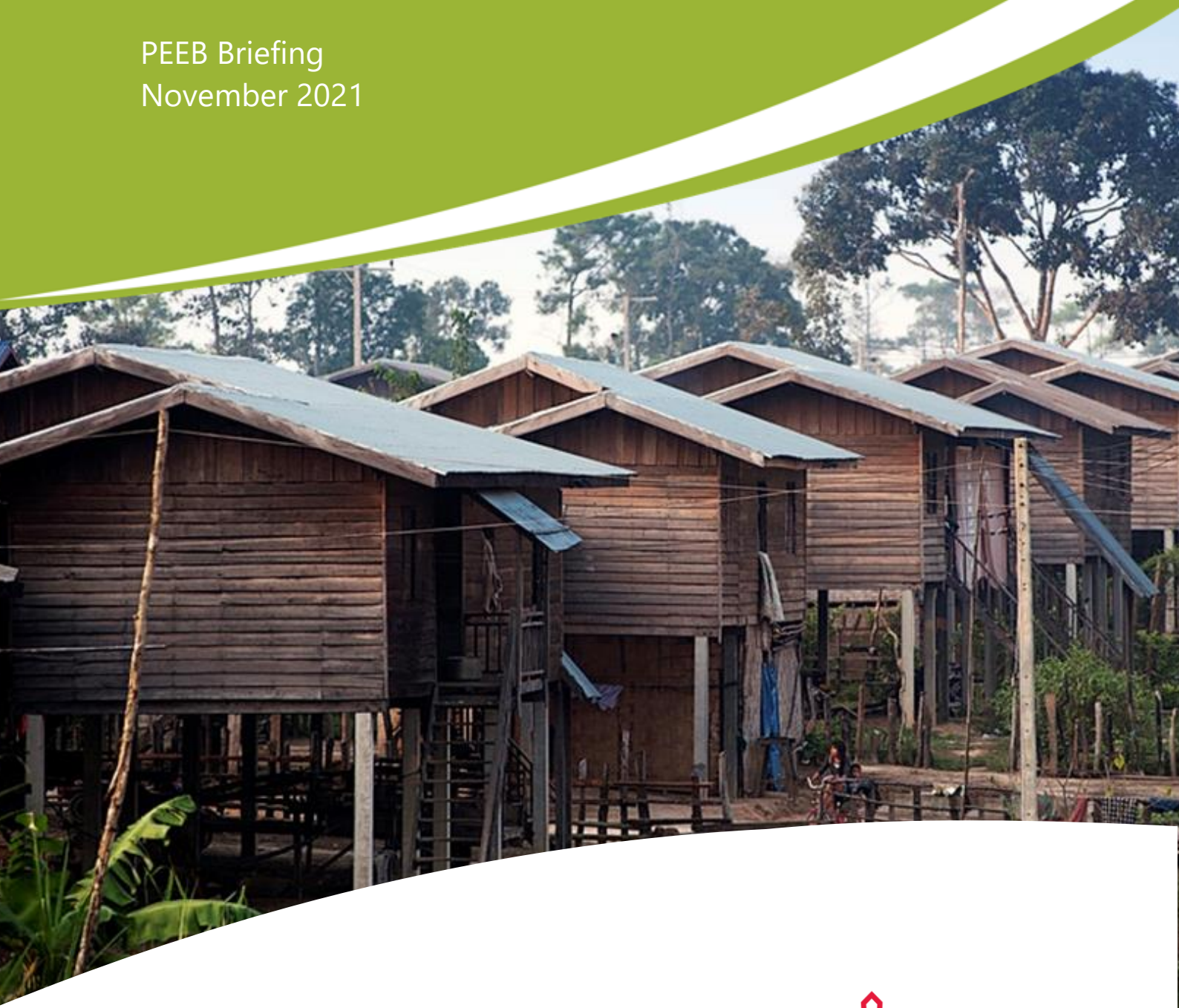
# THE ADAPTATION IMPERATIVE FOR BUILDINGS

## How can development banks scale up low-carbon and resilient buildings?

PEEB Briefing
November 2021



PEEB
PROGRAMME FOR ENERGY EFFICIENCY IN BUILDINGS

# CONTENT



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All possible inaccuracies remain the responsibility of the authors.

# EXECUTIVE SUMMARY

**Buildings – our homes, schools, offices - are at risk from extreme climate events such as floods, storms, heatwaves, droughts, soil erosion or wild fires.** Developing countries and poorer populations, which are more exposed and more vulnerable to disasters, are disproportionately affected by climate change. Among the 100 fastest growing cities in the world, 84 are already at an extreme risk from climate change. Failure to adapt buildings can threaten socio-economic development. Yet, adaptation of the building sector remains largely unaddressed.

**Climate change adaptation and mitigation need to be pursued actively and simultaneously to address current climate threats and avoid worst future impacts.**[1] Synergies between mitigation, adaptation and development goals in the building sector are numerous: passive cooling, flexible design, local materials, nature-based solutions or water conservation can both improve the resilience of buildings and reduce their environmental impact while increasing quality of life and local employment. These synergies must be brought to wider global attention in order to scale up action.

With over 10% of all investments worldwide, **development banks can play a major role in scaling up low-carbon and resilient buildings by raising awareness, setting new standards and building capacities.** With certain practices, development banks can mainstream climate adaptation and mitigation across their investments in partner countries.


Figure 10: Recommendations for development banks to mainstream climate adaptation and mitigation in their building investments (source: PEEB)

[1] Global Alliance for Buildings and Construction (GlobalABC) (2021). *Adaptation of the Building Sector to Climate Change: 10 Principles for Effective Action.*

# 1. ADAPTATION IN THE BUILDING SECTOR

## 1.1. Climate risks in the building sector

The built environment and the services it provides are particularly vulnerable to extreme climate events such as floods, storms, heatwaves, droughts, soil erosion or wild fires. Among the 100 fastest growing cities in the world, 84 are already at an extreme risk from climate change.[2] The populations of Sub-Saharan Africa and Asia are most at risk. Climate resilient buildings are therefore vital to ensure sustainable development around the planet.

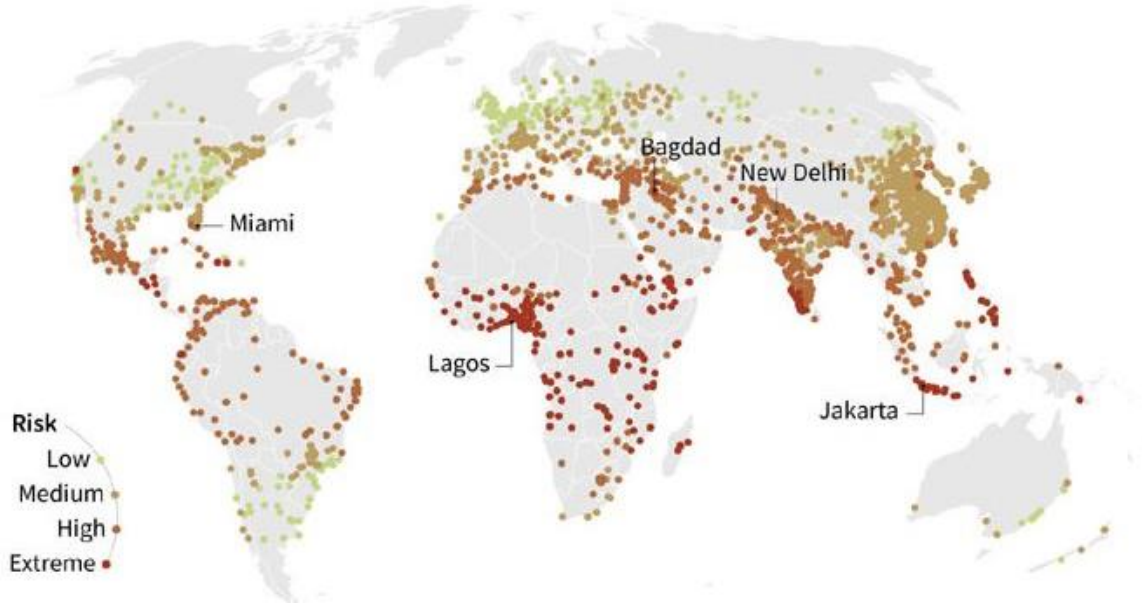


Figure 1 : Estimates of climate change vulnerability of large cities (source: GABC, 2021)

The global building floor area is expected to double by 2060 while the biggest growth is expected in developing and emerging economies.[3] The building sector thus represents a major lever for economic and human development with estimated USD 5,9 trillion annual investments in 2019.[4] However, investors have started raising concerns over asset worth loss in climate risk-prone areas.

Maladaptive infrastructures can increase climate risks and stunt the economic development of a region. The IEA has estimated that the long-term cost of inaction will be far greater than the cost of integrating adaptation in development plans early on.[5] Yet, growing awareness on rising climate risks has not been sufficient to motivate policies and investments to address climate adaptation in the building and construction sector at scale, notably in developing countries.

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[2] Reuters (2018). "Fast-growing African cities at 'extreme risk' from climate change"
[3] Global Alliance for Buildings and Construction (GlobalABC) (2017). *Global Status Report 2017: towards a zero-emission, efficient, and resilient buildings and construction sector.*
[4] International Energy Agency (IEA) (2020). *Energy Efficiency 2020.*
[5] GlobalABC (2018). *2018 Global Status Report on Buildings and Construction.*

## 1.2. Adaptation is lagging behind mitigation

The importance of the building and construction sector in the fight against climate change is widely acknowledged. The sector represents almost 40% of human activities-related greenhouse gas emissions globally.[6] Governments, private actors, international organisations are realising the importance of decarbonising the building sector. Buildings are mentioned in the Nationally Determined Contributions (NDCs) of 136 countries. Although building sector emissions keep rising, quantitative CO2 reduction targets and carbon assessment tools make it technically possible to evaluate the impact of buildings on the climate and define strategies for improvements.

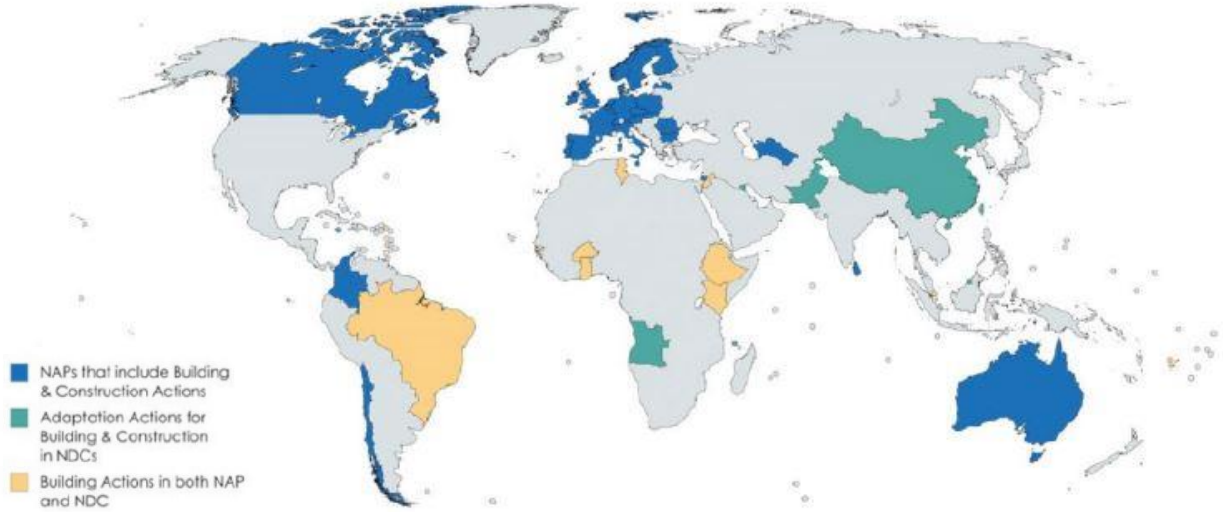


Figure 2: Global coverage of Building Sector Climate Adaptation Actions (source: GABC 2018)

Addressing climate vulnerabilities in the built environment has proven more challenging. Although adaptation to climate change is recognised as a global issue in the Paris Agreement, most countries do not yet have explicit measures in place to improve the resilience of their built environment.[7] Several factors can explain this lag in climate adaptation action.

Climate risks vary greatly depending on climatic, geographical and socio-economic factors. Adaptation is thus only effective when it takes into account local vulnerabilities and specificities. Information about the future climate and local context should drive the planification and design of any building. Large infrastructure projects may require thorough risk assessments with climate projections over several decades. However, information about risks is missing, vulnerability assessments are rarely mandatory and even large-scale project owners often lack the right expertise.

Self-construction holds a sizeable share in the rapid urbanisation of many developing countries. Yet, small project owners and self-constructors often lack information and knowledge to factor in climate risks over the lifetime of their building.[8] Insufficient awareness

[6] GlobalABC (2019). *2019 Global Status Report on Buildings and Construction*.
[7] GlobalABC (2021). *Buildings and Climate Adaptation: A Call for Action*.
[8] GlobalABC (2021). Buil*dings and Climate Adaptation: A Call for Action*.

raising, technical guidance, planning laws, enforcement and reporting make it difficult for authorities to regulate the building sector and reduce climate risks.

In the public sector, the extra-cost of building resilient or retrofitting ageing infrastructures may be difficult to meet. Especially in developing countries, climate risks appear marginal compared with more pressing development issues, and investing in resilience is not seen as a priority. [9] Financial resources and incentives are missing to ensure adaptation of public infrastructures at scale.

Moreover, public authorities and development institutions tend to separate adaptation from other socio-economic development and climate mitigation goals, although synergies with climate adaptation are numerous in the built environment. This leads to lower engagement to invest in individual climate adaptation measures because the benefits seem lower.

## 1.3. Synergies between adaptation, mitigation and development

Climate adaptation and mitigation actions usually affect different economic sectors, spatial scales and timeframes, so that costs and benefits are distributed differently.[10] However, in the case of the built environment, mitigation and adaptation measures can produce significant co-benefits for development, including safer, healthier, and more comfortable homes, public spaces and social infrastructures, and reduced vulnerabilities for low-income groups. [11]

Building projects can unlock synergies between adaptation, mitigation and socio-economic development if they follow certain principles. The following examples illustrate how building design and construction measures can achieve this:

- **Passive cooling**

In hot climates, passive design measures can drastically lower the energy needed to cool down a building while improving thermal comfort for building users. Orientation, shape, openings, window-to-wall ratio, façade coating and material choices can be optimised depending on the type of climate to keep the building cool while providing enough natural light and ventilation.[12] This approach delivers climate mitigation, by reducing GHG emissions related to energy needs, while improving the resilience of the building to rising temperatures

Figure 3: Léo Surgical Clinic and Health Centre uses passive cooling techniques such as compressed earth bricks and large overhanging roofs (Architects: Kéré Architecture)

[9] IPCC (2014). *Climate Change: Impacts, Adaptation, and Vulnerability*. Part A: Global and Sectoral Aspects: Urban Areas. Cambridge University Press.
[10] R. Swart, F. Raes (2007) M*aking integration of adaptation and mitigation work: mainstreaming into sustainable development policies?* Climate Policy, 7:4, 288-303.
[11] IPCC (2014). *Climate Change: Impacts, Adaptation, and Vulnerability*. Part A: Global and Sectoral Aspects: Urban Areas. Cambridge University Press.
[12] Programme for Energy Efficiency in Buildlings (PEEB) (2020). *Better design for cool buildings*.

and heatwaves. Passive design also supports socio-economic development by reducing energy poverty, increasing resilience to blackouts in combination with on-site renewable energy production, and improves access to social services in case of extreme heat events.

**● Design for flexibility**

Buildings can be designed to easily evolve over time in response to disruptions or changing needs. This extends the lifecycle of the building's while reducing the need for carbon intensive materials and energy for renovation, deconstruction and new construction. Adaptability prevents obsolescence of the building and increases its resilience to changing climate conditions such as rising temperature and sea level.

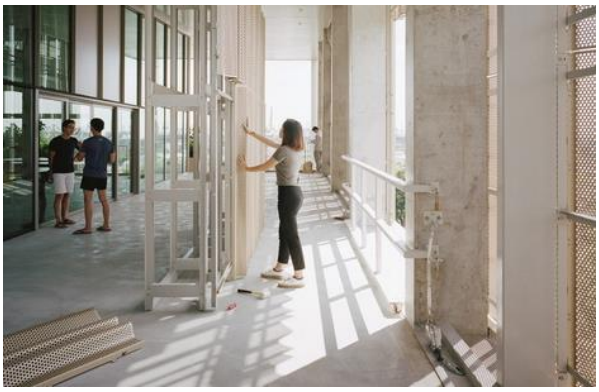

Figure 4: The NUS School of Design & Environment has flexible rearrangement of layout for exhibitions and future change of use. (Architects: Multiple Architects, Serie Architects, Surbana Jurong)

Designing for functional flexibility and adaptability involves, for example, using standardised and versatile layouts, long-lasting core structures, dismountable and reusable building components, or technical equipment with sufficient capacity to support more or less intensive uses in the future. Frangible design and "triage" design also provide greater resilience to extreme climatic events such as floods and storms.[13] These approaches use modular and easily removable building components to limit long-lasting damage to the core structure and enable quick rehabilitation after a hazard event.

**● Local materials**

Local bio-based materials have great potential to replace conventional building materials. They can offer excellent structural properties, enhance thermal comfort and minimise indoor humidity. Bioclimatic design increases building resilience while reducing its climate impact by combining passive and resilient design with local bio-based materials such as wood, bamboo, natural fibers, clay or raw earth.[14] Local materials, either bio-based or recycled, have a significantly lower carbon footprint than conventional building materials such as concrete, steel and glass. Plant-based materials contribute to carbon sequestration, while recycling lowers the need for new production and transportation. Using local materials in buildings promotes sustainable

Figure 6: Jewel Changi Airport, Singapore (Architect: Safdie Architects)

[13] UNEP (2021). *A Practical Guide to Climate-resilient Buildings & Communities*.
[14] PEEB (2021). *Building Materials and Construction – A hidden emissions heavyweight*.

economic development and creates non-relocatable jobs. Cheap and easily available materials also support quick repair or reconstruction after climate related disasters.

**● Nature-based solutions**

Figure 7: Green roof in densly populated area

Revegetation is the process of replanting and regenerating soil in environments disrupted by human activities, such as urbanised areas. Revegetation recreates dense eco-systems able to protect endemic species while contributing to climate mitigation by offsetting CO2 emissions. Green infrastructure can protect the built environment from extreme climatic events and disasters. By providing shade and reducing heat island effects through evaporation, surrounding vegetation can help keep a building cool. Proximity to green spaces has also proven to increase the mental well-being of residents and building users. Revegation supports ecosystems, prevents soil erosion and can offer a natural barrier protecting coastal populations from sea level rise and storm surges.[15] It also creates a layer of living and permeable soil in which water is retained and progressively absorbed, reducing the effects of drought and floods. Notably, green roofs are an effective way to provide insulation from excessive heat while improving rainwater management by storing and slowly evacuating rainwater.

**● Water conservation**

Figure 8: The cove house uses inverted roof to harvest the rainwater which is channeled and stored in multiple water bodies.
(Architects: Red Brick Studio)

Rainwater harvesting and water-saving devices can be combined to minimise water consumption in buildings. This measure can increase a building's self-sufficiency and resilience to water supply shortages and rising water prices caused by extreme climatic events or political conflicts. In addition, water conservation measures help lowering the strain on natural fresh water resources as well as water supply and treatment facilities. The need for additional infrastructure, maintenance and energy can thereby be reduced.

[15] UNEP (2021). *A Practical Guide to Climate-resilient Buildings & Communities*.

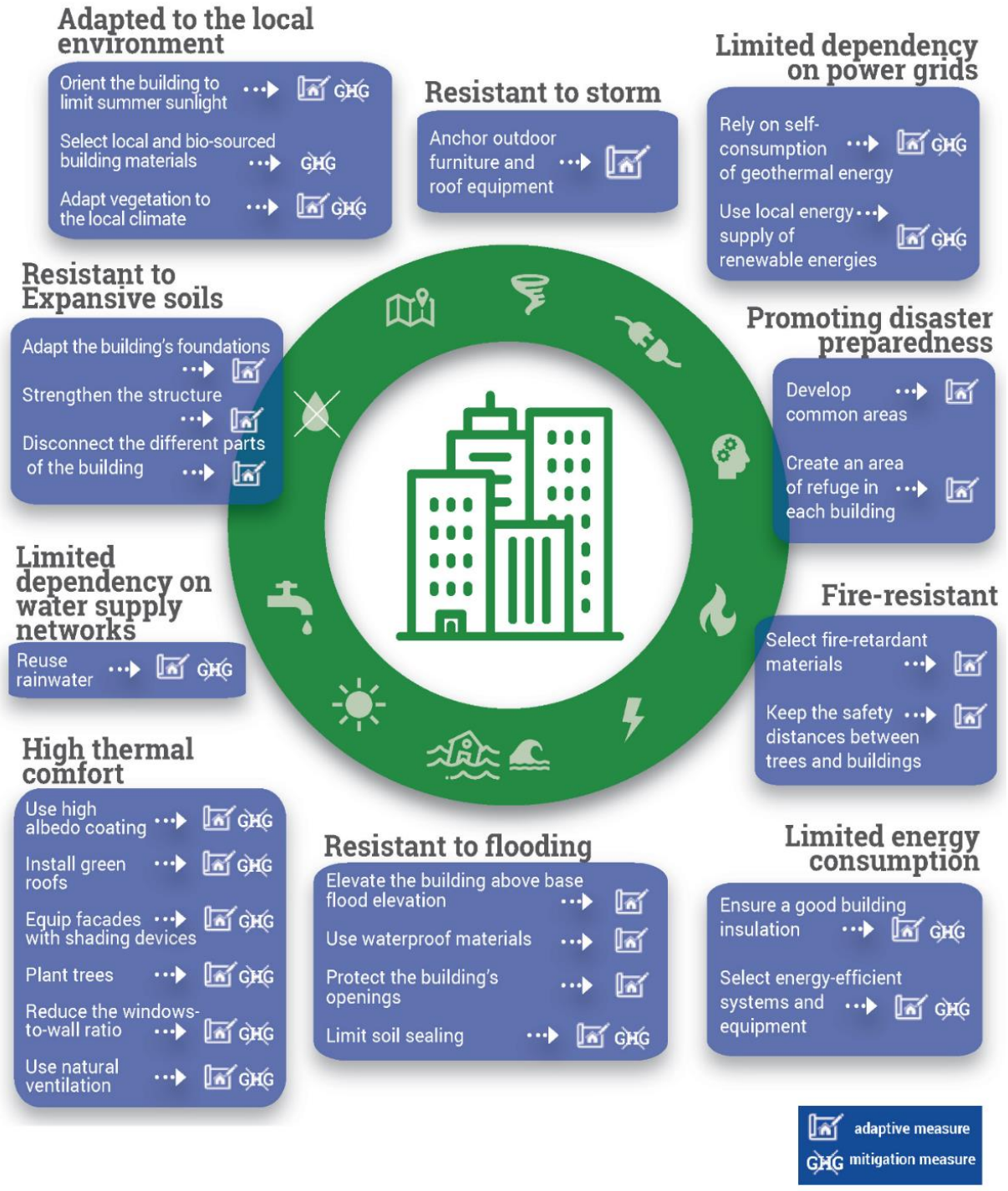


Figure 9: Mitigation and adaptation solutions to the challenges of tomorrow's buildings.
Source: GlobalABC (2021). *Buildings and Climate Adaptation: A Call for Action.*

# 2. THE ROLE OF DEVELOPMENT BANKS

## 2.1. Mainstreaming adaptation in development finance

With over 10% of all investments worldwide, development banks hold a central role in shifting global finance towards climate action.[16] Development banks have a responsibility to ensure their investments benefit climate resilient projects and avoid maladaptive projects that may undermine development efforts. By taking and promoting an integrated approach to climate adaptation and mitigation in their investments, development banks have the capacity to raise awareness among building sector stakeholders, set new standards and build capacities through projects and knowledge exchange. Highlighting the link between climate action and development goals may also increase interest and willingness of project stakeholders to engage in climate action.[17]

Development banks have largely expressed their ambition to align with UN Sustainable Development Goals and Paris Agreement targets. [18, 19] In 2015, Multilateral Development Banks and the members of the International Development Finance Club (IDFC) agreed on common principles and guidelines for climate mitigation and climate adaptation finance tracking.[20] Following the Paris Agreement, climate co-benefits[21] have become a central element in the strategies of development banks to achieve their climate commitments.[22]

However, while mitigation benefits from a relatively simple accounting framework based on the objective of reducing greenhouse gases, evaluating the success of adaptation measures is more challenging. The high level of uncertainty surrounding climate change makes it more difficult to integrate appropriate adaptation measures and assess their effectiveness in the long term.[23] Accounting for climate adaptation in development protfolios is also difficult because climate risks are rarely addressed through individual projects and the impact of adaptation measures cannot be easily aggregated. For many development banks, this has caused a lack of data and visibility around climate adaptation financing.

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[16] Finance in Common (2020). "Why finance in common".
[17] IPCC (2014). *Climate Change: Impacts, Adaptation, and Vulnerability.* Part A: Global and Sectoral Aspects: Urban Areas. Cambridge University Press.
[18] European Think Tank Group (ETTG) (2021). Financing the 2030 Agenda: An SDG alignment framework for Public Development Banks
[19] Climate Policy Initiative (CPI) (2019). *Implementing Alignment with the Paris Agreement: Recommendations for the Members of the International Development Finance Club*.
[20] International Development Finance Club (IDFC) (2015). *Common Principles for Climate Mitigation Finance Tracking*. & IDFC (2015). *Common Principles for Climate Adaptation Finance Tracking*.
[21] In development finance, climate co-benefits are the share of investment directly contributing to climate change mitigation or adaptation objectives. Although taxonomies and accounting methodologies may differ, the aim is to promote an integrated approach on development, climate mitigation and climate adaptation in development finance operations. Appropriately identifying and quantifying climate co-benefits in development projects is therefore a crucial step for development banks to achieve their climate commitments.
[22] World Bank (2019). *Joint Report on Multilateral Development Banks' Climate Finance.*
[23] Agence Française de Développement (AFD) (2019). *Climate Change: Assessing our Ability to Adapt*.

Development banks should therefore set up dedicated methodologies and assessments tools to ensure adaptation in building projects is accounted. Climate adaptation and mitigation experts should get involved at an early project phase and provide technical advisory and guidance throughout its implementation. Development banks should also exchange their experience in the field of integrated climate action to create the collective know-how that is needed.

Beyond their own financing tools, development banks should seek alignement with other sector stakeholders. Scaling up climate adaptation requires a shared understanding of the process, the climate data, the scale, the types of measures, the human impact, the potential synergies and trade-offs, etc. A set of common principles, such as defined by the GlobalABC, is essential to ensure coherence and effectiveness of action across the value chain.[24] As central stakeholders, development banks have a responsibility to involve all actors from national policy makers to the local community level in a common adaptation strategy, build capacities and ensure appropriate monitoring and evaluation.

**IDFC Green Building cooperation**

IDFC brings together 26 development banks from developed and developing countries who jointly committed to providing over USD 1 trillion climate finance by 2025.[25] In line with this objective, IDFC Climate Facility set up a Green Buildings Cooperation group to increase the volume of green building financing of IDFC members and accelerate the transition towards a climate-friendly and resilient building sector. The cooperation includes peer-to-peer knowledge exchange and technical advisory to help overcome recurring financing barriers and disseminate best practices. The cooperation is also providing a platform for matchmaking opportunities to encourage co-financing among IDFC members on complex and ambitious mitigation and adaptation projects in buildings in order to increase financing volume and strengthen internal capacities.

## 2.2. Recommendations for development banks

By adopting following practices, development banks can play an important role in scaling up integrated climate adaptation and mitigation in their partner countries:

- **Involve green building experts early on** in project identification and appraisal phases. Projects, which inherently increase resilience, should be prioritised. Early integration of adaptation and mitigation measures lowers costs and raises their effectiveness. Experts can ensure projects set adaptation and mitigation objectives prior to their design.

- **Make financial commitment conditional to climate vulnerability assessments.** Unknown or unadressed climate risks can undermine the usability and the financial viability of a building. Vulnerability assessment studies are an essential step to ensure financial support will deliver long-lasting socio-economic infrastructures and services.

[24] GlobalABC (2021). *Adaptation of the Building Sector to Climate Change: 10 Principles for Effective Action*.
[25] IDFC (2020). IDFC *Green Finance Mapping Report 2020*.

- **Offer concessional loans or grants to ambitious projects** focusing on long-term resilience rather than short payback periods. Provide monitoring and evaluation to ensure the right measures are implemented in order to meet the project's climate adaptation and mitigation targets.

- **Provide technical assistance** to help projects achieve high adaptation and mitigation targets. Free-of-charge technical assistance can encourage project owners to raise their climate ambitions. Sector stakeholders benefit from knowledge exchange and standards rise in local construction and renovation practices.

- **Account climate co-benefits for building projects** and make financing conditional to a minimum level of co-benefits. Develop a methodology that accounts for both the climate mitigation and adaptation co-benefits of each construction or renovation project. Incentivise measures with strong mitigation, adaptation and development synergies by summing their co-benefits.

- **Share knowledge among peers**. The development of appropriate incentives, financing tools and accounting methodologies for climate adaptation is challenging. International knowledge and best practice exchanges among development banks can help overcome recurring barriers.


Figure 10: Recommendations for development banks to mainstream climate adaptation and mitigation in their building investments (source: PEEB)

## 2.3. Financing tools for integrated climate action in buildings

**● ADB mandatory climate risk management and adaptation assessment**

Asian Development Bank (ADB) set mandatory Climate Risk Management (CRM) and Climate Risk Adaptation assessments (CRA) for all its projects. The aim is to address climate risks across ADB's development portfolio rather than focusing on individual climate adaptation projects. A vulnerability screening is applied to all ADB investments, followed by a more detailled climate adaptation assessment for projects identified to be at higher risk. CRM and CRA follow a set of principles ensuring that key climate risks are recognised early on during project identification in order to quickly orient the assessment towards adequate climate proofing measures.[26] The approach allows for flexibiility and iterative improvements in adaptation implemenation and monitoring. Although these principles are primarily intended at ADB's project cycle, they also provide useful guidance and incentives for climate risk management and adaptation to beneficiary countries.

**● AFD technical assistance facility for energy efficient buildings**

An internal technical assistance facility was set up to ease the climate proofing of AFD building construction and renovation projects. Internal capacity building and advisory is provided to encourage the integration of energy and environmental aspects early on in project identification and preparation. During implementation, the facility offers on demand free technical assistance for project owners in order to reach their energy performance, emissions reduction, thermal comfort and climate resilience objectives. A framework contract allows for a range of standardised services covering all building project phases. The facility also supports the development of sector level strategies, building guidelines and training programmes. In the Comoros, AFD's facility has mobilised technical consultants to help the Ministry of Education improve its higher education infrastructure. The assistance includes energy performance councelling, assessment of climate risks including sronger storms, cyclones, floods and earthquakes, as well as the elaboration of sectoral guidelines for climate-proof renovation and guidelines for professional training programmes towards energy efficiency jobs.

**● PEEB Tunisian hospitals**

The Programme for Energy Efficiency in Buildings (PEEB) is an initiative jointly implemented by AFD, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and Agence de la Transition Ecologique (ADEME) to support countries in their transition to a low-carbon and resilient building sector. In its partner countries, PEEB combines

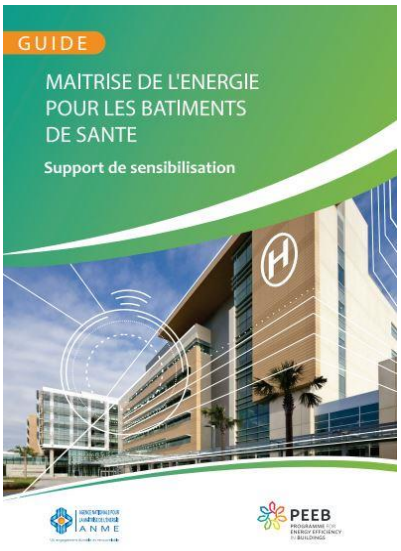


Figure 10: Guide for energy efficiency in healthcare buildings in Tunisia developed with PEEB support. (Photo: PEEB, avaible at: Tunsia hospital guide)

[26] Asian Development Bank (ADB) (2020). *Principles Of Climate Risk Management For Climate Proofing Projects*.

technical assistance for building projects benefiting from AFD financing or co-finanncing, public policy support provided by GIZ and capacity building activities developed by ADEME. The objective is to ensure that new constructions and renovations lower their CO2 impact, reduce energy expenses, and increase their resilience to climate change especially in terms of thermal comfort. In Tunisia, the Ministry of Health elaborated sectoral guidelines for energy efficiency in hospitals with the support of GIZ, while AFD hospital projects incorporate these guidelines and disseminate them through best practice.

**● AFD climate co-benefit accounting methodology for buildings**

Agence française de développement (AFD) elaborated a climate co-benefit accounting methodology to promote energy and environmental performance improvements in AFD financed or co-financed building projects. To contribute to AFD's Paris Agreement objectives, every building project has to achieve a minimum amount of climate co-benefits. Co-benefits are expressed as a share of total project investment. The methodology accounts for both climate mitigation and climate adaptation. Measures delivering on both aspects achieve cumulative accounting. Taking an integrated approach to mitigation and adaptation and setting clear objectives on both aspects when designing a building is therefore valued higher.

**● Global EbA Fund**

The Global Fund for Ecosystem-based Adaptation is supported by UNEP, International Union for Conservation of Nature (IUCN) and the German International Climate Initiative (IKI). The aim is to provide capacity building, policy support and finance mechanisms to scale up the use of nature-based solutions for climate adaptation. The fund provides grants to integrate nature-based adaptation into existing infrastructure projects and enhance their climate impact. It can be used to leverage larger multilateral funds or to incentivies private-sector involvement through demonstration actions and capacity building to reduce investment risk.[27] The fund emphasises low-cost and holistic natural approaches such as mangroves and coral reef preservation for coastal defence against windstorms and floods, urban revegetation for natural cooling and air quality, and reforestation for groundwater restoration in drought-prone areas.

Figure 11: The Global EbA Fund notably supports mangrove restoration projects.

[27] Global EbA Fund (2020). "What we fund".

# FIGURES

Cover: Photo by Stanislas Fradelizi (2010). Resettlement village, Nakai Plateau, Khammoune Province, Lao. World Bank Photo Collection.
Figure 1: Global Alliance for Buildings and Construction (2021). Buildings and Climate Change Adaptation- A call for action. Available at: https://globalabc.org/resources/publications/buildings-and-climate-change-adaptation-call-action
Figure 2: Global Alliance for Buildings and Construction (2021). Buildings and Climate Change Adaptation- A call for action. Available at: https://globalabc.org/resources/publications/buildings-and-climate-change-adaptation-call-action
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Figure 9: By PEEB
Figure 10: By PEEB. Avaible at: https://www.peeb.build/imglib/downloads/PEEB Tunisia - Maitrise de l'Energie pour les Batiments de Sante.pdf
Figure 11: Photo by Kmarius, Pixabay

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PROGRAMME FOR
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