**	**2015**	**2019**
World	22.7	20.8	15.9	10.1	…
Sub-Saharan Africa	59.3	52.6	46.5	42.5	39.2
Northern Africa and Western Africa	5.0	4.5	3.1	4.6	…
Central and Southern Asia	…	33.3	25.2	…	…
Eastern and South-Eastern Asia	31.7	16.7	9.8	1.8	0.7
Latin America and the Caribbean	12.8	9.8	6.1	3.9	4.1
Oceania	13.6	12.7	9.7	7.9	7.4
Europe and Northern America	1.3	0.6	0.5	0.7	0.5
Landlocked developing countries	51.2	42.0	34.6	30.8	…
Least Developed Countries	57.3	47.9	40.6	37.2	33.6
Small Island developing states	…	…	26.6	…	…
Source: The World Bank					

Table 2: Assessing the extent of losses compared to incremental growth, capital and value of capital

	AAL/change in GDP (2019-2018)	**AAL/change in GFCF (2019-2018)**	**AAL/change in Capital stock (2019-2018)**
Low Income Developing Countries	4.5%	13.0%	2.5%
Emerging Market Economies	6.9%	27.1%	1.3%
Advanced Economies	20.3%	61.1%	8.7%

Table 3: AAL across income categories and regions

		2019	**Max**
Low Income Developing Countries	AAL/GDP	0.3%	3.0%
	AAL/Capital Stock	0.1%	0.5%
Emerging Market Economies	AAL/GDP	1.4%	34.5%
	AAL/Capital Stock	0.3%	5.2%
Advanced Economies	AAL/GDP	0.3%	4.3%
	AAL/Capital Stock	0.1%	0.7%
Total	AAL/GDP	0.9%	
	AAL/Capital Stock	0.2%	

			AAL/GDP 2019	
			Max	Min
Africa	AAL/GDP	0.1%	0.7%	0.0%
	AAL/Capital Stock	0.1%	0.4%	0.0%
Americas	AAL/GDP	3.2%	34.5%	0.6%
	AAL/Capital Stock	0.7%	5.2%	0.0%
Asia	AAL/GDP	0.2%	1.2%	0.0%
	AAL/Capital Stock	0.1%	0.6%	0.0%
Europe	AAL/GDP	0.2%	1.8%	0.0%
	AAL/Capital Stock	0.1%	1.8%	0.0%
Oceania	AAL/GDP	1.8%	7.2%	0.0%
	AAL/Capital Stock	0.1%	0.5%	0.0%

Table 4: Debt service as a proportion of exports of goods and services

Regions	**2000**	**2005**	**2010**	**2015**	**2020**
Sub-Saharan Africa	9.2	8.6	2.5	9.0	10.8
Northern Africa	15.9	10.4	4.4	6.3	14.6
Central and Southern Asia	13.2	8.6	2.5	3.9	6.5

Latin America and the Caribbean	22.2	16.2	6.8	9.8	11.4
Oceania (exc. Australia and New Zealand)	6.0	…	…	3.6	13.4
Landlocked developing countries	8.2	4.5	1.7	3.9	7.1
Least Developed Countries	12.5	7.0	3.5	7.4	10.2
* Data cover only long-term and publicly guaranteed debt and repayments (repurchase and charges) to the International Monetary Fund (IMF) **Source:** World Development Indicators database, the World Bank					

Table 5: Trends in Infrastructure Investments

		2007	**2010**	**2015**	**2019**
Low Income Developing Countries	GFCF/GDP	14.9%	15.3%	14.3%	16.1%
	Govt. Inv /GDP	4.1%	4.2%	3.7%	4.0%
	Priv_Inv/GDP	10.8%	11.1%	10.6%	12.1%
Emerging Market Economies	GFCF/GDP	22.8%	25.0%	27.0%	27.7%
	Govt. Inv /GDP	7.1%	8.3%	7.7%	7.8%
	Priv_Inv/GDP	15.7%	16.7%	19.3%	19.9%
Advanced Economies	GFCF/GDP	22.4%	20.0%	21.0%	21.7%
	Govt. Inv /GDP	3.8%	4.1%	3.4%	3.5%
	Priv_Inv/GDP	18.6%	15.9%	17.6%	18.3%
Total	GFCF/GDP	22.3%	22.1%	23.6%	24.5%
	Govt. Inv /GDP	5.3%	6.0%	5.5%	5.7%
	Priv_Inv/GDP	17.0%	16.1%	18.1%	18.8%

Table 6: Domestic revenue mobilisation

Regions	**2000**	**2005**	**2010**	**2015**	**2020**
World	29.7	28.8	32.3	31.1	32.8
Sub-Saharan Africa	21.5	21.9	23.9	22.1	20.7
Northern Africa and Western Africa	29.1	28.5	32.2	31.1	32.4

Central and Southern Asia	29.6	28.6	32.1	30.9	32.2
Eastern and South-Eastern Asia	29.5	28.5	32.0	30.8	32.1
Latin America and the Caribbean	28.6	23.5	25.5	24.5	23.6
Oceania	27.8	31.3	43.5	50.8	56.1
Europe and Northern America	29.4	28.6	32.2	31.0	32.4
Landlocked developing countries	21.8	23.7	28.0	25.1	22.6
Least Developed Countries	19.2	19.4	34.2	28.2	25.3
Small Island developing states	25.6	26.5	41.9	38.7	48.2
Note: The global and regional aggregates are based on the country-level data for the budgetary central government and/or consolidated central government (with and without social security funds), and/or consolidated general government. **Source:** Government Finance Statistics (GFS) Database classified according to the Government Finance Statistic Manual 2014 (GFSM 2014) revenue classification, International Monetary Fund (IMF).					

Table 7: Regional distribution of xxx

		2007	**2010**	**2015**	**2019**
Africa	GFCF/GDP	14.8%	13.3%	13.4%	13.5%
	Govt. Inv /GDP	4.8%	3.8%	3.7%	3.6%
	Priv_Inv/GDP	10.0%	9.5%	9.7%	9.9%
Americas	GFCF/GDP	20.1%	18.5%	19.8%	19.8%
	Govt. Inv /GDP	3.9%	4.4%	3.4%	3.2%
	Priv_Inv/GDP	16.2%	14.1%	16.4%	16.5%
Asia	GFCF/GDP	26.0%	28.1%	30.2%	31.0%
	Govt. Inv /GDP	8.0%	9.3%	8.6%	9.0%
	Priv_Inv/GDP	18.0%	18.8%	21.6%	22.0%
Europe	GFCF/GDP	21.1%	18.9%	18.7%	19.9%
	Govt. Inv /GDP	3.4%	3.6%	3.0%	2.8%
	Priv_Inv/GDP	17.6%	15.3%	15.7%	17.1%

Oceania	GFCF/GDP	24.9%	24.8%	24.1%	22.5%
	Govt. Inv /GDP	3.0%	4.2%	3.2%	4.0%
	Priv_Inv/GDP	21.9%	20.6%	20.9%	18.6%

Table 8: Summary

Investment Need inclusive of SDG (% of GDP)						
Sector		**2020**	**2025**	**2030**	**2035**	**2040**
Energy	Current Trend	1.03	1	0.96	0.92	0.88
	Investment Need	1.13	1.11	1.07	1.03	1
	Investment Need inclusive of SDG	1.32	1.31	1.28	1.03	1
Telecommunication	Current Trend	0.33	0.31	0.29	0.28	0.26
	Investment Need	0.37	0.35	0.33	0.32	0.3
	Investment Need inclusive of SDG	0.37	0.35	0.33	0.32	0.3
Airport	Current Trend	0.08	0.08	0.08	0.07	0.07
	Investment Need	0.1	0.1	0.1	0.09	0.09
	Investment Need inclusive of SDG	0.1	0.1	0.1	0.09	0.09
Port	Current Trend	0.07	0.07	0.06	0.06	0.06
	Investment Need	0.09	0.09	0.09	0.08	0.08
	Investment Need inclusive of SDG	0.09	0.09	0.09	0.08	0.08
Railway	Current Trend	0.41	0.39	0.38	0.37	0.36
	Investment Need	0.45	0.44	0.42	0.42	0.4
	Investment Need inclusive of SDG	0.45	0.44	0.42	0.42	0.4
Road	Current Trend	1.02	0.98	0.97	0.93	0.9
	Investment Need	1.31	1.28	1.27	1.24	1.21
	Investment Need inclusive of SDG	1.31	1.28	1.27	1.24	1.21
Water	Current Trend	0.23	0.22	0.21	0.21	0.2
	Investment Need	0.26	0.25	0.24	0.23	0.23
	Investment Need inclusive of SDG	0.32	0.31	0.3	0.23	0.23

Table 9:

% of GDP	Current Trends (CT)	Investment Needs (IN)	Gap (IN-CT)	SDG (Requirement over and above IN)
Road	1.00%	1.30%	0.30%	
Electricity	1.00%	1.10%	0.10%	0.20%
Rail	0.40%	0.40%	0.00%	
Telecoms	0.30%	0.30%	0.00%	
Water	0.20%	0.20%	0.00%	0.10%
Airports	0.10%	0.10%	0.00%	
Ports	0.10%	0.10%	0.00%	
Asia	4.00%	4.40%	0.40%	0.30%
Americas	1.70%	2.50%	0.80%	0.10%
Europe	2.30%	2.60%	0.30%	0.00%
Africa	4.30%	5.90%	0.60%	3.40%
Oceania	3.50%	3.80%	0.30%	0.00%
World	3.00%	3.50%	0.50%	0.30%

Table 10: Total Costs to Finance the SDGs by Sector

(US$ Billions in 2019 Constant Prices)

Sector	2019	2030	Average 2019-2030
Health	$175.20	$284.10	$224.90
Education	$230.40	$288.00	$258.70
Infrastructure	$185.50	$231.80	$208.30
Energy	*$48.20*	*$57.80*	*$53.00*
Flood protection	*$14.50*	*$18.50*	*$16.50*
Irrigation	*$6.30*	*$8.00*	*$7.10*
Transport	*$71.10*	*$89.80*	*$80.30*
WASH	*$32.50*	*$41.70*	*$37.00*

Telecommunications	*$12.90*	*$16.10*	*$14.50*
Biodiversity	$7.50	$9.50	$8.50
Agriculture	$14.80	$18.50	$16.60
Social Protection	$93.40	$116.50	$104.80
Child and Orphan Benefits	$32.70	$40.90	$36.70
Maternity	$9.40	$11.70	$10.50
Disability	$17.30	$21.60	$19.40
Pension	$34.10	$42.30	$38.10
Justice	$31.00	$38.90	$34.90
Humanitarian	$14.40	$18.10	$16.20
Data	$1.10	$1.40	$1.20
TOTAL SDGs	**$753.20**	**$1,006.80**	**$874.00**
Non-SDG Public Expenditure	**$122.50**	**$152.00**	**$137.00**
TOTAL	**$875.70**	**$1,158.80**	**$1,011.00**

(Source - SDSN, 2019)