



# Climate-Resilient Infrastructure: How to scale up private investment

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Long-term  
Infrastructure  
Investors  
Association

# Table of Contents

<b>1. LANDSCAPE</b>	<b>5</b>
<b>2. SCOPE</b>	<b>7</b>
• Climate physical risks (CPR)	7
• Definition retained	8
• A two-way relation	8
<b>3. CURRENT SITUATION OF CLIMATE RESILIENT INFRASTRUCTURE INVESTMENT</b>	<b>8</b>
<b>3-1</b> The data quandary	8
<b>3-2</b> The lack of appropriate KPI and standards	9
<b>3-3</b> Sector-specific issues	10
<b>3-4</b> Challenges/Methodological issues for quantitative assessment	11
<b>3-5</b> Barriers to private investment	13
<b>3-6</b> Drivers for private investment	14
<b>3-7</b> Good practices	16
<b>4. RECOMMENDATIONS/ PROPOSALS</b>	<b>20</b>
<b>4-1</b> For Institutional Investors	20
• Increase awareness about the need to adopt climate-resilient infra strategies	20
• Better prepare, identify, develop & manage Climate resilient Infra investment	21
• By combining two complementary approaches	21
• In the future: Nature-based Infra solutions to climate change adaptation?	21
• How to reach financial viability?	23
• Overall, an early, proactive action on Climate adaptation should bring a triple dividend to investors	23
<b>4-2</b> For Governments, Central Procuring Authorities & Regulators	23
• Data/Climate change modelling	24
• Enabling framework & incentives	25
• Appropriate public procurement tools	25
<b>4-3</b> For local Governments & public Authorities	26
• Elaborate programs, identify projects & allocate budgets	26
• Streamline/adapt regulations on planning	25
<b>4-4</b> For Public development Banks	26
• Support & leverage Prioritize Climate resilient projects	26
<b>5. CONCLUSION</b>	<b>27</b>
Annex 1-Sources & references	28
Annex 2-Definition of terms and Concepts	33

# Foreword

Climate change poses a systemic risk to the economy and financial markets. The focus of action has been overwhelmingly in Mitigation so far, i.e., reducing carbon emissions. But, halfway through the Paris accord deadline, we already know that Mitigation will not be sufficient: even if the Paris Accord goals were to be met- which seems doubtful today<sup>1</sup>- there would still be a need to adapt assets and processes to new climate conditions. Adaptation to climate change should therefore be considered as important as Mitigation: accordingly, Antonio Guterres, SG of the United Nations, has been calling all nations and development finance institutions to raise Adaptation & Resilience finance to 50% of total climate finance, while also mainstreaming it into financial decision-making. This is particularly needed for Infrastructure assets and systems, key assets underpinning the economy and society. Sustainable development, and sustainable infrastructure rely in no small way, on Infrastructure resilience to Climate Physical risks - itself key to our overall resilience.

Infrastructure is reckoned to be on the front line for Climate change as both a driver and a prime potentially impacted sector. Its assets are vulnerable to extreme weather events, or just small local shocks, liable to disrupt complex networks.

This long-standing diagnostic, combined with Infrastructure role as an enabler of most UN Sustainable Development Goals, has led to

the identification of a huge -and increasing- Infrastructure financing gap: UNEP<sup>2</sup> estimates that global climate resilience financing needs will be up to USD 300 billion per year by 2030, and up to USD 500 billion per year by 2050. Infrastructure projects targeting Adaptation are, in this respect, suffering from a financing gap even bigger proportionally than the general Infrastructure gap.

■ All new and a growing part of existing infrastructure assets ought to be climate and disaster resilient.

■ Speed of scaling up is of the essence: infrastructure assets have long economic lifecycles once built and will shape future generations for decades (the so-called "Lock-in effect"); meanwhile, climate change is already here.

■ Climate Physical risks and their negative externalities are yet to be fully incorporated in investment-making decisions, in what some describe as a "Marke-t-failure".

■ Already insufficient public finance resources,<sup>3</sup> and increased budgetary constraints going forward post-COVID make leveraging Private financing even more necessary in Climate-resilient Infrastructure projects. This seems to be a no-brainer, as it should converge with many investors' objective to future-proof their investments while generating a positive societal impact.

■ Investing in climate-resilient infrastructure assets thus represents a new investment opportunity.

<sup>1</sup> IPCC report March 2022 warned we have at best a 50 per cent chance of limiting global warming to a 1.5°C temperature rise this century

<sup>2</sup> UNEP Adaptation Gap Report 2021

<sup>3</sup> According to GCA State & Trends report 2021: Funding for climate adaptation, which averaged US\$ 30 billion a year pre-COVID- of which only \$500m were from private sources- remains far short of what is needed. Global funding would need to increase ten-fold, to US\$ 300 billion a year, to meet the UNEP's estimates of what is needed to respond to escalating climate risks

■ But whereas Institutional Private investors have significantly ramped up their act in Mitigation (in particular through Renewable energy<sup>4</sup> and energy efficiency), private financing of Climate Adaptation Infrastructure to date is difficult to measure and most probably still negligible<sup>5</sup>.

The object of this report is to foster awareness of Institutional and Private sector investors on their potential role and improve understanding of the issues, obstacles and opportunities to help catalyse and increase private investment in climate resilience infrastructure projects/assets. A number of specialized agencies<sup>6</sup>, think tanks and academic institutions & entities<sup>7</sup> have already engaged in this overall field of climate-related risk and resilience in

Infrastructure investments. The LTIIA working group has therefore endeavoured to synthesize what knowledge already been acquired, and add the voice and, as much as possible, concrete experience and feedback, from institutional investors, to provide guidance, draw some first lessons and table proposals.

The ultimate goal is to help address the current situation through the implementation of tools, methodologies and principles to help the infrastructure investors & the financial industry, build resilience to a changing climate. Investing to address the Climate Adaptation needs could and should be a huge investment opportunity, perhaps the largest in a generation, and contribute to build a more resilient institutional investors industry.

## 1. LANDSCAPE

Accelerating Climate change makes even short-term future more uncertain, which is an existential issue for long-term institutional investors like pension funds or life insurance companies. As in the financial asset management industry, historical patterns (past performance) is no longer a good predictor of future resilience. The silver lining is that Climate risks are hard to estimate precisely because future outcomes directly depend on our collective efforts to mitigate and adapt.

The summer of 2022 marked a new leap in the occurrence and severity of extreme weather events, with a stream of record-high temperatures in the Northern hemisphere, huge uncontrolled wildfires, long-lasting episodes of droughts jeopardizing crops and water-provision in previously temperate regions and catastrophic monsoon rains in South Asia... No one can further deny the scale and rhythm of the change at play. And yet, knowing the direction of travel doesn't necessarily translate

<sup>4</sup> Renewable projects now receive half of all private sector investment in infrastructure, demonstrating investors' appetite for assets with clear green credentials (GIH)

<sup>5</sup> Cf IFC strategy and business outlook update FY23-25- on the road to 2030, p 16: Private finance has been difficult to mobilize for adaptation measures, especially in LICs, due in part to a lack of availability of climate-related risk data to derive investment decision-making on strengthening the resilience of assets, as well as to a lack of bankable projects focused on building system-wide resilience and adaptation measures.

<sup>6</sup> Such as the Global Commission on Adaptation (GCA), set up in 2018 to raise the visibility of Climate adaptation and encourage innovative solutions

<sup>7</sup> See chapter 6 Sources & References



into an appropriate surge in climate-resilient investment. This is certainly the situation in the infrastructure realm, where such a change is yet to occur.

### This is due, among other causes, to:

- a dearth of appropriate tools to measure the exposure of an infrastructure asset to physical climate risks, leading investors to be unaware of Climate Physical risks that may affect financially their assets directly, or, if they are aware, not to know how to deal with those risks,
- a divergence between social and private costs (and benefits) due to the limited inclusion of externalities of private investment on public goods,
- the difficulty in identifying and comparing resilience options,
- for those investors that sense profitable opportunities in the Climate adaptation field, and may direct investments there, hurdles such as inadequate pipeline, confusing regulation, lack of resources,
- the fact that many investors don't adjust yet their expected returns or cost of capital to account for such risks,
- the fact that a trade-off may be needed in some cases between financial returns and resilience: investors may have to accept lower-return impact investments or require specific blended finance vehicles if they want to proceed with climate-resilient investments.

This situation, de facto, "corresponds to a market failure<sup>8</sup>."

The divide between public interest and private ownership doesn't make it any easier. Even once it is clear what investments need to be made, which should be done by public entities, and which are best left to the private sector? not all investments have an economic model supportive of a private investment: investments targeting public goods and non-monetizable socio-economic benefits and externalities<sup>9</sup> may not be tackled by private investors.

### The key questions for the private sector are therefore:

- how to make sound investment decisions amidst the uncertainties of geophysical, economic and political changes, linked with data quality and availability,
- how to balance short term financial issues with wider, LT expected benefits: should investors limit themselves to investing in strict compliance with existing regulations & standards, or go beyond to better protect and future-proof their assets and cash flows?
- And how can they take part in broader climate adaptation goals that are more of public goods nature with non-monetizable, and what would then be the level of public funding<sup>10</sup> required?

<sup>8</sup> As highlighted by the Coalition for Climate-Resilient Investment-CCRI

<sup>9</sup> A typical example would be a coastal protection wall, when there's no way to capture the increase in land value generated by the project

<sup>10</sup> Through budget financing of availability-payment PPPs, subsidies, risk-sharing mechanisms as first-loss public equity layer (Junior), tax-benefits, ...to lower perceived/real risk

## 2. SCOPE

### Climate physical risks (CPR):

#### Climate change can generate 3 different types of risks for investors:

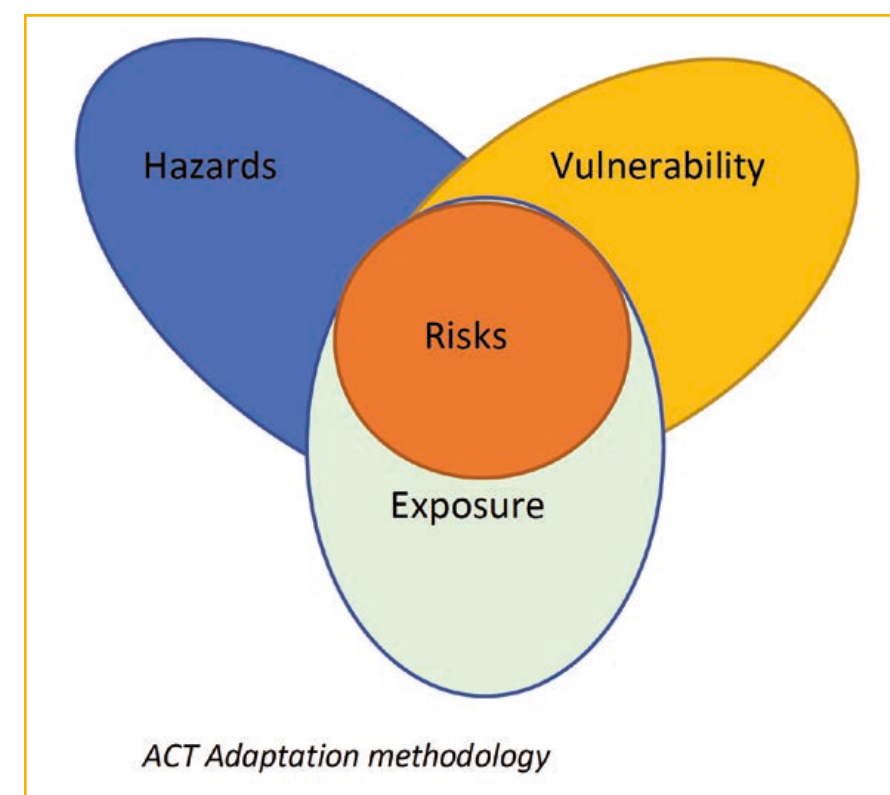
- **Physical risks** (impacts on the value of financial assets & operations arising from climate- and weather-related events),
- **Transition risks** (the financial risks & depreciation of assets resulting from changes in policy, regulation, technology or markets),
- **Liability risks**, (litigation from users/customers & stakeholders exposed to climate-related loss or damage), to which one could add Reputational risks.

The current note will focus primarily on Climate Physical risks, and indirectly, to a lesser degree, on their legal/regulatory implications in terms of Transition and Liability risks. Indeed the internal survey we conducted with our members engaged in this working group

showed that while the majority of our respondents had reviewed the vulnerability to climate change of their asset portfolio from a financial materiality perspective, they had done so primarily to map and assess the potential impact of Physical risks before Transition risks, Liability risks coming last and far behind.

Risks from climate change impacts arise from the interaction between hazards (triggered by an event or trend related to climate change), vulnerability (susceptibility to harm) and exposure (people, assets or ecosystems at risk).

It should be emphasized that Climate Physical risks can affect assets or investment portfolio value through several transmission channels: value depreciation due to reduced ability to generate recurrent cash-flows, credit or liquidity risks, or indirectly through macro-economic risks such as loss in GDP or increased inflation and interest rates.



### Definition retained

**Climate-resilient or Climate-adaptation infrastructure, is hereby defined<sup>11</sup> as an Infrastructure that is designed, built, operated, and maintained so as prepare for, and adapt to physical risks, linked to changing climate conditions, and their implications.** It has a narrower definition than Resilient infrastructure –an infrastructure geared to adapt to physical risks, mostly changing climate conditions, but also including natural disasters of telluric origin such as earthquakes, tsunamis, volcanic eruptions...

### A two-way relation

Climate change and infrastructure assets mutually influence themselves. Here, the focus will be the Impact from the Climate environment on the asset, rather than the other way around (Impact from the asset on Climate environment ), which we consider to be more on the Mitigation side.

## 3. CURRENT SITUATION OF CLIMATE RESILIENT INFRASTRUCTURE INVESTMENT

As the saying goes: “you can’t manage what you can’t measure”. This is one of the key obstacles facing investors in Climate-resilient infrastructure assets today.

**Three main steps are required:**

→ **generate new and more granular data at the relevant level**

While climate change can be assessed globally, weather events patterns can affect very differently adjacent areas: a local approach is therefore needed to be efficient. The issue at stake isn’t limited to data about potential physical impact, but also, where possible, on what sectors/stakeholders are likely to bear the financial impact of well identified climate impacts. Currently, we just don’t have a good handle on what the impacts of climate change are at a local & regional level. Given the magnitude of regional impacts, this issue is critical.

### 3-1 The data quandary:

Better incorporating climate-change related risks into investment decisions requires having access to relevant data and tools as a prerequisite. While this may seem at first glance more as a researcher issue, it does have an impact on identifying the kind of investment needed. Today, infra investors are in effect facing a global data emergency situation, with grossly inadequate collating and processing of relevant data.

<sup>11</sup> see also Annex 2 below

→ **standardize and incorporate the data into appropriate methodological tools and set of PCR metrics**

Unlike Mitigation, there are no universal, fungible measure unit (like the ton of CO<sub>2</sub> avoided) for Adaptation.

→ **Disseminate and mainstream climate finance approach to infra investment.<sup>12</sup>**

While the vast majority of today’s climate adaptation investment comes from public sources (including Multilateral development banks), it should be noted that there are several key challenges, usually resulting in underassessment of the Private sector efforts, associated with determining what counts as adaptation finance for tracking purposes<sup>13</sup>:

**Adaptation finance data cannot be easily compared to mitigation finance:**

Many adaptation finance tracking methodologies focus on the costs or the expenditure to projects of specific adaptation-related activities. Adaptation finance is therefore significantly lower than mitigation flows, where typically the whole investment cost is tagged.

**There are significant data gaps among financial Actors:**

Because adaptation data provision is usually limited to bilateral climate-related development finance from governments and public finance institutions with the capacity to report it, private sector and within-country national public sector (as opposed to cross-border/multilateral) investment statistics are often missing.

**There are definitional challenges** associated with both how the private sector defines adaptation finance and with the boundaries set between adaptation and broader development finance. Private sector actors often do not define activities as adaptation finance even when the projects would be designated as such by public actors, leading to an undercounting of private adaptation activity.

All this combines to make any estimate of Climate adaptation flows – let alone the ones provided by the private sector- a very delicate task.

### LTIIA internal survey:

#### Main challenges you face in Access to data & methodological issues

Item	Total Score <sup>1</sup>	Rank
Inadequacy/ lack of decision-making tools (e.g.: limited capacity to price climate risks and value of adaptation outcomes into project return calculations).	32	1
lack of consensus on scenarios/ stress tests to refer to	30	2
lack of adequate granular, relevant (locally, country- or sector- level) climate-risk data	27	3
lack of relevant literature/case studies	19	4
lack of in-house expertise	12	5

*LTIIA survey: Score is a weighted calculation. Items ranked first are valued higher than the following ranks, the score is a sum of all weighted rank counts*

<sup>12</sup> Coalition for Climate-Resilient Investment-CCRI, Risk & resilience report 2021

<sup>13</sup> CPI: A snapshot of Global adaptation investment & tracking methods-2020

### 3-2 The lack of appropriate KPI

#### and standards:

→ **Financial flows to adaptation do not align with impact metrics**, as there are no universally accepted impact metrics:

Impact metrics are crucial for a full accounting of adaptation finance because the incremental cost of adaptation is not necessarily reflective of the benefit of that investment. For example, a drought-resilient wastewater investment could have vastly different resilience implications in a drought-vulnerable location than in a region with sufficient projected rainfall. It is therefore difficult to approximate the expected impact through the cost of inputs. A number of methodological works<sup>14</sup> currently target the better definition and measure of impact<sup>15</sup>, but do not specifically target Infrastructure, let alone Climate-resilient Infrastructure.

### 3-3 Sector-specific issues

All infra sectors are potentially concerned by Adaptation to Climate change: even though **Transport** (Flood-prone roads or airports,...) and **Energy** (hydro-electricity or nuclear power stations cooling facilities affected by droughts,...) sectors usually come to mind first, other economic and social infrastructure dimensions are at risk as well. The case of Digital infra, often thought of as less concerned by Climate change, is a good illustration:

#### DIGITAL INFRASTRUCTURE:

More extreme weather events also have implications for infrastructure assets like data centres.<sup>16</sup>

Floods have inundated basements with generators, leading to power outages and internet downtime in Europe and New York; electricity substations powering data centres have been turned off for days at a time in California owing to wildfire risk; cooling systems have been over-whelmed by heatwaves in the UK; and water shortages have led to evaporative cooling restrictions in Spain.

- Climate change will require organisations to rethink their overall resilience strategies. Actions might include increasing site resilience; upgrading backup and disaster-recovery processes, and distant backup capabilities.

- Water use will increasingly be restricted in many regions, which is likely to cause friction between large data-centre operators/builders and local communities. A possible trade-off may be higher energy consumption, even as the energy efficiency of IT equipment will become a new focus of attention as social pressure grows.

- Climate change risks are not confined to single sites, but extend to regional infrastructure, partners, utilities and to wider changes that may add costs and administrative burdens.

### Where is most Climate adaptation investment in infrastructure taking place?

- **Water & waste** Utilities firms appear to be the prime recipients of such projects, a trend probably linked with the fact that the most frequent form of Climate change hazard is linked with the excess or scarcity of water. This can take one of the below forms:

- reducing leakage and water loss in water supplies,

- helping assets achieve water savings through efficiency improvements,

- lowering water demand through rational pricing, metering and consumer awareness programmes.

- **Power grids** also appear to be a good place to start enhancing Adaptation features (from reinforced security of the asset proper or its surroundings to burying high tension power lines), as there have been numerous examples recently of power cuts, or wildfires generated by inadequate equipment: the repeated and devastating fires traced to Pacific Gas & Electric (PG&E) power transmission lines in northern California<sup>17</sup>, which failed to prepare for wildfires and weather-related shocks, are a case in point. Conversely, Texas was stricken in the winter 2021 by a grid breakdown due to extreme freezing temperatures.

- **Port terminals & facilities** are increasingly vulnerable to sea-level rise and associated flood and storm impacts. As port operators reckon the need to improve the climate resilience of a port terminal, appropriate resilience strategies need to harness environmental management systems with emergency

response plans and managing risks such as operational disruptions or accidental release of chemicals, in an extreme weather event.

### 3-4 Challenges/Methodological issues for quantitative assessment

Investment in Adaptation infrastructure projects targeting better resilience against Climate physical risks in projects is complex, as these projects can be very diverse:

- From standalone projects exclusively dedicated to Adaptation (ex: a seawall protection building; but a coastal dam could also serve as a tolled road and thus bring revenues),

- to traditional infrastructure projects with enhanced resilience features going beyond usual requirements.

Translating the complexities of physical climate change into indicators of financial risk is not an easy task either:

→ How should new economic scenarios be constructed and how should they be adjusted to reflect local conditions?

→ How should analysts account for different levels of climate risk sensitivity? it's a big agenda.

→ How to price climate risks and integrate value of adaptation outcomes in project assessments & return calculations?

<sup>14</sup> Paris Europlace's Finance for Tomorrow launched in March 2021 a Paris Financial Centre Task force dedicated to Impact Finance at the request of the French Minister of the Economy & Finance. It now gathers more than 80 institutions from the Paris financial centre within four working groups focusing on (i) the definition, (ii) the measure, (iii) the conditions for development and removal of barriers, and (iv) the international promotion of the corresponding vision of Impact Finance. Other examples include the Global Impact Investing Network (GIIN), EVPA - the European network of Investors for impact etc...

<sup>15</sup> Impact Finance is often described as an investment or financing strategy that aims to accelerate the just and sustainable transformation of the real economy, aligned with frameworks of reference such as the Sustainable Development Goals, by providing evidence of its beneficial effects. It is based on the pillars of intentionality, additionality, and impact measurement.

<sup>16</sup> IPE Real assets and Uptime Institute report on climate change and resilience-2022

<sup>17</sup> In contrast Southern California Edison, its southern counterpart is spending more than \$1bn a year on resilience



Investors are not helped by the absence of resilience-specific rating framework, and the lack of proven business models applicable.

**Recently, a number of initiatives have tried to address this Adaptation Methodology dimension for investors:**

■ the Physical Climate Risk Assessment Methodology (PCRAM) tool has been developed by Coalition for Climate Resilient Investment (CCRI) to help investors incorporate physical climate risks in infrastructure design and investment decision making decisions. One of CCRI's areas of focus is to address long term physical climate risks, which cannot be completely designed or engineered out of projects ('unadaptable' or 'unmitigable' risks), through financial instruments which allow these risks to be insured or otherwise efficiently allocated in the market. The approach relies on the identification of a 'adaptable risk threshold' below which it is economically viable to address increased physical risks through the construction and design of the infrastructure itself. by mitigating a basic level of risk exposure so that the total amount of insurance or risk allocation needed for the project is reduced, and the range of impacts which need to be 'covered' will be narrower.

CCRI pleads for a hybrid approach, a combination of adaptation measures for infrastructure (materials, design, size, location) and passing off acute event tail-risks which would result in:

- Infrastructure which is physically more resilient;
- Specific instruments allocating the residual risks to insurers, investors and ultimately governments; and

→ Lower insurance premiums paid to cover residual risks.

While CCRI is about Investing in Infrastructure, other similar Climate Resilience initiatives are more corporate-oriented and do not target specifically Infrastructure projects/investments. However they contribute to spread the Adaptation gospel to a wider population of investors, some of whom may also have assets allocated to Infrastructure:

■ The Institutional Investors Group on Climate Change (IIGCC) just released a discussion paper on a proposed climate-resilience investment framework in September '22. This framework aims to help investors to manage the risks to their operations and portfolios posed by the physical impacts of climate change and take advantage of emerging opportunities, in line with fiduciary duty and regulatory requirements (such as disclosures expected or required through the Task Force on Climate-related Financial Disclosures (TCFD), the EU Sustainable Finance regulations, ISSB, and others).

■ The ACT Adaptation jointly developed by ADEME (the French Ecological Transition Agency) and CDP aims not at quantifying a company's level of climate resilience, but rather at assessing the quality, robustness and comprehensiveness of its adaptation strategy, from the physical risk analysis to their governance.

Simultaneously, a number of Tools guiding investors in their investment process have been developed recently and made available to the community of investors<sup>18</sup>:

**→ WBG Climate PPP toolkit for infrastructure investors:**

This toolkit targets mostly governments and their advisors and is intended to enable both to address key questions on "how to" mainstream climate considerations into real infrastructure and PPP projects. It considers that climate mainstreaming in infrastructure and PPP projects must start on the government side so that it can be addressed early in planning and specifies that climate considerations should be seen as a competitive advantage.

**The toolkit covers:**

- Methodologies, standards, and frameworks for assessing climate risks; and designing adaptation and mitigation measures and options into PPPs
- Designing for climate uncertainty and exploring value-for-money considerations against the backdrop of climate vs. affordability considerations
- Innovating to allow for optimal risk allocation and contractual predictability in an environment marked by uncertainty,
- Translating climate decisions into project requirements and technical specifications to be integrated within the contractual structure and the tender documents, focused on climate and sustainable performance, key performance indicators (KPIs), reporting, and certification requirements
- Exploring and enhancing opportunities to tap into new and innovative financing options: climate and sustainable finance, blended finance, and more
- Pushing beyond least-cost consideration in tendering to consider climate credentials, investments, and plans to ensure asset resilience against loss from climate events

This toolkit is the first of a series on sustainability and PPPs. From here, sector-specific toolkits are to be released.

While governments targeted are those of Emerging and developing economies, the toolkit contains guidance and recommendations applicable to globally the public sector.

**→ GCA Climate-resilient Infra officer handbook (CRIO)**

The Handbook aims to build the upstream capacity of practitioners to integrate climate resilience into infrastructure PPPs. It identifies the key entry points across the PPP project cycle to integrate resilience and provides the necessary tools and knowledge for practitioners.

Altogether, while there is several interesting initiatives lately in this field, there's no agreed upon general standard, leaving interested investors to draft and develop their own proprietary approach (see below).

### 3-5 Barriers to private investment

Whereas the lack of granular/localized climate-risk data and appropriate metrics/unified methodology is a prime obstacle, there are other important barriers to increased private investment in that field:

- lack of visibility on Governments' investment gaps and Adaptation strategies
- lack of capture of positive externalities to community, leading to a perceived low or inexistent financial return

Greater clarity and financial support from the Public sector is thus required to further unlock private investment, but there are still steps that can be undertaken by private actors to increase rapidly the scope of their intervention. The way

<sup>18</sup> See annex 1

forward goes through developing innovative structured financing, combining multi-layered financing with junior/senior tranches or securitization,... to achieve the required de-risking

A good example would be the recently set-up TURF Fund

### Case: TURF fund



The Urban Resilience Fund (TURF) is an equity investment fund in resilient urban infrastructure, as Cities are not as well equipped as national counterparts – and have a clear need for project preparation, delivery, and management expertise and capital to unlock projects. Its Resilience Objectives (in Fund's by-laws) are not limited to protective/defensive resilience for the asset proper, but go beyond climate hazards to incorporate impacts to society and be responsive to the needs of poor and vulnerable urban communities to produce social, environmental and/or economic benefits that extend beyond the direct objectives of the project. It blends different layers of capital (from "catalytic" capital provided through a partnership with the Rockefeller Foundation to regular capital from various stakeholders: DFI, impact funds as well as Institutional investors targeting commercial revenues), and covers the main sectors (Energy transition and Mobility).

The Fund uses its catalytic capital that supports a pipeline of opportunities through early-stage preparation and structuring of projects and aims for Long-term predictable cashflows, through long-term performance contracts.

### 3-6 Drivers for private investment

Notwithstanding real obstacles, it should be emphasized that Climate change is also a real opportunity to invest in climate resilience, whether in assets that are screened for their resilience to climate impacts or in assets that help to build resilience or adapt to the effects of climate change. Recent analysis from TCFD indicates that companies are increasingly identifying potential investments from climate change, with the Carbon Disclosure Project (CDP) reporting that companies face \$1 trillion in climate change risks, and \$2.1 trillion

level for commercial investors. This can be achieved by the blending of impact or philanthropic financing with commercial financing.

in climate business opportunities.<sup>19</sup> A growing number of investors are now realizing that the next step beyond de-carbonization is to integrate net-zero strategy and Resilience.

Investors, particularly institutional investors such as pension funds and insurance companies, are understandably keen to integrate PCRs into their investment appraisals. Indeed, a whopping 87,5% of our respondents considered that management of climate risks is part of fiduciary duties of investors. An almost equivalent share (75%) subscribes to the "Universal owner" approach which

considers institutional investors by holding a slice of the whole global economy and market through their portfolios have their interests and long-term financial performance aligned with healthy economies and resilient communities.

→ Doing so should effectively enable them to improve their overall risk-return profile and maximize long-term investment returns by:

→ protecting & upgrade their existing assets, by safeguarding their current and future capacity

→ reinforcing their value before eventually re-selling them

Apart from these direct benefits, there are also the indirect benefits of acquiring goodwill from public authorities by ensuring the smooth operation of key public services under all circumstances and gaining recognition and form the wider community of stakeholders.

Not to mention upcoming new regulations that will mandate Climate risk disclosure...

For those survey respondents that did invest recently in Infrastructure assets incorporating a Climate adaptation dimension, 2/3 of them did go beyond the minimum required tech/environmental regulation features, while 1 out of 2 did it not just with a defensive view to moderate potential, but also with a view to exploit beneficial opportunities of climate change.

*Greenfield vs Brownfield:* It is interesting to note that such investments were not limited to Greenfield projects, as 80% concerned retrofitting of existing assets.

This is a key finding, as oftentimes, adaptation is deemed to be too complex or costly as opposed to incorporating this resilience feature from design stage, at a more limited cost. In view of the current rhythm of infrastructure renewal and modernization in most jurisdictions,

Resilience will have to go through reinvesting in and adapting the existing stock!

EX: **Brisbane airport**, where the sustainable design considerations are embedded through all design and construction projects to ensure future impacts from climate change are mitigated.



The private investors decided to raise the runways above forecast sea level rise heights, by a few more meters than legally requested for a significantly better level of protection over time against future floods and sea-rise hazards.

The working group set up by LTIIA to work on this theme – though not a representative sample of the whole institutional investor population – is a testimony to the strength of this driver:

■ The vast majority of respondents have adopted a formal management approach specific to Climate adaptation risks, mostly at Management level (75%), in their Individual investment review, but also at Board level (44%) and Management level (56%) in their Investment strategy/roadmap.

<sup>19</sup> CDP, June 2019



Extracts from LTIIA internal survey of investors:

*"Due Diligence process has been updated to integrate systematic review of assets' exposure to physical Climate Risk".*

*"Specific alert thresholds have been set to identify which assets have high Climate Risk, exposure which triggers additional due diligence to assess required adaptation measures".*

*"Our engagement policy (in the making) will seek to identify and monitor potential implementation of adaptation measures".*

The Coalition for Climate Resilient Investment ("CCRI") aims to be part of the solution by promoting the efficient integration of PCRs in investment decision-making, "Avoid losses (stranded assets,..) on existing portfolios:

- Generate economic benefits,
- Social/Environmental benefits,
- Anticipate on upcoming tightened regulations,
- Create Impact/Reputational outcomes.

3-7 Good practices

→ Goal:

We should ensure that Climate-resilience is embedded in the design, structuring and valuation of infra assets while supporting the development of financial innovations to scale up the flow of capital towards resilient assets. The below examples and illustrations contributed by LTIIA members do not pretend to encapsulate the full scope of good practices, but provide.

As much as possible we should try to ensure all the corresponding deliverables are in the public domain: in any case **Climate Risk Disclosure** is Coming.

A growing number of companies and investors are voluntarily committing to analyze and disclose their climate-related financial risks, aligned with the TCFD recommendations, and there is an increasing likelihood that this type of disclosure will become mandatory in the mid-term. While climate risk analysis and disclosures initially focused on measuring carbon intensity and transition risks (e.g., stranded assets), shareholders and regulators are now also asking companies and investors to analyze and determine the climate-based physical risks to assets and operations.

Beyond complying with disclosure requirements, investors should have plans in place to address the financial risks from the physical effects of climate change in their own portfolios. Acute or chronic physical climate risks can severely impair the value of investment portfolios if left unaddressed<sup>20</sup>.

<sup>20</sup> The recent bankruptcy of Pacific Gas & Electric (PG&E), the 10th largest utility in the United States, due to wildfire liability was described as "The First Climate-Change Bankruptcy", but probably not the last" (WSJ, Jan 2019)

At the project level:

Case Miami Port Tunnel/Meridiam



The Miami port tunnel project, a 35-yr availability payment PPP launched in 2009 and delivered in 2014, incorporates a key climate resilience feature through floodgates. It is designed to prevent extreme weather shocks, ensure the perfect transit of goods and people between the port and the city centre and to protect the value and economic potential of the asset in a relatively simple situation in which:

- detailed local weather data (Hurricanes) over a long period of time was available,
- the adaptation dimension was required by the procuring authority, and incorporated from design stage in a new project...,
- and limited in size (around 4m\$ out of total 600m\$ Capex for the project), as opposed for instance to retrofitting New York subway with floodgates post Sandra hurricane, for which costs are much higher.



The tunnel portals are equipped with four 55-ton hurricane flood gates, designed to withstand hydrostatic flood forces for a design water elevation of 22.6-ft based on the 500-year design storm event. This feature –already activated 3 times as of mid-2022– could help avoid up to \$1bn in potential flooding costs, and the city of Miami has gone on to broaden its Climate-resilience boosting approach, and joined the C40 resilient cities network...



At the portfolio level:

## Assessing climate risks of portfolio/ Arpinge



an Italian investment company operating in the infrastructure sector and focused on energy transition (renewables, energy efficiency and urban mobility), has recently developed an assessment model capable of identifying and evaluating climate risks associated with its own portfolio, comprising wind and Photovoltaic solar plants as well as parking facilities all over Italy.



The assessment model has been developed jointly with the Politecnico di Milano, one of the most renowned technical Italian universities, allowing Arpinge to quantify the potential financial effect of acute and chronic physical risks on the company's assets under several climate scenarios, as well as to evaluate the potential severity of portfolio's transition risks.

The granularity of this methodology allows Arpinge to integrate climate risks into the projected cash flow of each asset under the main UN IPCC's climate scenarios, enabling the implementation of proactive and preventative management strategies to maintain the expected profitability of Company's portfolio. Overall, the assessment has revealed that Arpinge's portfolio is more resilient to climate change than that of its peers.

The project is currently expected to evolve for integrating climate-resiliency assessments in the due diligence phase of new investments. In this regard, Arpinge is paving the way to introduce a robust methodology for including climate-related financial risks into yields projections of upcoming business opportunities, a much-needed approach to ensure the long-term sustainability of infrastructure investments.

## The Aurora power company/Infravia

Aurora is a Finland-based power co, with a successful track record in providing reliable and clean electricity to its clients in Finland. In view of the key importance of power supply, it has prioritized reliability and made continuous efforts, through optimal design of network structures and redundant transmission lines investments, above and beyond regulatory requirements, to effectively ensure a 100% availability track-record over time and 0 incidents, regardless of the natural hazards encountered.



Crucially, this extra investment has not penalized the bottom line over time, thanks to a thorough control over the network design and operations.

### → Green bonds:

While Green bonds are primarily a diversified source of funding for public sector issuers, they can act as a catalyst for mainstreaming resilience across a range of financial instruments.

The market for green bonds has gone from almost non-existent a decade ago to over half a trillion (USD517.4bn) in 2021<sup>21</sup>. These bonds generate financing for renewable energy, energy efficiency, sustainable housing and other environmentally friendly initiatives. The Climate Bonds Initiative, an international non-profit working to develop a

one trillion-dollar market for green bonds, published a set of Climate Resilience Principles (CRP), which provides guidance for investors, bond issuers and banks to determine when projects are assets are compatible with a climate resilience economy<sup>22</sup>. The CRP provides a framework for screening green bonds to ensure that proceeds are funding assets and activities that assess and address climate risks and build climate resilience.

A growing share of Green bonds proceeds, representing close to 1/5 of all green bond deals<sup>23</sup>, now include climate resilience components.

<sup>21</sup> according to Climate Bonds Market Intelligence

<sup>22</sup> Climate Bonds Initiative (2019). Climate Resilience Principles: A framework for assessing climate resilience investments, September 2019

<sup>23</sup> GCA Guide 'Green Bonds for Climate Resilience: State of Play and Roadmap to Scale' notes that 1,265 green bonds that include climate resilience components have been issued up to September 2020, accounting for 16.4% of total

More recently, the emergence of resilience bonds, the proceeds of which must go to climate adaptation, can be seen a trend that fits with the investment strategies of many large institutional investors. A first issuance in 2019 by the European Bank for Reconstruction and Development was significantly oversubscribed.

A green bond with resilience features, or a climate resilience bond, give access to the same benefits as traditional green bonds focused on low-carbon investments, including:

1. Access to low-cost capital to finance investment pipeline and a broadened the investor base for issuers,
2. Suitable for large-scale projects that require large capital investment ahead of revenues and longer investment horizons, as is often the case for investment projects,
3. Unlock blended finance facilities and funds,
4. Greater visibility and recognition of the commitment to resilience goals.

## 4. RECOMMENDATIONS/ PROPOSALS

### 4-1 For Institutional Investors

Now is the time to act, as external shocks affect infrastructure and the wider economy at an accelerated pace. Investors in infrastructure projects should integrate best practices of climate resilience into the investment project design, operations, and maintenance. This should be systematic in new "Greenfield" projects, as it is a well-known fact that the incremental investment cost required is much smaller at this upstream stage. It should include embedding climate resilience into project structuring through resilient design and Key Performance Indicators (KPIs), as well as setting higher resilience benchmarks into O&M standards and leveraging data to monitor resilience options and maximize benefits of current and future projects. Existing (Brownfield) assets should also be concerned as much as possible, as climate adaptation can pay off/ avoid significant costs: beyond the immediate damage from storms and floods, costlier or reduced insurance coverage, costs of installing backup generators and other emergency systems, ...

Building in resilience will be key to make PPPs bankable and allow them to tap into a growing market of green finance, such as Resilience bonds.

#### → Increase awareness about the need to adopt climate-resilient infra strategies

The responsibility of Asset Owners (AO)-Limited Partners -particularly in equity investment- in setting the direction of travel and clarifying their expectations and willingness to incur trade-offs in the process is here foremost as they are the ones shaping the mandates of their asset managers.

In that respect, our internal survey showed some A.O. may be lagging behind: while the Climate adaptation dimension was one criteria used by just 25% of Asset Owners (LP) to select an Asset manager, the reverse was true for 50% of Asset managers (1 out of 2 used this criteria to attract funds from AO).

But here again, the long-term nature of many institutional investors and correspondingly long horizon for asset holding should make the move easier, at least for new "greenfield" assets

to invest in. Admittedly, things could be less straightforward in the market for existing infra assets ("brownfield") where technical solutions and time horizons may not lend themselves easily to such a new approach.

#### → Better prepare, identify, develop & manage Climate resilient Infra investment...

Better use existing frameworks already available to Integrate Climate Resilience into Project from start of cycle: investment origination & planning, management. Have realistic expectations: Maximize "narrative" benefits on E and S dimensions of ESG while ensuring adequate Governance. Improve Transparency & disclosure... Suggest appropriate metrics to measure investments in Climate Resilience. Equipping with internal expertise may also be needed: our survey showed that just 1 in 2 investors are equipped with in-house expertise on Climate change risk, the rest resorting, when thought necessary, to external consultants.

#### → By combining two complementary approaches:

- the Design, Engineering and Building of new infrastructure to withstand increased PCR and reduce the magnitude of the physical impact,
- with the Transfer of remaining "unmitigable" risks to another party best placed to absorb it (Governments, Insurers, impact investors,...).

For instance, once in 10 years expected damages from climate events may be addressed through resilience building and adaptation while the less frequent, but more extreme events would be covered through insurance - or governments if not insurable at market terms.

#### → Encourage the emergence of specialized Climate resilient Infrastructure Investment funds

Resilience-focused investment funds are beginning to emerge in the infrastructure upstream space. Private-equity firms<sup>24</sup> are ploughing money into technologies such as geospatial imaging, weather analytics and precision agriculture, helping alleviate the data availability issue. Sustainable energy infrastructure firms<sup>25</sup> with backers including pension funds from all over OECD countries, raised billions of dollars, on a narrative of no-trade-offs between returns and resilience benefits: The fact that these funds are often oversubscribed by institutional investors points to a keen interest, underpinned by the realization that sustainability to Climate change doesn't have to come at the expense of financial performance.

#### → In the future: Nature-based Infra solutions to climate change adaptation?

Definitions: Grey vs Green infrastructure

#### GREY

- Traditional, engineered and built systems providing resilience benefits to water, drainage or transportation systems through built structures; and
- Includes enhancements to water systems and treatment plants, storm drains, sewers, shoreline levees, wave attenuation devices, sea walls or tidal gates.

Also called Built infrastructure

<sup>24</sup> Lightsmith Group, is a case in point

<sup>25</sup> See Generate Capital, in America: the firm's durable electric "microgrids" in Texas and California, kept the power flowing and continued to earn revenues during recent outages caused by freezing weather and wildfires



## GREEN

→ Projects that mimic natural cycles to enhance natural systems or provide other climate risk mitigation; and

→ Includes living shorelines, tree preservation /planting, green roofs, rainwater harvesting, bioswales, bio retention ponds, open space preservation, wetland restoration, coral reef restoration, oyster reef restoration or barrier island restoration.

Also called Nature-Based Solutions (NBS)

Source: CCRI

Nature Based Infrastructure is increasingly recognised as an economically viable approach to infrastructure resilience, especially in river and coastal areas subject to increasing sea-levels and flooding. Coastal nature-based solutions provide many co-benefits, such as carbon sequestration, water quality improvement, erosion reduction, habitat provision and support for recreation and tourism

industries. Nature Based Solutions can support adaptation against chronic climate change impacts, but they generally cannot protect an asset against an extreme event (tail risks).

While still at embryonic stage, Nature-Based Solutions could represent a new area for private investors towards creating a sustainable business model. Alternatively, the Hybrid or mixed approach, consisting of a Blend of natural and engineering structures allows for some ecosystem functions mediated by technological solutions<sup>26</sup> for better overall value for money.

Today, there are very few instances of Institutional investors incorporating such "Green" infra in their investment projects (except for philanthropic/impact investors). Significantly, no LTIIA Survey respondents have already invested in nature-based solutions (NbS) to climate-proof Infrastructure. But that could change in the coming years in view of the pace and scope of climate change, if incentivized through public or philanthropic catalytic capital.

### Case of Nouakchott/Meridiam: Scaling up hybrid/nature-based solutions for adaptation in coastal areas

Nouakchott, Mauritania's capital and biggest city, is mostly below sea level and is particularly vulnerable to rising ground-water levels, seawater intrusions, porous soils, sand extractions, and heavy rains in low-lying areas. The coast is protected by



a fragile wall of dunes at risk from natural erosion, sand mining, grazing of livestock on dune vegetation, and other human activities. Protecting the dunes, and restoring wetlands and mangroves, replenishing beaches, and building seawalls and dikes are a priority for the sustainable development of the city, maintain existing infra and supply of fresh water; a first project was launched using World Bank financing, with the support of the WACA (West African Coastal Areas program ) Resilience Investment Project, to overcome the challenge. The TURF fund (see above) is now considering a broader scope of intervention, financed through its innovative, financing structure , blending catalytic and commercial capital.

<sup>26</sup> e.g. porous pavement; green roofs; rain gardens; constructed wetlands; Sustainable Drainage Systems...

### → How to reach financial viability?

While sustainability/Climate resilience doesn't have to come at the expense of financial performance, there are still many instances where projects (particularly standalone Resilience projects) cannot be commercially financed, for want of a viable business model. Possible approaches like capturing positive externalities (through Land value capture for instance) may be too complex or slow to be implemented in the tight time schedule: If the private sector is to be harnessed in building and operating these projects, there will have to be an injection of blended and/or philanthropic/impact innovative financing.

This dimension was clearly highlighted in our member survey: Asked *What kind/level of public support would you expect for investments targeting climate-change risks from an environmental and social materiality perspective with low monetizable cash-flows , so as to be able to invest?* our survey respondents answered<sup>27</sup>:

Assistance to develop & structure the project's contract	62.5%
Concessional money (through grants or subsidies...)	100%

#### The specific role of the insurance industry

Insurance plays a crucial role in promoting climate resilience, from the perspective of both financial risk-transfer and risk exposure assessment and management.

With over USD30tn of AUM, a significant part of which are directed toward real estate and infrastructure assets, the insurance industry also has a broad influence on the financing. of sustainable assets.

The benefits to insurers from resilient investments range from larger potential insurable markets to generally lower claims, leading to higher underwriting profitability. It also reduces the likelihood over time that certain assets become too vulnerable to CPRs and non-insurable.

From a corporate perspective, these types of adaptation and resilience activities can also support brand, reputation and positive stakeholder engagement, as well as reducing the risk of investor activism.

### → Overall, an early, proactive action on Climate adaptation should bring a triple dividend to investors:

1. Protect /upgrade existing assets to avoid losses and operational capacity to generate growing cash-flows at a lower cost than curative , ex-post investment,
2. Achieve environmental Impact,
3. Gain goodwill from Authorities and wider society, improving the "social license to operate".

### 4-2 For Governments, Central

#### Procuring Authorities & Regulators

It is the responsibility of the public partner to mainstream climate resilience into infrastructure planning by identifying and prioritising projects that relate to their climate commitments as per the 2015 Paris Agreement:

- clear Nationally Determined Contributions,
- robust National Adaptation Plans),
- Strong climate policies (mainstreaming climate resilience in national budgets,...).

<sup>27</sup> A respondent also mentioned technical expertise to assess whether the climate adaptation/resilience angle is being met

Many public partners need to better understand and communicate current and future climate risks, including through data collection and monitoring, modelling climate impacts to identify costs and benefits, and integrating climate risks into design and resilience options. They should also ensure that the procurement framework and regulatory environment are fully aligned with this objective. It is also necessary

for the public partner, mainstream climate-resilient standards, be ready to proactively co-invest in adaptation and integrate participatory process, in order to better mobilize private capital and incentivize investment in climate resilience.

Expectations are high from the private side in that respect:

## LTIIA internal survey:

### Rank main Issues with your public sector counterparts?

Item	Total Score <sup>1</sup>	Overall Rank
lack of clear policy framework/signal by public procuring/regulatory authorities (e.g. no or low weighting of Climate change dimension in bid assessment criteria)	27	1
lack of appropriate investable projects	25	2
lack of Institutional capacity in public entities	24	3
Regulatory constraints (specify)	20	4
sectoral constraints (specify)	9	5

LTIIA: Score is a weighted calculation. Items ranked first are valued higher than the following ranks, the score is a sum of all weighted rank counts.

Things are moving in the right direction<sup>28</sup>. Nonetheless, there is still a lack of visibility on many national public project pipelines, regarding the Climate adaptation dimension in developed and developing markets alike: hence the importance of the local/subnational level as cities are more likely to have fleshed out climate adaptation priorities and more relevant info may be available.

#### → Data/Climate change modelling:

AT the supranational level, the creation of an international climate-computing centre would be useful to keep improving scientific models for forecasting climate change impacts. This action would have to be complemented by subnational, locally produced relevant data needed at the project asset level (see below).

#### → Enabling framework & incentives

##### Appropriate framework:

At national level: there is a continuous need for:

- clear Policy & regulatory Framework, combined with National infra plans<sup>29</sup> to target climate adaptation and ensure steady flow of deals (Pipeline); new data processing technologies can now allow governments to identify 'hotspots' across a country's major infrastructure networks most vulnerable to climate risk, ensuring the effective and efficient investment of public and private resources,

- Key regulatory initiatives will also be needed in some jurisdictions to facilitate blending of resources and finance between the public and private sectors and corresponding budgets assigned.

#### → Appropriate public procurement tools

Investing in infrastructure resilience typically involves incremental upfront costs; though those extra capex would be recouped over time, that may be an obstacle to being selected whenever the tender criteria revolve around over the lowest cost approach for the public procuring authority. Procuring Authorities should therefore:

- Include *climate resilience as a significantly-weighted attribution criteria* in public procurement tenders. Lowest (immediate) cost of construction/delivery should no longer be the primary criteria for procuring infrastructure assets.

- Promote most *appropriate public contracting tools to reinternalize climate externalities* and provide incentives/opportunities for Private sector innovation.

- Be prepared to *inject public co-financing* as a means to catalyse private investment in non-commercially viable climate adaptation projects. The expansion of blended finance is one of the most important policy levers at the government's and development banks' disposal. Allocating more resources to blended financing tools, allow organizations to invest, lend or provide guarantees alongside each other while achieving their own objectives, such as remunerating capital or increasing the environmental and social resilience outcomes. It helps mobilise private sector financing by mitigating investment risks and rebalancing risk-reward profiles of projects, thus leveraging limited pools of public or concessional funds, especially in cases when projects' marginal benefits to society are greater than its marginal costs.

- *Revive Public-Private Partnerships*: According to Multilateral development banks and the Global Commission on Adaptation (GCA), PPPs can and should be "a key entry-point to mobilise private sector finance to bridge this infrastructure systems' climate resilience gap", as they are a versatile vehicle to mix and blend contractually financing from public and private partners.

<sup>28</sup> as of 2021, 79 per cent of all countries have adopted at least one national-level adaptation planning instrument

<sup>29</sup> Jamaica is a case in point having just drafted its country plan for Adaptation, with the support of the CCRI. It will become the world's first country to use ground-breaking technology capable of accelerating the resilience of its major national infrastructure to extreme weather events



### 4-3 For local Governments

#### & public Authorities

#### Elaborate programs, identify projects & allocate budgets

■ Subnational plans and frameworks for Climate adaptation<sup>30</sup>,

■ Most infrastructure projects are initiated at the local government level, but work is needed on aggregating small projects into platforms to reach a critical mass liable to attract private investors,

■ Local Governments and Authorities are also the best placed to provide relevant/localized Climate data and determining climate change impacts for the granular and detailed modelling needed by investors and corporations to adapt to climate change.

**Streamline/adapt regulations on planning,** and when feasible on procurement, competition and transparency.

■ The objective should be to inspire market confidence and attract investment to the most-needed projects.

### 4-4 For Public development Banks

#### Support & leverage Prioritize Climate resilient projects

The Climate resilience issue has already been identified and incorporated in Multilateral and Public Development Banks strategies; However, there is still room to better prioritize Climate resilient projects & offer blended finance geared to further leverage private investment in contractual or regulated infrastructure.

## 5. CONCLUSION

The awareness to the issues at stake and the willingness to do more are clearly present in all the investors we met, members or not of LTIIA. The alignment of interest with the wider community is well understood as well. But we're still far from the required level of investment. Even more than other infra dimensions, Climate adaptation requires a full coordination and good articulation between public and private actors if it is to be scaled up. Aligning private and social interests will require a combination of better data, regulatory, and financial incentives to help markets operate properly and steer institutional investors in the right direction, by incentivizing them to incorporate resilience building in their infrastructure portfolios...What is needed now to significantly scale it up is to address these 3 main prerequisites identified in this report:

■ **The information gap:** better collect, and process the relevant data at local, relevant level and make it widely available through adequate dissemination channels; Adopt and publicize appropriate investment pipelines,

■ **Institutional capacity:** Concerned stakeholders, starting with public authorities need to get their act together and clarify/improve their policy framework, and corresponding regulation, procurement processes, standards and metrics,

■ **Financial incentives:** The private sector can and should contribute to build and operate broader Climate-resilient infra assets, provided it can rely on blended finance tools, such as guarantees, grants, tax-benefits or first loss mechanisms) provided by public finance or philanthropic/ impact investors.

<sup>30</sup> Cf for instance the « Plan régional d'adaptation au changement climatique » (PRACC) drafted by Region Ile de France in Sept 2022, including financial support to the building of climatic shelters, or district cooling networks powered by geothermy,...





### → Global Commission on Adaptation (GCA)/ Rotterdam

<https://gca.org/>

The Global Center on Adaptation (GCA) founded in 2018 and hosted by the Netherlands, engages in policy activities, research, communications, and technical assistance to government and the private sector, policy development, research, advocacy, communications, and partnerships

### "Knowledge Module on Public Private Partnerships for Climate Resilient Infrastructure Handbook"

see <https://climatesmartwater.org/wp-content/uploads/sites/2/2021/10/GCA-Handbook-V2.0-13-September-2021-2.pdf>  
addresses issues pertinent to the implementation of climate resilient PPP infrastructure head on.

<https://gca.org/programs/climate-finance/>

### Climate-resilient Infra Officer (CRIO) Handbook:

<https://gca.org/reports/climate-resilient-infrastructure-officer-handbook/>

Developed with support from the Ministry of Infrastructure and Water Management of the Netherlands and in partnership with the World Bank Group (WBG), the African Development Bank (AfDB), Asian Development Bank (ADB), European Bank for Reconstruction and Development (EBRD), Global Infrastructure Facility (GIF), Inter-American Development Bank (IDB), the Islamic Development Bank (IsDB), Public-Private Infrastructure Advisory Facility (PPIAF-WBG), and UNOPS.

Goal = promote climate-resilient infrastructure to practitioners, ensure that new & existing projects:

- account for physical climate risks,
- can adapt to future climate, socio-economic and technological change scenarios,
- harness potential of Nature Based Solutions across the infrastructure lifecycle.

### Target Audience:

→ Practitioners from the public and private sector, including infrastructure operators, *asset managers, investors and financiers*, NGOs and International Organizations, directly working with infrastructure PPP projects at country, regional and/or city-level,

→ Decision makers working at national, regional and local level, from ministries and governmental agencies, as well as PPP Units,

→ Technical staff of multilateral/Development banks from both infrastructure and climate programs.

### → Coalition for Climate Resilient Investors (CCRI)

Private sector-led Coalition launched in 2019 by the Government of the United Kingdom, the Government of Jamaica, WTW, the Global Commission on Adaptation and the World Economic Forum; currently over 120 institutions -including institutional investors, asset managers, pension funds, banks, insurers, standard setters, ratings agencies- covering the whole physical & financial infrastructure ecosystem; the Coalition for Climate Resilient investment explores the market failure of overlooking climate risk in infrastructure investments (lack of analytical tools to quantify the exposure of a 'real asset' to physical climate risks; difficulty in comparing resilience options,...). Supports investors and policy makers to. Ultimately, CCRI hopes to provide analytical tools for infrastructure investors to

include resilience cost and benefit considerations into investment decision-making and help them better understand and manage physical climate risks.

It recently launched a Systemic Risk Assessment Tool (SRAT), designed by Oxford University in collaboration with the Jamaican Government and first rolled out in Jamaica. J-SRAT has been developed to help identify 'hotspots' across the country's major infrastructure networks - such as energy, water and transport - most vulnerable to climate risk, ensuring the effective and efficient investment of public and private resources.

<https://resilientinvestment.org/ccri-launches-new-climate-technology-to-transform-how-countries-anticipate-prepare-and-adapt-to-intensifying-climate-conditions/> May2022  
<https://resilientinvestment.org/risk-and-resilience-report/> Nov 2021.

### → Climate Policy Initiative CPI- Cities Climate Finance Leadership Alliance (CCFLA):

analysis and advisory organization with deep expertise in finance and policy. Mission is to help governments, businesses, & financial institutions drive economic growth while addressing climate change.

CPI is Secretariat for CCFLA, the main coalition aimed at closing the investment gap for urban subnational climate projects and infrastructure.

<https://www.climatepolicyinitiative.org/>

2021 Global Landscape of Climate Finance  
<https://www.climatepolicyinitiative.org/publication/the-state-of-cities-climate-finance/>

2021 State of Cities Climate Finance Report examines the state of urban climate investment, the barriers to reaching the needed investment levels, and the steps to overcoming these challenges.

### → C40 Cities

A global network of 97 global cities dedicated to addressing climate change.

<https://www.c40.org/>

### → Global Covenant of Mayors -GCOM

largest global alliance for city climate leadership, uniting more than 10,000 cities and local governments in a coalition that also includes 100+ supporting partners. Together, the members of this network share a common long-term vision: supporting voluntary action to combat climate change in creating resilient, low-emissions societies.

<https://www.innovate4cities.org/>

### → Glasgow financial alliance for Net-Zero (GFANZ)

coalition of private financial institutions (announced at Glasgow COP26) to accelerate the alignment of financing activities with net zero and support efforts by all to achieve the goals of the 2015 Paris Agreement.

<https://www.gfanzero.com/press/amount-of-finance-committed-to-achieving-1-5c-now-at-scale-needed-to-deliver-the-transition/>

### → Global Adaptation & Resilience Investment Working Group (GARI)

private investor-led initiative; Set up in the run up to the Paris COP21 conference to bring together private investors & other stakeholders to focus on investment in climate adaptation and resilience provides private investors with briefings & connections around the practical intersection of investment (not infra-specific) and climate adaptation and resilience.

<https://garigroup.com/>

GARI 2019 Investor Briefing on Physical Climate Risk and Resilience.

Briefing provides an update to the 2017 *Investor guide to PDR and Resilience* with the latest developments in adaptation finance. Purpose of Briefing is to educate investors on how to think about physical climate impacts in their investment and portfolio management decisions, & to help investors identify new opportunities to proactively invest in adaptation and resilience. This briefing seeks to mainstream climate adaptation.

in financial management for asset owners, investors, insurers, and lenders.

#### → G20-Global Infrastructure Hub (GIH)

<https://www.gihub.org/>

The Global Infrastructure Hub (GI Hub) is an international infrastructure body established by the G20, to foster the development of sustainable infrastructure across the world.

The 2022 G20 Infrastructure Investors Dialogue – promoted by D20-LTIC, the Indonesian G20 Presidency, the OECD and GI Hub – will inform the G20/GI Hub Framework on how to best leverage private sector participation to scale up sustainable infrastructure investment.

To stimulate action towards achieving climate goals, the GI Hub is working on a framework for G20 countries to increase private sector investment in sustainable infrastructure projects. The G20 and GI Hub Framework on How Best to Leverage Private Sector Participation to Scale Up Sustainable Infrastructure Investment is still a work in progress as of September 2022, requiring stakeholder consultation between June and September, including with the G20 Infrastructure working group (IWG) members and the private sector (including LTIIA).

#### → GSIA: the Global Sustainable Investment Alliance

<http://www.gsi-alliance.org/>

#### → Institutional Investors Group on Climate Change (IIGCC)

<https://www.iigcc.org/>

Leading global investor membership body – largest in Europe – focusing on climate change; at the heart of key global investor initiatives on CC. This includes *Climate Action 100+* & *the Investor Agenda*. IIGCC works closely with investor networks across the globe through the *Global Investor Coalition on Climate Change*.

*Investor Practices* programme helps members and broader investment sector better integrate climate risks & opportunities into their investment processes and decision-making. Reports & a guide for investors focused on Understanding physical climate risks and opportunities – rather than financial dimension.

IIGCC just launched (Feb'22) a private equity component for the Net Zero Investment Framework (NZIF) to help GPs make and implement net zero commitments and allow LPs to incorporate private equity in net zero strategies for multi-asset portfolios. It released a discussion paper on a proposed climate-resilience investment framework in September '22.

<https://www.iigcc.org/resource/working-towards-a-climate-resilience-investment-framework/> – Sept 2022

<https://www.iigcc.org/news/first-net-zero-guidance-for-private-equity-for-gps-and-lps-launched-by-iigcc/>. – Feb '22

Also Published in 2020-21:

<https://www.iigcc.org/download/addressing-physical-climate-risks-and-opportunities>

<https://www.iigcc.org/resource/building-resilience-to-a-changing-climate>

<https://www.iigcc.org/download/understanding-physical-climate-risks-and-opportunities-a-guide-for-investors>

#### → International Sustainability Standards Board (ISSB)

established by IFRS Foundation, the international accounting standard body, & launched in Glasgow to develop globally consistent climate and broader sustainability disclosure standards for the financial markets.

<https://www.ifrs.org/groups/international-sustainability-standards-board/>

the ISSB aims to deliver a comprehensive global baseline of sustainability-related disclosure standards that provide investors with information about companies' sustainability-related risks and to help them make informed decisions.

#### → ISRC: the International Sustainable Resilience Center

<https://isrc-ppp.org/>

Founded in 2018, ISRC is one of 8 International PPP Specialist Centers of Excellence. It

provides research and capacity-building to create Next Generation Public Private Partnerships furthering the UN Sustainable Development Goals (SDGs). It aims to strengthen investment projects by incorporating resilience, sustainability and ensuring adherence to Next Generation PPP principles.

#### → The Global Innovation Lab for Climate Finance (the Lab)

The Lab is an investor-led initiative that identifies, develops, and launches promising solutions to drive critical public and private investment in climate change in developing economies, to tackle barriers to investment and unlock sustainable private financing, through a broad range of financial instruments such as guarantees, mortgages, insurance, and bonds.

<https://www.climatefinancelab.org/>

#### → Net-Zero Insurance Alliance (NZIA)

group of over 20 leading insurers representing more than 11% of world premium volume globally, launched at the G20 Climate Summit in Venice in July 2021.

NZIA members have committed to transition their insurance and reinsurance underwriting portfolios to net-zero greenhouse gas (GHG) emissions by 2050. Also members of Net-Zero Asset Owner Alliance (NZAOA).

<https://www.unepfi.org/net-zero-insurance/>

#### → OECD :

<https://mneguidelines.oecd.org/environment/>

*Managing Climate Risks and Impacts through Due Diligence for Responsible Business Conduct: A Tool for Institutional Investors*.

The paper seeks to explain how the due diligence process recommended by the OECD Guidelines for Multinational Enterprises can be applied by investors to prevent and mitigate adverse climate impacts associated with underlying companies and assets in their portfolios, i.e. from an environmental materiality perspective.

#### → Taskforce on Climate-related Financial Disclosures (TCFD)

has published guidance on metrics, targets and transition plans to measure more accurately the alignment of lending, investment with Climate goals.

<https://www.fsb-tcfd.org/>

#### → UN Environment Programme (UNEP)

*Adaptation Gap Report 2021- The Gathering Storm* looks at how the world is adapting to intensifying impacts & Urgent need to step up climate adaptation finance.



<https://www.unep.org/resources/adaptation-gap-report-2021>

<https://www.unep.org/explore-topics/climate-action>

#### → World Bank Group

<https://openknowledge.worldbank.org/handle/10986/35203>

#### **Enabling Private Investment in Climate Adaptation and Resilience: Current Status, Barriers to Investment and Blueprint for Action**

The report covers current levels of private financing for climate adaptation in Emerging Markets and Developing Economies and how they fit into global efforts to finance climate resilience-building. It documents the main barriers to private investment in adaptation and how to address these barriers.

It proposes a blueprint for action to develop, finance, and implement priority adaptation and resilience investments where the public sector plays a critical role in mobilizing private investment.

*Public-Private Partnership Legal Resource Center (PPPLRC)*

<https://ppp.worldbank.org/public-private-partnership/energy-and-power/climate-smart-ppps-1>

<https://openknowledge.worldbank.org/handle/10986/37287> : PPP Climate toolkit for Infrastructure

The fiscal constraints of governments requires to crowd in private sector solutions, innovation, and finance to create solutions and pathways to meet Paris Agreement goals. Participation of the private sector in climate-smart investments in infrastructure through public-private partnerships (PPPs) is critical, but can be a challenge. The toolkit aims to address this challenge by embedding a climate approach into upstream PPP advisory work and structuring. If structured correctly, PPPs can increase

climate resilience offering innovative solutions to address both mitigation and adaptation challenges.

*Global Facility for Disaster Reduction and Recovery (GFDRR)*

Established in 2006, GFDRR is a global partnership that helps low- and middle-income countries better understand and reduce their vulnerability to natural hazards and climate change.

<https://www.gfdr.org/en>

*PPIAF*

The Public – Private Infrastructure Advisory Facility (PPIAF) helps developing-country governments strengthen policies, regulations, and institutions that enable sustainable infrastructure with private-sector participation

<https://blogs.worldbank.org/ppps/blue-print-action-attract-private-investment-climate-adaptation-infrastructure>

#### → World Economic Forum (WEF)

WEF's Climate Initiative supports the scaling of global climate action through public-private collaboration. The Initiative works across several workstreams to develop inclusive and ambitious solutions.

This includes the Alliance of CEO Climate Leaders, a global network of business leaders from various industries that use their position and influence to accelerate the transition.

<https://www.weforum.org/agenda/2022/01/trillions-are-being-committed-to-climate-mitigation-but-what-about-climate-adaptation>

## Annex 2

### Definition of terms and Concepts:

**Adaptation** of climate change constitutes “The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.”

**Adaptation costs:** Costs of planning, preparing for, facilitating, and implementing adaptation measures, including transaction costs.

**Impacts:** The consequences of realised risks on natural and human systems, where risks result from the interactions of climate-related hazards lives, livelihoods, health and wellbeing, ecosystems and species, economic, social and cultural assets, services (including ecosystem services) and infrastructure. Impacts can be adverse or beneficial.

**Maladaptation:** Actions that may lead to increased risk of adverse climate-related outcomes, including via increased greenhouse gas (GHG) emissions, increased vulnerability

to climate change, or diminished welfare, now or in the future. Maladaptation is usually an unintended consequence.

**Mitigation** of climate change constitutes “a human intervention to reduce the sources or enhance the sinks of greenhouse gases (GHGs)”.

**Resilience** is “the capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation.”

**Climate-resilient infrastructure:** Infrastructure that is planned, designed, built and operated in a way that anticipates, prepares for, and adapts to changing climate conditions. It can also withstand, respond to, and recover rapidly from disruptions caused by these climate conditions.

*The definitions above are mostly based on Synthesis Report, Contribution of Working Groups to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Annex II: Glossary in Climate Change, IPCC, 2014.*





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Report established by & under the responsibility of **Francois Bergere**, Executive Director **LTI/A**.

We gratefully acknowledge the inputs of the following LTI/A working group members: Serge Ndikum & Jemima Atkins, **AllianzGI**, Rhyadd Keaney-Watkins-**Arjun Infra Partners**, Benedetta Gillio & Francesco Tomaiuolo -**Arpinge**, Anne-Claire De Vauplane -**CNP**, Priscilla Negreiros-**CPI**, Tobias Haumer-**D20-LTIC**, Takeo Kitamura & Kentaro Hayashi, - **DBJ**, Cinzia Losenno-**EIB**, Fabien Nugier & Darwin Marcelo - **EDHEC Infra**, Julie Maertens & Motohiro Taniguchi-**GPSS**, Evelina Radgren-**Infranode**, Isoline Degert & Ludovic Both-**Infravia**, Madeleine Pollock & Regan Smith-**J.Hancock/Manulife**, Emmanuelle Nasse Bridier & Salim Bensmail- **Meridiam**, Nathalie Dogniez- **PWC Lux**, Beatrice Causse-**Pro BTP**, Alexandre Triki **Rivage Investment**, Hans Fredrik Forssman, **Skandia**, Celeste Pouteaux-**STOA**, and Georg Inderst & Robin Simpson ,**LTI/A advisory Board**





Long-term  
Infrastructure  
Investors  
Association

4, place de l'Opéra  
75002 Paris, France

**info@ltiia.org**