



**WORLD  
GREEN  
BUILDING  
COUNCIL**

# Developing a strategy for climate resilient buildings

A position paper for industry and policymakers on  
how to create resilient buildings and cities from  
planning to operation

August 2025



# Introduction

Nearly half of the global population — 3.6 billion people — are currently highly vulnerable to the impacts of climate change, and this number is only projected to rise.<sup>1</sup>

More than 30 million people each year are forced to leave their homes due to extreme weather events such as floods, storms, wildfires and droughts.<sup>2</sup> It is predicted that this could surge to as high as 1.2 billion people at threat of being displaced by 2050.<sup>3</sup>

This highlights the urgent need to ensure our communities and cities are resilient against such changing conditions — now and for the future.

## Climate change resilience is financial resilience

The deepening climate crisis is also increasingly costing our economies as well as our societies.

For governments, countries in the northern hemisphere are spending around 3% of their GDP on recovery from natural catastrophes, while in some African nations the figure is closer to 5%. Climate disasters have cost the global economy US\$8.5 trillion since 2000 and, without action, the potential GDP losses could rise to 18% by 2050.<sup>4,5,6,7</sup>

For businesses, the financial impact of climate change has already led to insurance losses due to natural catastrophes exceeding US\$135 billion in 2024. This marks five consecutive years that losses have exceeded US\$100 billion,<sup>8</sup> with parts of the world regularly exposed to the impacts of climate change becoming increasingly uninsurable.

## Resilience increasing on the international agenda

The first Global Stocktake in 2024 — assessing progress towards the Paris Agreement goals — recognised that considerable efforts have been made

by countries in adaptation planning and implementation. The analysis also highlighted, however, that most adaptation responses are incremental and unequally distributed across regions, with gaps in financing and assessment of the effectiveness of adaptation actions.<sup>9</sup>

Increasingly, the topics of mitigation and adaptation to the climate crisis are being tackled as one in the international policy arena. For the built environment, the United Nations' Buildings Breakthrough set a target for '**near-zero emission and resilient buildings to be the new normal by 2030**' supported by 29 countries and the European Commission.

## Near-zero emission and resilient buildings to be the new normal by 2030

Achieving these targets and setting the enabling conditions for progress on resilience and mitigation requires industry and government to work together. We commend the increased ambition and momentum towards international cooperation, and our network remains active in driving collaboration and implementation globally and locally.

## Developing a strategy for increased resilience

From users and policymakers to manufacturers and developers, it is crucial for all stakeholders to understand the key factors that contribute to building resilience and prioritise the actions needed to adapt and create a more resilient built environment.

To support the advancement of resilience across the sector, WorldGBC published a flagship report titled [\*Climate Change Resilience in the Built Environment\*](#) in 2022, which presents principles and considerations for tackling the growing impacts of climate change in our homes, communities and cities.

In this subsequent paper, we:

- set a common position for the definition of a climate resilient building
- introduce the strategy for how to create resilient buildings and cities from planning to operations
- expand our [\*Readiness Framework\*](#) for developing zero carbon and climate resilient buildings
- outline the starting points to develop roadmaps and action plans

# Climate resilient buildings

## What does resilience mean for the built environment?

WorldGBC has conducted an analysis of the main international frameworks on climate resilience (see *Repository* section in *Appendix*), from which we state that **a climate resilient building has the ability to: resist, mitigate, adapt and recover from local current and future events.**

For the purpose of this paper, climatic events are hazards related to the environment, exacerbated by climate change.

## How can we create climate resilient buildings?

The WorldGBC network has discussed an essential group of strategies to ensure that a sustainable building is also a climate resilient building. This should be a continuous process as the local conditions can change significantly over time, particularly into the future.



# How to create climate resilient buildings and cities

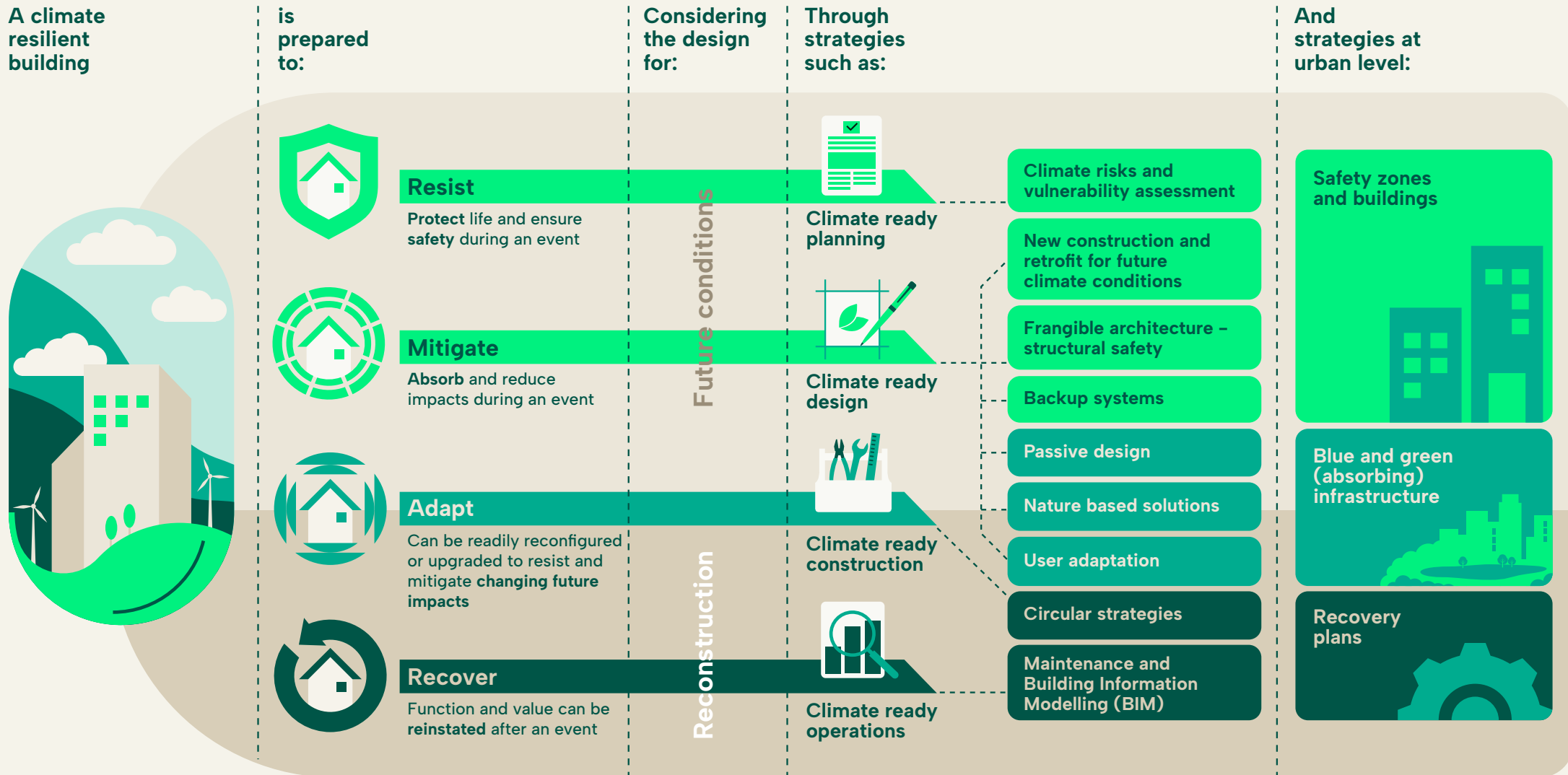


Fig 1: How to create climate resilient buildings and cities

\*Note: this group of strategies is not exhaustive and is not presented in a hierarchical way.



# Key considerations

We briefly examine several of the key concepts that need to be considered as part of climate ready planning and design.

## Climate ready planning:

### Hazards and events

An event is an occurrence, whereas hazards are anticipated potential events. They can be classified as:

- shocks – events that develop over a short period of time and have an immediate, measurable impact.
- stresses – events that develop over an extended period of time with impacts that may not be immediately noticeable.

Both forms of hazards should be taken into consideration as part of climate ready planning.

### Climate risks and vulnerability assessments

Climate risk assessments identify the likelihood of future climate hazards and their potential impacts for cities and their communities. Therefore, they are highly localised.

Despite the spiralling risks, current climate impact models do not yet consider the increasing effect of climate change, and so existing climate stress tests underestimate future risks.

Similarly, vulnerability is determined by sensitivity, exposure and adaptive capacity, which depends on the infrastructure, but also the people and the community strengths and resources to prepare for and respond to shocks or events.

Climate risk and vulnerability assessments could result in the conclusion that a particular location for a new or an existing building is unsuitable because the hazards are too great or the costs of adaptation too high. In such cases relocation to a more suitable site should be prioritised.

Special attention is required for informal settlements, which are particularly vulnerable to climate change impacts and other shocks, since they are often located in hazardous areas. Long lasting solutions can be achieved with community engagement increasing empowerment, ownership, and economic development.

A focus on:  
Location

Use the WorldGBC [Zero Carbon and Climate Resilience Readiness Framework](#) to support the strategic planning and development of resilient buildings, cities and communities.





## Climate ready design:

### Building design for future conditions

Commercial and institutional buildings are often modelled using climate data to predict their performance based on the local conditions and, with it, improve their design. These simulations often focus on the optimisation of energy consumption, but several aspects can be optimised by analysing potential trade-offs, for example carbon emissions, costs, and indoor environmental quality conditions.

The weather data sets, or weather files, describe the climatic conditions of a specific location. Commonly used weather files are based on historical climate observations – representing a typical year of weather by averaging past data from a multi-year period (typically spanning 15, 20 or 30 years).<sup>10</sup> **To be future-ready, simulations should use future or extreme weather scenarios**, which are now being developed at a local level in many cities and municipalities around the world portraying a location's anticipated annual weather

10, 25, 50 years into the future,<sup>11</sup> based on the Intergovernmental Panel on Climate Change (IPCC) scenarios.

### Frangible architecture

Frangible structures are those that break or yield in a way that maximises safety. For buildings, it translates into the intentional design of walls, roofs or other structures that in face of high winds, floods or other extreme events deform or break in a more controlled way. This approach can help to mitigate overall damage to a building and aid in the protection of life.<sup>12</sup>

This is particularly applicable in buildings that are essential in case of emergencies such as hospitals or schools, which often serve as provisional shelters.

### A focus on: Hazards vs chronic changes


Climate change does not only result in hazards but also in chronic changes such as increasing temperatures, with impacts such as longer heatwaves and shifting seasons, erosion and changes in the soil and water compositions, which could also affect the design and performance of buildings.

Frangible architecture design strategies include high performance and flexible structures, or adding additional layers to take the impact (redundant structures) such as adding columns or external façades – all of which can lead to higher embodied carbon and costs.

Designing for future weather conditions also includes analysing what current or future conditions are more likely to occur – for example, areas prone to cyclones may want to restrict natural ventilation but that could increase the loads and energy-use on HVAC systems.

A focus on:  
Trade-offs





Although building modelling is encouraged to analyse the specific conditions, it is not always feasible due to costs, building size, etc. For such cases, the prescriptive requirements in building codes should be adjusted for future climatic conditions, and national and local authorities should collaborate with industry bodies like Green Building Councils to provide easy to follow guidance on the key hazards and most appropriate resilience strategies for a given context.

### Modelling vs prescriptive methods

## Passive design and nature-based solutions

Designing for future conditions involves analysing scenarios to determine how the building could respond to them and optimising an approach that guarantees safety while balancing costs, environmental impacts and other key considerations.

Passive design utilises natural elements to maintain a comfortable indoor environment and meet energy requirements. This minimises dependence on HVAC which is reliant on a power grid that is susceptible to disruption by climate events.

Nature-based solutions – green and blue infrastructure – such as green spaces and roofs, ponds and wetlands, can also enhance resilience. These spaces significantly contribute to mitigating extreme conditions, such as managing heat and water, at both a building and local level.

## Design for adaptation and reconstruction

Flexible and evolving structures, together with Design for Deconstruction or Disassembly (DfD) strategies could not only facilitate recovery and rapid reparability of reconstruction processes in response to events, but also increase their value and support the circularity of the built environment. Additionally, it is important to include Building Information Modelling (BIM) or similar tools to manage all the information about the building during its life cycle and register its main features (as appropriate for the size of project).

## Designing for people

It is highly important that resilience and adaptation practices are equitable and available for everyone. **Community engagement provides detailed local information and increases empowerment by including residents in the development of strategies and solutions.**

It is fundamental to consider conditions for sensitive users, such as children, people with disabilities or senior citizens, as they tend to have further requirements in terms of mobility, adaptation capacity to indoor temperatures and air quality and/or vulnerability when hazards occur.<sup>13</sup>

It is also vital to consider the impact of environmental factors on the local population, such as access to water or effects of extreme weather events, and how this may evolve with climate change. In particular, considering the role of built environment in exacerbating or limiting this impact.

See WorldGBC's publications for more information, including: [\*Building a Water Resilient Future\*](#), [\*Social Impact across the Built Environment\*](#), [\*Health and Wellbeing Framework\*](#).



# Developing a roadmap for resilient buildings

*Fig 2: Excerpt from WorldGBC Zero Carbon and Climate Resilience Readiness Framework*

Resilient buildings are not only able to withstand shocks and hazards, they are also integral to strong and healthy communities that can withstand, and recover from, shocks and longer-term climate changes.

**A key action in the development of resilient communities is the creation of industry and government roadmaps** – which provide a time-bound framework with quantified targets to relevant stakeholders that help to drive progress.

To support the development of roadmaps for the built environment, the WorldGBC network released an international Framework – the [Zero Carbon and Climate Resilience Readiness Framework](#) – now featuring an additional focus on resilience (see excerpt on right). **This Framework provides the first step towards developing roadmaps** which outline key actions for decarbonising the built environment and achieving energy efficient and resilient buildings.

For practical roadmap examples, we include a list of national guidance from across the Green Building Council network in the *Appendix* which feature resilience and adaptation targets.



## Government Leadership

**Readiness Goal 1.1:** Local and national governments to support the creation of future weather and climate data sets for buildings and urban design.



## Technical Solutions

**Readiness Goal 2.1:** Buildings to be analysed by climate risk and vulnerability assessments.



## Finance

**Readiness Goal 3.1:** Assessment and disclosure of climate-related physical risks and climate-related opportunities at the asset level, in line with national and international frameworks.



## Data

**Readiness Goal 4.1:** Public and private sector to work with academia to develop and update local future weather and climate data sets for buildings and urban design modelling.



## Mindset

**Readiness Goal 5.1:** All sectors to promote an innovation driven mindset.



**We encourage governments and industry to use our [Readiness Framework](#), to develop their roadmaps for resilient buildings.**

**View full Framework: <https://worldgbc.org/zero-carbon-framework/>**



Drawing on the [Readiness Framework](#) recommendations, along with insights from established frameworks and building certification systems, we propose seven key steps to guide the development of resilience considerations on decarbonisation roadmaps.

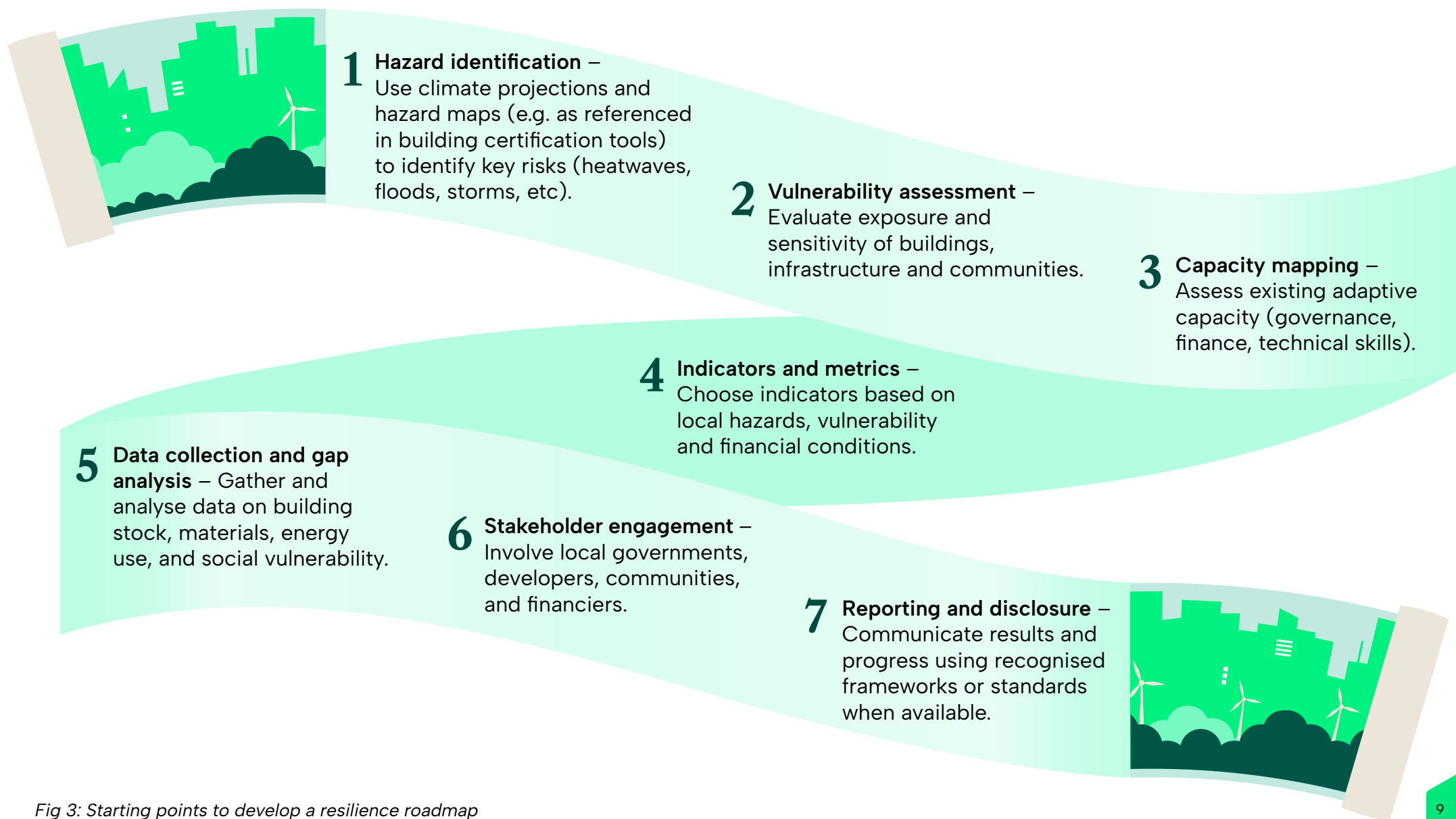


Fig 3: Starting points to develop a resilience roadmap

# Acknowledgments

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# Appendix

## National resilience guidance

WorldGBC wishes to highlight the existing leadership of many the Green Building Councils (GBCs) within our network who have included resilience and adaptation targets within their national roadmaps and guidance, as well as additional industry and advocacy publications.

These include:

- UKGBC – [Climate Resilience Roadmap](#)
- Guidance and case studies of partnership: GBCA – [Future in focus – Resilience in the built environment](#)
- HKGBC – [HKGBC Climate Change Framework For Built Environment](#)
- Netherlands – [Klimaat effect atlas](#)
- GIZ – [Costa Rica Nature-based Solutions Guide](#)
- Case Study: South Africa – [Lapalala Wilderness School](#) – a net zero, off the grid school, functional and repairable by school staff and the local community
- GBCSA – [Trends on the cost and business case of GREEN BUILDING: a South African perspective](#)
- GBCSA – [MSCI South Africa Green Annual Property Index 2023](#)
- GBCSA – [MSCI South Africa Green Annual Property Index 2024](#)

Further analysis will be conducted as a next step, on a regional basis, to consider key recommendations and timeframes for developing resilience recommendations within national roadmaps.

# Repository

A list of international frameworks on climate resilience:

## Finance

- CDRI – [Financing for Disaster – and Climate-Resilient Infrastructure](#)
- OECD – [Climate-resilient finance and investment](#)
- Standard Chartered – [Mobilising capital for adaptation and resilience – A practical roadmap for investment](#)
- World Bank Group – [Investing in Urban Resilience](#)
- IFRS – [IFRS S2 Climate-related Disclosures](#)
- TCFD – [Comparison IFRS S2 Climate-related Disclosures with the TCFD recommendations](#)
- United Nations Environment Programme | Finance Initiative – [A Comprehensive Review of Global Supervisory Climate Stress Tests](#)

## General

- ARUP – [City Resilience Index](#)
- C40 – [Achieving a decarbonised and climate-resilient built environment](#)
- BBP Climate – [A guide to climate resilient strategies for commercial Real Estate Building Resilience Index](#)
- UN-Habitat – [City Resilience Profiling Tool](#)
- World Bank – [Building Urban Resilience](#)
- Science Direct – [Resilience in the built environment: Key characteristics for solutions to multiple crises](#)

## Technical

- GBCA – [Green Star](#)
- Climate.OneBuilding.Org – [Repository of Building Simulation Climate Data](#)
- UNEP – [A Practical Guide to Climate-resilient Buildings & Communities](#)
- USGBC – [LEED V5 – New LEED v5 resilience credits to provide much-needed guidance](#)
- CSIRO's Ag Climate Data Shop – [Projected weather files for building energy modelling](#)

## Social

- Building Research and Information – [Managing crises 'together': how can the built environment contribute to social resilience?](#)
- Local Environment – [Social equity in urban resilience planning](#)

## Regional

- South African Government – [Green Book – adapting settlements for the future](#)
- US White House – [National Climate Resilience Framework](#)
- Association of Southeast Asian Nations – [Towards Strengthening Cooperation for Urban Resilience in ASEAN](#)
- Singapore – [Climate Resilience Through Nature](#)
- BSR – [Building Climate Resilience in Southeast Asia](#)
- FDFA – [Climate Resilient in Vietnam – An assessment in metropolitan regions](#)



# References

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9. United Nations Climate Change (2024), [Outcomes of the first Global Stocktake](#)
10. Climatedata.ca: [Guidance on Using Future Climate Data for Building Performance Simulation](#)
11. Weather sets for 80 or 100 years might be encouraged for zoning planning under floods and rain patterns analysis.
12. UNEP (2021): [A Practical Guide to Climate-resilient Buildings & Communities](#)
13. For example, the LEED credit "resilient spaces" calls for design features to increase the capacity of occupants to adapt to changing conditions, such as having certain indoor air quality systems and modes or providing occupant thermal safety during power outages.

## About World Green Building Council

At the World Green Building Council (WorldGBC) our role is to help property and construction markets around the planet reach tipping points and by 2050 achieve:

- total decarbonisation of the built environment
- healthy, equitable and resilient buildings, cities and communities
- regeneration of natural systems and thriving circular economy

That means building the right policy environments, the right financing environments and the right social and cultural environments to deliver sustainable built environments.

As the largest local-regional-global action network leading the transformation to resilient and decarbonised buildings, cities and communities, we are driving systemic changes together with over 75 Green Building Councils (GBCs) and industry partners from all around the world.

We work with businesses, organisations and governments to deliver on the ambitions of the Paris Agreement and UN Global Goals for Sustainable Development (SDGs).

This position paper complements WorldGBC's Building the Transition programme – our flagship global programme to deliver our Strategic Plan 2025–2027. This programme sees WorldGBC continue to scale solutions with the GBCs by matching global ambition with local impact.