



Global Alliance
for Buildings and
Construction

ADAPTATION PATHWAYS

ADAPTATION HUB
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RESILIENCE BEG V

Climate change is no longer a distant concern but a present-day reality with far-reaching consequences.

Across the globe, we are witnessing an increase in extreme weather events, rising sea levels, and shifting climatic conditions that pose immediate threats to the built environment. The buildings and construction sector, responsible for a significant portion of global greenhouse gas emissions and energy use, is particularly vulnerable to the impacts of climate change. From urban heat islands and flooding risks to energy inefficiencies and building deterioration, the sector faces a multitude of challenges requiring urgent attention and innovative solutions.

Adaptation, the process of adjusting to these changing conditions, has become a critical focus in the face of climate change. For the buildings and construction industry, this means designing, retrofitting, and managing buildings and infrastructure to reduce vulnerability to climate-

related risks. However, despite widespread recognition of the need for adaptation, progress in the sector remains frustratingly slow. In many instances, adaptation efforts are fragmented, reactive, or merely driven by compliance with existing regulations rather than a comprehensive, proactive strategy. This gap between awareness and action is a significant hurdle.

Much of this inaction can be attributed to the siloed nature of the industry, where different stakeholders work in isolation and wait for others to take the lead on adaptation efforts. This creates a stalemate, where all parties, from developers and asset owners to contractors and policymakers, are hesitant to act because they perceive others as hindering progress or themselves as bearing all the costs of change. This collective inaction undermines the potential for meaningful adaptation, and until these barriers are addressed, the sector risks remaining vulnerable to future climate threats.

AINS WITH ACTION

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A shared journey to turn scattered ambitions into actionable, measurable progress

Shaped through dialogue,
reflecting many voices

Adaptation begins with shared
intent, not perfection

Genesis of the Adaptation Pathways

Born from global consultations and grounded in field realities, the Pathways were shaped through dialogue, evidence, and the shared conviction that adaptation must be achievable for all actors

Our “Why Are We Not Adapting?” report highlighted these systemic barriers to adaptation, shedding light on the root causes of this inaction. Through detailed analysis, we identified several key factors that hinder adaptation in the buildings and construction sector: a lack of cohesive policy frameworks, fragmented incentives, financial barriers, and the absence of integrated climate risk management practices, and stakeholders waiting for others to take the first step in addressing climate risks. Moreover, the complexity and uncertainty surrounding climate risks make it difficult for industry stakeholders to make informed decisions, while the immediate costs associated with adaptation often overshadow long-term benefits. However, the report also emphasized that adaptation is not a one-time action but a process requiring continuous, concerted effort across all parts of the value chain.

In response to these challenges, we are now developing the Adaptation Pathways. The initiative is designed as a set of actionable steps, tailored to different time horizons, for all stakeholders in the buildings and construction value chain. These pathways offer a way forward that is both realistic and practical, enabling each stakeholder to take concrete action.

Recognizing that adaptation requires collaboration across traditionally siloed sectors, the pathways aim to break down these silos by offering a framework for joint action that aligns the interests of all parties. Crucially, the pathways acknowledge that action, even at small scales, can unlock future capabilities and enable further progress, creating a positive feedback loop where early actions pave the way for more ambitious and effective adaptation measures in the future.

The Adaptation Pathways initiative is not just another set of theoretical guidelines. Rather, it aims to be a toolset designed to drive real change by providing stakeholders with the clarity and confidence they need to act. It empowers each actor in the sector to make decisions today that will build resilience for tomorrow, ensuring that adaptation becomes an integral and ongoing part of the decision-making process. By creating pathways that reflect the collective needs and capabilities of all stakeholders, we hope to provide the necessary guidance to overcome the barriers identified in our previous report, facilitating proactive and long-term adaptation in the face of climate uncertainty.

THE ADAPTATION PATHWAYS INITIATIVE

**THE
ADAPTATION
PATHWAYS
INITIATIVE
IS BUILT WITH
A CLEAR AND
STRATEGIC
OBJECTIVE:
TO CREATE
ACTIONABLE,
STEP-BY-STEP
PATHWAYS
THAT GUIDE ALL
STAKEHOLDERS
IN THE
BUILDINGS AND
CONSTRUCTION
SECTOR TOWARDS
A CLIMATE-
RESILIENT
FUTURE.**

DESCRIPTION AND GOAL OF THE INITIATIVE

These pathways are designed not as isolated efforts, but as interconnected steps that, when followed across the entire value chain, will unlock further action capacities for all stakeholders. By aligning with existing international frameworks, leveraging sector expertise, and fostering collaboration across boundaries, they aim to turn the sector's adaptation challenges into an opportunity for shared progress and transformative change

METHODOLOGY

Building these pathways began with a thorough review of existing international agreements and frameworks, recognizing that many important commitments and objectives already exist, such as those laid out in the Paris Agreement, the UN Sustainable Development Goals, and various industry-specific pledges. Rather than reinvent the wheel, the goal was to extract the core actions and commitments that these agreements require from the buildings and construction sector and break them down into tangible, actionable steps. This ensures that the pathways align with global efforts and provide a clear roadmap for the sector to follow, step by step.

To ensure that these actions are both realistic and

relevant, stakeholders were engaged across the value chain through Stakeholder Ideation Labs. In 2024, these collaborative sessions have focused on three key areas:

1. *Step Identification:* What actions can stakeholders take now, and what are the next steps they see as viable for their specific roles?
2. *Hurdles Identification:* What challenges do they face in achieving resilient practices, and what support do they need from other stakeholders to overcome these hurdles?
3. *Collaborative Contributions:* How can stakeholders contribute to supporting others within the value chain?

Through this process, a comprehensive understanding of the actions each stakeholder can take, the barriers they face, and how they can collaborate with others to drive progress across the entire sector was gathered.

DEVELOPING DRAFT PATHWAYS

A hierarchy of actionable steps was then developed. These steps are designed to be structured in layers, with short-term actions that lay the foundation for medium- and long-term commitments. This layered approach ensures that adaptation is not a distant,



overwhelming goal but a series of manageable steps that stakeholders can start taking immediately.

The key to this approach is identifying around three to five critical actions for each stakeholder group. These actions are directly relevant to their specific trade but will also contribute to the broader goals of the value chain. For each action, we:

1. Identified *hurdles* that could prevent the action from being taken;
2. Transformed these hurdles into clear *prerequisites* or *support measures*;
3. Defined the next steps required to either further the adaptation strategy of a particular stakeholder or enable other stakeholders to take action.

This resulted in a draft pathway for each trade in the value chain, which served as the foundation for further refinement and iteration through cross-pollination among stakeholders.

DEVELOPING THE ACTUAL COMPREHENSIVE PATHWAYS

To move from the initial draft to the finalized stakeholder-specific Adaptation Pathways, focus shifted from the system as a whole to each stakeholder's agency and capacity for action. All prerequisites identified in the drafts were mapped to the stakeholders best positioned to unlock them, removing the burden of dependencies from others. Simultaneously, long-term opportunities were attributed to stakeholders capable of seizing them. As a result, each stakeholder pathway was built around three actionable sets: (1) enabling actions that help others, (2) core actions they must undertake for



themselves, and (3) forward-looking opportunities. This structure ensured that every pathway remained manageable while fostering system-wide momentum. Through targeted consultations and successive

refinements, this structure was translated into a clear list of short-, medium-, and long-term actions for each stakeholder. Finally, to support implementation, each pathway was completed with measurable KPIs and curated resources (methodologies, case studies, and tools), turning the pathways into an actionable blueprint for advancing adaptation across the value chain.

COLLABORATIVE ACTION AND INDUSTRY EXPERTISE

The success of the Adaptation Pathways initiative depends on open collaboration. This work does not claim to offer universal truths, but rather a synthesis of actions frequently identified as useful by diverse stakeholders. Built through extensive consultations, surveys, and expert partnerships, the actions and tools offered here aim to be relevant, practical, and rooted in the sector's realities. We welcome continued review and collective refinement.

GLOBAL PARTNERSHIPS AND ENGAGEMENT

To drive this initiative forward, we will actively seek partnerships with influential organizations, governments, and stakeholders from multiple regions and sectors. By enlisting "champions" (key organizations or countries that will commit to adopting the pathways and taking the proposed actions) we aim to create momentum that induces a sector-wide shift. If enough influential entities sign on, this can catalyze widespread change across the industry. Our engagement milestones include securing these champions by COP30 and demonstrating active



participation at the next Buildings and Climate Global Forum, where signatories could publicly commit to the pathways, showcasing support and action for the sector's climate resilience.

The Adaptation Pathways Initiative



Serves the Objectives of the Chailot Declaration and the Building Breakthrough

The Adaptation Pathways initiative is designed to be a transformative tool for the buildings and construction sector, aligning directly with the strategic goals outlined in the Chailot Declaration and the Building Breakthrough. By providing a comprehensive, step-by-step roadmap for resilience, our initiative not only advances the objectives of these pivotal frameworks but also fosters a collaborative, sector-wide effort to ensure long-term sustainability and climate adaptation.

Chailot Declaration Objectives

CHAILLOT 6.1: LONG-TERM ROADMAP AT NATIONAL AND SUBNATIONAL LEVELS

The Adaptation Pathways initiative will create a long-term roadmap for the buildings and construction sector, designed to be implemented at both national and subnational levels. It will provide a clear set of objectives for all stakeholders, ensuring that each part of the value chain understands their specific role in enhancing climate resilience. This will allow governments, local authorities, and industry leaders to integrate these pathways into their own plans, ensuring that resilience becomes a foundational aspect of policy and decision-making.

CHAILLOT 6.2: PATHWAYS FOR FINANCIAL AND INSURANCE STAKEHOLDERS

Recognizing the pivotal role that finance and insurance play in driving adaptation, there will be a dedicated Pathways for financial and insurance stakeholders. Financial frameworks and fiscal incentives designed to promote resilience will be integrated into the pathways, offering actionable guidelines for how the financial sector can facilitate the widespread adoption of adaptation measures. Insurance providers will also be given a clear set of actions to incorporate resilience into their risk models, ensuring that financial instruments support the transition to a more resilient built environment.

CHAILLOT 6.5: MATERIALS PATHWAY FOR SUSTAINABLE MATERIALS USE

With the potential support of the GlobalABC Materials Hub, the Adaptation Pathways will outline actionable steps for the materials sector to enhance sustainable practices. These steps will focus on achieving sustainable materials use, reducing environmental impact, and ensuring that the materials chosen for building projects are resilient to climate impacts. Additionally, the pathways will identify how other stakeholders, such as developers and architects, can support and benefit from these sustainable practices, creating a circular benefit across the value chain.



CHAILLOT 6.6: FOSTERING COLLABORATION ACROSS THE B&C VALUE CHAIN

The core objective of the Adaptation Pathways initiative is to foster collaboration across all stakeholders in the buildings and construction value chain. By bringing together developers, contractors, architects, engineers, and policymakers, the pathways will create a shared vision for resilience. This collaborative approach will break down silos within the industry, facilitating a unified effort to tackle climate adaptation challenges.

CHAILLOT 6.8: COORDINATING A VALUE-CHAIN-WIDE APPROACH TO RESILIENCE

The pathways will provide a value-chain-wide approach to resilience in the buildings and construction sector. Every stakeholder will be equipped with a set of actions that they can take to contribute to the overall climate resilience of the sector. This coordinated effort will ensure that no part of the value chain is left behind, creating a comprehensive and interconnected strategy for resilience.

CHAILLOT 6.9: SECTOR-WIDE LEARNING AND DATA SHARING

The Adaptation Pathways will respond to Chaillot 6.9 by generating valuable data and insights that can be used for sector-wide learning. As the pathways are implemented, they will provide feedback and measurable outcomes, allowing the sector to continually evolve and improve its adaptation strategies. This data will serve as a critical resource for future policy development and industry best practices.

CHAILLOT 6.10: PLATFORM FOR SHARING BEST PRACTICES

The pathways will also provide a platform for sharing best practices, knowledge, and lessons learned across stakeholders. By enabling cross-sector collaboration and knowledge exchange, the initiative will ensure that successful adaptation strategies are widely disseminated, fostering a culture of continuous improvement and innovation within the sector.

ALL OTHER CHAILLOT COMMITMENTS

The Adaptation Pathways initiative will address all other commitments outlined in the Chaillot Declaration through specific actions within the stakeholder pathways. From improving operational efficiencies to integrating biodiversity considerations into construction practices, the pathways will ensure that every aspect of the built environment contributes to climate resilience.

Building Breakthrough Objectives

BBT 1: SUPPORTING RESILIENCE-FOCUSED ROADMAPS

The Adaptation Pathways will support the deployment of resilience-focused roadmaps across the buildings and construction sector. This initiative will build on previous efforts, including mapping existing methods for assessing resilience, and provide stakeholders with a structured and actionable framework to assess and improve their climate resilience. It will enable countries and organizations to report on their actions and outcomes in line with global resilience goals.

BBT 5: CLEAR MAP OF NECESSARY STEPS FOR RESILIENCE

The pathways will provide a clear map of necessary steps for achieving resilience, focusing on what stakeholders can do today and in the future to build a more resilient built environment. These steps will identify immediate priorities and long-term actions, ensuring that stakeholders have a clear understanding of how to contribute to the overall resilience goals of the sector. By following this map, stakeholders will be empowered to take meaningful steps that collectively move the entire industry forward.



NATIONAL GOVERNMENTS & POLICY MAKERS

Who is this
pathway for?

This pathway is intended for national governments and central policy actors: ministries and agencies responsible for housing, public works, environment, infrastructure, planning, finance, and emergency management. It also supports national development agencies, regulators, and institutions involved in long-

term infrastructure planning, climate governance, and disaster preparedness. It provides a clear roadmap for those shaping national strategies and legal frameworks to drive systemic adaptation across the buildings and construction sector.



National governments hold a primary responsibility to protect public health, safety, and well-being. In the face of climate change, this means ensuring that buildings and infrastructure are adapted to a wide range of evolving risks. Heatwaves, floods, wildfires, and other extreme

events threaten lives, economic stability, and critical services. Governments must integrate adaptation into building policies to secure safe, healthy, and liveable environments for all. Adapted infrastructure ensures continuity of essential services and safeguards vulnerable populations.

National governments also have a unique mandate to coordinate cross-sectoral adaptation efforts, aligning infrastructure policy with climate objectives and providing funding, legal frameworks, and technical guidance.

Their decisions shape the enabling environment for local governments, private actors, and communities. Moreover, they must uphold international climate commitments (e.g., Paris Agreement, NDCs), making systemic adaptation not only a national necessity, but a global responsibility.

Set the course for systemic, inclusive adaptation across the built environment.

Many governments have started integrating adaptation into national climate strategies, but sector-specific roadmaps for

buildings are still rare. Short-term progress means clarifying roles, launching national adaptation plans, and revising funding programs. By the

medium term, policy tools and investment frameworks must fully integrate resilience. Long-term, governments must mainstream adaptation across

ministries and sectors, making it a foundational pillar of national development policy.

NATIONAL GOVERNMENTS & POLICY MAKERS

Short-Term Actions

Actions	Resources & case studies	KPIs
Select a Standardized Climate Scenario and Facilitate Access to Climate Data	IPCC AR5 WGII Chapter 15: Adaptation Planning and Implementation	% of ministries and agencies using the same reference scenario in policy planning
Build Knowledge, Partnerships, and Policy for Resilience	UNFCCC Adaptation Committee's Toolkit for Monitoring, Evaluation and Learning for NAP Processes	Frequency of consultations and published recommendations
Reform Legal and Administrative Frameworks to Empower Local Governments	IPCC AR6 WGII Chapter 6 Cities, Settlements and Key Infrastructure	% of municipalities with delegated adaptation or resilience authority
Legislate for Accountability and Incentives	EU Technical Guidance on Adapting Buildings to Climate Change and its best practice guide	Number of policies or frameworks updated to integrate resilience

Medium-Term Actions

Actions	Resources & case studies	KPIs
Develop a National Adaptation Plan/Roadmap Taking Critical Infrastructure Into Account	Toolkit for Monitoring, Evaluation, and Learning for National Adaptation Plan Processes (Nap Global Network & UNFCCC)	Number of ministries and agencies contributing to the plan's drafting
Adopt and Promote Future-Oriented Building Codes and Standards	Output of the Global Resilience Dialogue	Share of national building and energy codes updated with resilience clauses
Review and Adjust National Government Funding Programs for New Builds and Retrofits	UNFCCC's Toolkit for engaging the private sector in National Adaptation Plans	Number of resilience-focused funding instruments launched (grants, loans, tax credits)

Long-Term Actions

Actions	Resources & case studies	KPIs
Develop a National Implementation and Enforcement Plan with Local Adaptation Options	UNFCCC's National Adaptation Plans 2024 Progress report	% of municipalities adopting locally adapted resilience implementation plans



Short-term actions

Select a Standardized Climate Scenario and Facilitate Access to Climate Data

Goal: Provide a consistent, transparent, and accessible reference framework for climate risk assessment and adaptation planning.

Description: National governments should select a standardized reference climate scenario (e.g., RCP 4.5 or 8.5) that will guide all adaptation policies in the buildings and construction sector. This ensures coherence across national strategies, local planning, and private-sector investment decisions. To support this, governments must establish multi-sectoral coordination mechanisms at national and subnational levels that guarantee alignment across policy, planning, and implementation.

In parallel, governments must act as data facilitators, aggregating, validating, and disseminating high-quality,

disaggregated climate and hazard data. Whether sourced nationally or from global institutions, this data should be made publicly accessible in formats usable by municipalities, developers, insurers, and communities. Collaboration with scientists and local stakeholders will ensure the data is both comprehensive and actionable.

By providing both a standardized climate scenario and open access to disaggregated climate data, governments reduce uncertainty, promote consistency in design and planning, and enable all other stakeholders to make climate-informed decisions.

- [Canadian Centre for Climate Services](#) provides a central information portal with links to climate data and services, offering training and support, including a climate services support desk, and links to datasets including [climatedata.ca](#)
- Pacific Climate Impacts Consortium's [Design Value explorer](#) provides future-shifted climatic design data for Canadian buildings for different degrees of global warming.
- Intergovernmental Panel on Climate Change (IPCC) [Chapter 15: Adaptation Planning and Implementation](#) (AR5 WGII) Provides guidance on how governments can set scenarios, engage sectors, and coordinate adaptation planning

INPUT INDICATORS

Measure the resources required to deliver

- Existence of a nationally adopted reference climate scenario (e.g. RCP/SSP)
- Number of datasets and climate models made publicly available

LEADING INDICATORS

Looks forward at future outcomes and events

- % of ministries and agencies using the same reference scenario in policy planning
- Frequency of updates and validation cycles of the climate data platform.

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in inconsistencies between national and local adaptation plans
- Improved consistency in adaptation policies across regions.
- Proportion of sectoral plans and regulations aligned with the national reference scenario.

Action 1

Resources

KPIs

Build Knowledge, Partnerships, and Policy for Resilience

Goal: Create the institutional and regulatory foundations for climate-resilient planning and construction.

Description: National governments should build territorial knowledge systems that generate reliable climate and hazard data and make them accessible at national and subnational levels. To ensure policies are practical and enforceable, governments must also form National-Local Technical and Practitioner Advisory Groups, bringing together private sector actors, local governments, academics, community leaders, and builders. These groups will co-develop building codes and standards that align with national climate goals while remaining locally relevant.

Alongside these mechanisms, governments should review and adjust national policy frameworks to ensure they support climate-responsive and innovative construction models. Frameworks must be flexible enough to integrate new

scientific data, resilience practices, and evolving hazards over time. Governments must also provide clear legal and regulatory signals across planning, building codes, rental laws, and real estate disclosures. This includes setting minimum resilience standards that reflect local risks and making resilience a visible, enforceable element of the built environment. Critically, governments must also revise legal and regulatory frameworks to enable microgrids and decentralized energy production.

By combining data, expertise, inclusive advisory processes, and regulatory clarity, national governments lay the groundwork for builders, property managers, insurers, developers, and local authorities to plan, invest, and build with confidence in a climate-resilient future.

INPUT INDICATORS

Measure the resources required to deliver

- Existence of inter-ministerial coordination mechanisms
- Existence of a national-local advisory group
- Number of advisory groups established at national and regional levels.
- Diversity of stakeholder representation (public/private/academic).
- Review and revision of sectoral adaptation policies

LEADING INDICATORS

Looks forward at future outcomes and events

- Frequency of consultations and published recommendations.
- Inclusion of advisory outputs in building codes or policy updates.

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of building code revisions incorporating adaptation provisions
- Measurable improvements in compliance or enforcement efficiency.
- Inclusion of adaptation metrics in national progress reports (e.g., NDCs, NAPs).

Action 2

KPIs

Reform Legal and Administrative Frameworks to Empower Local Governments

Goal: Grant municipalities and regions the authority, resources, and autonomy to implement adaptation measures effectively.

Description: National governments must undertake legal and administrative reforms to ensure that subnational authorities can revise planning rules, enforce adaptation standards, and lead locally tailored initiatives. This involves clarifying responsibilities, decentralizing key powers, and supporting the necessary legislative changes. Budgeting processes should also be reformed so local governments can access credit, manage predictable funding streams, and

demonstrate administrative readiness.

Local authorities, for their part, should advocate for reform and show that they can manage these new responsibilities effectively. By aligning national reforms with local preparedness, governments create a governance framework that enables place-based adaptation, while ensuring accountability and coherence across all levels.

Action 3

INPUT INDICATORS

Measure the resources required to deliver

- Number of legal reforms enacted to delegate planning/enforcement powers
- Existence of national-local coordination, training and support mechanisms.
- Existence of a formal local adaptation mandate or delegated authority to the local level

LEADING INDICATORS

Looks forward at future outcomes and events

- % of municipalities with delegated adaptation or resilience authority
- % of local governments trained in adaptation governance.

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Increase in local governments implementing climate-adapted zoning codes
- % of local governments with active climate adaptation plans or resilience regulations.
- Documented reduction in procedural bottlenecks for local adaptation enforcement.

KPIs

Legislate for Accountability and Incentives

Goal: Hold stakeholders accountable for climate risks while encouraging investment in resilience.

Description: National governments should adopt legislation that makes climate risk assessment and disclosure a mandatory component of financial, insurance, and real estate practices. This includes requiring banks and insurers to integrate resilience considerations into underwriting, loan eligibility, and premium-setting. At the same time, laws should create incentives for private investment in adaptive materials, technologies, and infrastructure such as preferential financing terms, tax credits, or insurance discounts.

By combining accountability mechanisms with incentives for resilience, governments can steer market behavior toward long-term adaptation while ensuring that risks are neither ignored nor externalized. This approach creates a level playing field, encourages innovation, and reduces systemic vulnerability across the buildings and construction sector.

Action 4

INPUT INDICATORS

Measure the resources required to deliver

- Existence of legislation linking resilience to financing and insurance mechanisms

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of policies or frameworks updated to integrate resilience.
- % of financial products integrating resilience requirements
- Share of new public projects using climate risk assessments and undertaking adaptation actions

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in climate-related economic losses across the built environment.
- Reduction in uninsured climate-related damages

KPIs

- UNFCCC's [NAP overview](#) describes how national governments can establish institutional arrangements, engage stakeholders and integrate adaptation into planning processes as well as how adaptation planning links national and local levels, and how legal/administrative reforms support sub-national implementation.
- UNFCCC Adaptation Committee's [Toolkit for Monitoring, Evaluation and Learning for NAP Processes](#) helps governments set up institutional knowledge, M&E, and stakeholder partnerships required to maintain resilience policy and build capacity across sectors
- The [EU's technical guidance on adapting buildings to climate change](#) is accompanied by a [best practice guide](#) and details what to assess (hazards, vulnerabilities), how to rate resilience, and which measures to prioritize. The technical Guidance includes elements on standardised

resilience metrics, which can feed into legislation on building resilience disclosure, insurance requirements and incentives. It includes discussion on building code and planning law aspects, which national policy-makers can draw on when decentralising authority and reforming building regulation frameworks.

- IPCC [AR6 WGII Chapter 6 Cities, Settlements and Key Infrastructure](#) details the role of governance, infrastructure and multi-level coordination in resilience. Valuable for policy-makers revising frameworks for buildings & construction in line with adaptation goals. It also highlights the importance of integrating resilience into infrastructure, financing and regulatory mechanisms, which is directly relevant to creating laws for disclosure, incentives, and market accountability.

Resources

Medium-term actions

Develop a National Adaptation Plan or Roadmap Taking Critical Infrastructure Into Account

Goal: Identify climate risks, vulnerabilities, and adaptive solutions specific to the buildings and construction sector, establishing a clear national pathway to resilience.

Description: Create a robust and detailed plan that outlines strategies for reducing vulnerabilities to climate change impacts (e.g., extreme weather, sea-level rise, temperature changes). Integrate sector-specific solutions, considering regional variations and prioritizing critical infrastructure.

- UNFCCC [Updated technical guidelines for the National Adaptation Plan \(NAP\)](#) process provides a structured framework for governments to formulate, implement and update adaptation plans. Useful for building a roadmap that incorporates the built-environment, infrastructure and buildings & construction sectors.
- The [Toolkit for Monitoring, Evaluation, and Learning for National Adaptation Plan Processes](#) (Nap Global Network & UNFCCC) helps governments set up systems to track progress of the adaptation plan, including critical infrastructure and building sectors, ensuring ongoing iteration and alignment with national goals.
- This [EU Technical Guidance](#) is sector-specific to buildings and provides an approach for governments to guide building-resilience policy based on standardised hazard and scenario frameworks

INPUT INDICATORS

Measure the resources required to deliver

- Existence of a multi-ministerial task force for adaptation in buildings and infrastructure
- % of national climate budget allocated to developing and implementing the adaptation plan
- Availability of national-scale hazard and exposure maps for critical infrastructure

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of ministries and agencies contributing to the plan's drafting
- Frequency of stakeholder consultations held (builders, local authorities, CSOs, utilities)
- Proportion of critical infrastructure assets assessed for climate risks

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Publication and official adoption of the National Adaptation Plan/Roadmap
- % of critical infrastructure covered by resilience plans or adaptation projects
- Integration of adaptation priorities into national development and construction codes

Action 1

Resources

KPIs

Adopt and Promote Future-Oriented Building Codes and Standards

Goal: Mandate that new and existing buildings adhere to standards that account for future climate risks.

Description: Develop or endorse building codes that incorporate projected climate risks, ensuring resilience and adaptability of new constructions and retrofitted structures. Align with national and international goals for net-zero emissions and explore integrating nature-based solutions (e.g., green roofs, urban forests) to complement traditional resilience measures.

Action 2

- [Output of the Global Resiliency Dialogue - principles for resilient building codes and standards](#), developed by Canada, US, NZ and Australian building codes developers and researchers.
- This [foundational report](#) provides an assessment of how climatic design data relevant to users of the National Building Code of Canada and the Canadian Highway Bridge Design Codes might change as climate continues to warm. The methodologies and data described in this report underpin the transformation of the Canadian National Model Codes to begin designing for future climate scenarios with the publication of the 2025 Codes.
- [Codes, Standards and Guidance for Climate Resilience in Canada](#) illustrates a national programme for embedding resilience (including nature-based solutions) into codes, standards and infrastructure. Useful as a model for policy makers updating building codes for future climate risk.
- World Bank's [Stronger Building Codes for a Safer, More Resilient Future](#) report provides valuable context on how national adaptation efforts for infrastructure and buildings should include resilient design, hazards and future climate risks.
- GFDRR's [Building Regulation for Resilience resource hub](#) offers many tools and reports, especially its 2015 [Building Regulation For Resilience Report](#).
- [Resilient Building Codes Toolkit](#) (US HUD Exchange) is a design and briefing check-list oriented to building codes and resilience upgrades.
- [Strong Building Codes for a Safer, More Resilient Future](#) is a World Bank review of building codes for resilience & disaster risk. Useful for manufacturers advocating with policymakers to ensure material and systems performance standards (durability, hazard tolerance) are embedded in regulations, linking to life & property safety.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of outdated codes or standards under review

LEADING INDICATORS

Looks forward at future outcomes and events

- Share of national building and energy codes updated with resilience clauses

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in losses from climate-related building failures

KPIs

Review and Adjust National Government Funding Programs for New Builds and Retrofits

Goal: Ensure public funding aligns with climate resilience priorities for both new constructions and retrofits.

Description: Conduct a systematic review of national funding programs for buildings to identify and integrate resilience measures. Adjust funding criteria to prioritize projects that demonstrate climate adaptation features, aiming for resilient, and low-carbon designs, starting with identified critical infrastructure.

- UNFCCC's [Toolkit for engaging the private sector in National Adaptation Plans](#) helps governments review and structure public-funding programmes (including retrofits) to incentivize adaptation and private sector participation
- Canada's [Climate Resilient Built Environment Initiative \(CBRE\)](#) states that research and standards feed into public infrastructure funding and public-sector codes. Shows example of national research and funding aligning with resilience in buildings and infrastructure; useful for governments reviewing public programmes to ensure resilience criteria are included.
- The [EU-level Technical Guidance on Adapting Buildings to Climate Change](#) offers a detailed technical foundation for defining what constitutes climate resilience in buildings, serving as a reference for funding eligibility and policy alignment. Complementing this, the accompanying [best practice guide](#) showcases real-world examples to help stakeholders apply the guidance in practice.

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of a national audit of funding programs for construction and retrofits
- Existence of national construction specifications integrating climate adaptation considerations
- % of national housing and infrastructure funding reviewed for climate resilience criteria
- Technical guidelines for integrating climate resilience into funding eligibility

LEADING INDICATORS

Looks forward at future outcomes and events

- % of reviewed programs updated to include resilience or risk-screening requirements
- Number of resilience-focused funding instruments launched (grants, loans, tax credits)
- Number of funded projects integrating climate-resilient materials or designs

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of total public construction funding allocated to climate-resilient projects
- Measured reduction in damages or reconstruction costs in publicly funded buildings
- Increase in number of municipalities or agencies adopting similar funding criteria

KPIs

Long-term actions

Develop a National Implementation and Enforcement Plan with Local Adaptation Options

Goal: Ensure consistent and enforceable implementation of resilience standards across regions, while allowing flexibility for local conditions.

Description: National governments should design a centralized implementation and enforcement framework that guarantees consistent climate adaptation standards nationwide. A designated national agency should oversee compliance and coordinate policies, while local authorities adapt and enforce these standards based on their specific climate risks, materials, and building practices.

This dual-level system provides both coherence and flexibility: national alignment with global strategies (such as NDCs) ensures credibility and accountability, while local adaptation options respect the diversity of regional conditions. By combining centralized oversight with decentralized execution, governments can close enforcement gaps, avoid fragmentation, and ensure that resilience measures are both practical and uniformly applied across the country.

This dual-level system provides both coherence and flexibility: national alignment with global strategies (such as NDCs) ensures credibility and accountability, while local adaptation options respect the diversity of regional conditions. By combining centralized oversight with decentralized execution, governments can close enforcement gaps, avoid fragmentation, and ensure that resilience measures are both practical and uniformly applied across the country.

- UNFCCC’s [Updated Technical Guidelines for the National Adaptation Plan \(NAP\) Process](#) provides structure for how governments should both formulate and implement adaptation plans, including institutional arrangements, monitoring and enforcement, and multi-level coordination (national to subnational)
- UNFCCC’s [National Adaptation Plans 2024 Progress](#) in the formulation and implementation of NAPs shows how countries are implementing NAPs, including what institutional arrangements are being used, helping governments learn how to structure enforcement and local-adaptation options.
- [Climate Risk & Vulnerability Assessment in Informal Settlements](#) (Land, 2024). While focused on informal settlements in the Global South, this paper published in Land, offers important lessons on hazard exposure and vulnerability assessment in contexts with limited data.

INPUT INDICATORS

Measure the resources required to deliver

- Establishment of national oversight agency for resilience

LEADING INDICATORS

Looks forward at future outcomes and events

- % of municipalities adopting locally adapted resilience implementation plans

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Improved compliance rate with building and resilience codes

Action 1

Resources

KPIs

SUBNATIONAL GOVERNMENTS & REGULATORS & ENFORCEMENT OFFICIALS

Who is this
pathway for?

This pathway is tailored for subnational governments with legislative and fiscal powers (e.g. regional, state, provincial, or county-level authorities), as well as local and municipal governments, regulatory agencies, and enforcement bodies. It supports public planners, building inspectors, permitting officers, and local

climate adaptation units. It offers a roadmap for institutions tasked with implementing climate resilience strategies at the territorial and urban scale, ensuring safe, adaptive, and sustainable buildings and infrastructure for all communities.

Local and subnational governments are at the frontline of climate impacts. From extreme heat and flooding to wildfires and water scarcity, these risks are deeply place-based, demanding tailored responses rooted in local context. Municipalities and local authorities are often the first responders to crises and are responsible for infrastructure, planning, permitting, and service delivery. Adapted buildings reduce health risks, disruption to services, emergency costs, and community displacement. They also protect critical facilities and foster economic continuity. Subnational governments, with broader regulatory or financial authority, have the power to shape planning frameworks and support the scale-up of local solutions. Together, **these actors bridge national ambitions and community needs**, ensuring adaptation is implemented where it matters most. Their actions unlock resilience for millions. But they face challenges: limited budgets, siloed responsibilities, and lack of technical capacity. The pathway helps navigate these realities with realistic, staged actions and shared responsibilities.

Lead place-based adaptation while overcoming fragmented mandates and capacity gaps.

While some cities and regions have begun integrating climate risk into planning, most subnational and local governments still rely on reactive, fragmented approaches. In the short term, they must build capacity, assess risks, and integrate adaptation into permitting. Medium term, coordination with utilities, builders, and national governments becomes key. Long term, these actors must govern resilient development systemically—supported by clear mandates, adequate resources, and empowered regulatory tools.

SUBNATIONAL GOVERNMENTS & REGULATORS & ENFORCEMENT OFFICIALS

Short-Term Actions

Actions	Resources & case studies	KPIs
Institutionalize Resilience Competencies within Local Governments	Local Government Climate Adaptation Training by US EPA	Number of internal technical workshops or peer learning events organized per year
Empower local authorities to prioritize local needs	Local Climate Adaptive Living Facility (LoCAL) by UNCDF	Number of policy reforms proposed or implemented at municipal level within a subnational authority's jurisdiction to integrate adaptation
Map Local Vulnerabilities and Update Risk Management	Resilient Florida program	Frequency of updates to local risk maps and inventories (in years)
Incentivize And Strengthen Capacity For Renovation And Retrofit	Guidelines for Creating Community-Driven Building Retrofit Programs by C40	Uptake rate (% of eligible projects benefiting from local incentives)

Medium-Term Actions

Actions	Resources & case studies	KPIs
Reform Local Urban Planning Frameworks for Resilient Development	UN-Habitat's International Guidelines on Urban and Territorial Planning	% of new permits including resilience or sustainability clauses
Build Institutional Capacity for Climate Enforcement and Adaptation Planning	How to make cities more resilient: a handbook for local government leaders (UNDRR)	Decline in violations of zoning, code, or environmental resilience rules
Develop Non-Monetary Incentives to Encourage Resilience	Chicago Green Roof Grant & Permit Streamlining Programme	Number of projects benefiting from non-monetary incentives annually

Long-Term Actions

Actions	Resources & case studies	KPIs
Develop Local Adaptation and Climate Risk Management Plans	UNDRR Disaster Resilience Scorecard for Cities	% of municipal budgets allocated to adaptation measures
Create Collaborative Governance Structures with Civil Society and Local Experts	Help Them Help Themselves: A Toolkit to Facilitate Transformative Community Based Climate Change Adaptation	% of projects including public consultations and number of stakeholders engaged
Deliver Targeted Public Awareness and Outreach Campaigns	WRI's Locally Led Adaptation	% of population reached through communication campaigns
Link Climate Resilience with Urbanization Efforts	C40 Cities' Integrating Climate Adaptation toolkit	Inclusion of climate adaptation criteria in municipal procurement guidelines



Short-term actions

Institutionalize Resilience Competencies within Local Governments

Goal: Ensure subnational governments can design and enforce locally relevant resilience strategies.

Description: Invest in training staff on adaptation challenges and solutions, updating local hazard maps and plans, and building territorial engineering expertise. Establish technical partnerships with academia, national agencies, professional bodies, and local tradespeople and experts to provide the know-how needed for resilient planning and enforcement.

- The paper [SDGs in Global South Cities for Building Resilience to Climate Change](#) offers reflections on urban and building contexts in the Global South. It addresses how adaptation must consider systemic urban, social, institutional constraints.
- [Capacity-building on climate change adaptation](#) (Climate-ADAPT, EEA) explains what capacity-building means for sub-national governments (training, tools, networks). Useful for local/regional authorities creating staff training programmes on adaptation.
- A [practical toolkit for local authorities](#) by Local Partnerships (UK) to run through climate risk, vulnerability and adaptation planning. Helps build local technical capacity, hazard mapping etc.
- [Local Government Climate Adaptation Training](#) by US EPA provides self-guided modules for local governments on adaptation to a range of hazards (heat, flooding, drought). Good for sub-national staff training.
- User-friendly [guide](#) created by the US Federal Emergency Management Agency (FEMA) to help local governments build capacity to create resilient communities.

INPUT INDICATORS

Measure the resources required to deliver

- % of staff trained on climate adaptation, resilience, or risk management
- Budget allocated annually to resilience training, hazard mapping, and technical partnerships
- Number of partnerships or MoUs with universities, national agencies, or technical institutes

LEADING INDICATORS

Looks forward at future outcomes and events

- Frequency of hazard map updates (years since last revision)
- Number of internal technical workshops or peer learning events organized per year
- Establishment of a cross-departmental resilience taskforce, focal point or Chief Resilience Officer and number of initiatives undertaken per year

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- When updated, risk maps and resilience data are integrated into urban plans or permitting systems
- Improvement in building compliance rates for resilience-related codes
- Reduction in damages or disruptions from climate events in municipal reports

Action 1

Resources

KPIs

Empower local authorities to prioritize local needs

Goal: Empower local governments to lead adaptation.

Description: Subnational governments grant municipalities the authority to revise planning rules, enforce adaptation standards, and run local initiatives. Local governments demonstrate administrative readiness while engaging with national policymakers to ensure adequate financing and credit eligibility.

Action 2

- One UN Climate Change Learning Partnership (UN CC:Learn) provides a [course on adaptation to climate change for civil servants](#).
- The Brookings Institution's [Rethinking our assumptions and financing tools for community resilience in the face of growing climate risk](#) highlights how financing and networks need to shift for resilience programs to scale and provide examples of locally led funding mechanisms by local authorities
- [Local Climate Adaptive Living Facility \(LoCAL\)](#) by the United Nations Capital Development Fund (UNCDF) is a mechanism designed to assist local governments (especially in Global South) access climate finance, build capacity and implement adaptation. Useful for sub-national authorities seeking finance and local mandate.
- The United Nations Department of Economic and Social Affairs (UNDESA) [Handbook on Effective National to Local Governance for Climate Change Mitigation and Adaptation](#) provides guidance on how national and subnational roles can be aligned and how local governments can be empowered. This can support local authorities negotiating for devolution of power.
- Virginia (U.S.) [community resilience planning](#) helps enabling localities to make the best decisions to design and improve buildings and infrastructure for climate resilience
- A [case study](#) of an Australian community that relocated due to flood risk
- A [case study](#) of an Alaskan (U.S.) village that relocated due to sea level rise and permafrost melt that resulted in more serious hazard conditions
- City of Cape Town (South Africa)'s [resilience strategy](#) includes lobbying the national government for the creation of regional independent power producers (IPPs), and preparing for the likelihood of being able to procure directly from IPPs

INPUT INDICATORS

Measure the resources required to deliver

- Existence of a transparent mechanism put into place by subnational governments to help smaller municipalities to access funding from all levels (subnational, national, international)

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of policy reforms proposed or implemented at municipal level within a subnational authority's jurisdiction to integrate adaptation
- Number of financing partnerships or co-financed projects with national or international institutions at municipal levels within a subnational authority's jurisdiction
- Establishment of a local resilience or climate finance office

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Increase in number of implemented resilience projects financed through local decision-making
- Share of adaptation initiatives funded through municipal revenues at subnational level (vs. subnational or national revenues)
- Positive performance in national or regional audits on financial and administrative management

Map Local Vulnerabilities and Update Risk Management

Goal: Identify and manage climate-sensitive assets and critical infrastructures within the subnational authority's jurisdiction.

Description: Subnational governments should systematically map vulnerabilities across their territory, including critical infrastructure such as substations in flood-prone areas, water supply systems, transportation hubs, and public facilities. Based on this mapping, they must revise emergency protocols, load-shedding priorities, and recovery plans to reflect evolving climate risks. This ensures that local authorities can anticipate disruptions, minimize cascading failures, and protect vulnerable populations during climate-exacerbated events.

To achieve this, subnational authorities will need to invest in risk mapping and integration of operational data from utility companies for instance, and to pilot downscaling climate data and probabilistic risk scenarios with research and national bodies. By combining localized assessments with technical data, municipalities can make risk management more targeted, credible, and actionable.

- This [article](#) in the magazine of the National Council of Structural Engineers Associations describes how local governments map vulnerabilities (existing building stock, hazard exposure) and then enforce retrofit/upgrade programmes
- [Resilient Florida](#) program conducts an annual statewide assessment of risk levels related to heavy rain/winds and sea level rise for municipalities/localities across the state and issues grants to local jurisdictions for adaptation projects
- The International Code Council (ICC) has resources for regions with wildfire and bushfire risk, including a model [Wildland-Urban Interface Code](#), to apply to localized areas that face a heightened threat.
- US Federal Emergency Management Agency (FEMA) [resource](#) for local flood mapping for subnational governments and local jurisdictions to use for assessing and mitigating flood risk
- [Case studies](#) of local jurisdictions that have improved resilience to flooding by accessing FEMA’s Community Rating System
- [Climate Risk & Vulnerability Assessment in Informal Settlements](#) (Land, 2024). While focused on informal settlements in the Global South, this paper published in Land, offers important lessons on hazard exposure and vulnerability assessment in contexts with limited data.
- [Global Resiliency Dialogue](#) organized by code and research organizations in Canada, Australia, New Zealand and the U.S. to provide guidance on incorporating future focused risks in design requirements. Developed the Global Resiliency Guidelines.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of a completed local vulnerability and infrastructure risk assessment

LEADING INDICATORS

Looks forward at future outcomes and events

- Ratio of vulnerabilities identified to vulnerabilities addressed through mandatory resilience regulations
- Frequency of updates to local risk maps and inventories (in years)

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Number of climate-related service disruptions recorded annually

KPIs

Incentivize And Strengthen Capacity For Renovation And Retrofit

Goal: Scale up renovation and retrofitting to improve the resilience of existing building stock.

Description: Subnational governments should develop programs that both enhance local renovation capacity and lower financial barriers to retrofits. This involves training local construction actors in resilience-focused renovation techniques, supporting supply chains for adaptive materials, and integrating resilience criteria into building permits and inspections.

To make retrofits financially feasible, local authorities should partner with national governments, banks, and utilities to

offer subsidies, rebates, low-interest loans, or tax incentives. Building owners and managers, in turn, must apply for these programs and integrate resilience upgrades into planned renovations.

By combining capacity-building with targeted financial incentives, subnational governments can accelerate the adaptation of vulnerable assets, reduce future damages, and create local economic opportunities in the construction sector.

Action 4

- The Brookings Institution’s [Rethinking our assumptions and financing tools for community resilience in the face of growing climate risk](#) highlights how financing and networks need to shift for resilience programs to scale
- The [Guidelines for Creating Community-Driven Building Retrofit Programs](#) by C40 Cities directly addresses how local governments can develop retrofit programmes, build local capacity, and provide incentives for renovation.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of local subsidy or loan programs for adaptation retrofits

LEADING INDICATORS

Looks forward at future outcomes and events

- Uptake rate (% of eligible projects benefiting from local incentives)

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in post-disaster recovery costs and downtime

KPIs

Medium-term actions

Reform Local Urban Planning Frameworks for Resilient Development

Goal: Adapt zoning codes, land-use planning regulations, and local rules (including building codes - if adopted locally - and HOA bylaws) to promote climate-resilient construction and land development.

Description: Local governments play a pivotal role in shaping urban form. Reforming urban planning and zoning regulations to limit development in risky areas and integrate resilience (e.g. allowing for elevated structures, green buffers, water retention areas) is essential. This includes reviewing and modernizing building codes, density rules, and design guidelines to reflect updated climate risk assessments. Doing so enables developers and homeowners to build or retrofit in ways that reduce long-term exposure and vulnerability.

- While focused on recovery, American Planning Association (APA)’s [Planning for Post-Disaster Recovery: Next Generation](#) includes how planning codes and zoning should anticipate future hazard risks, which local authorities can adapt. It also comes with multiple briefing papers on specific topics.
- UN-Habitat’s [International Guidelines on Urban and Territorial Planning](#), though old (2015), is still the reference document, available in multiple languages.
- [Chapter 10](#) of UN Habitat’s [World Cities Report 2022](#) is dedicated to Building Resilience for Sustainable Urban Futures and offers guidance to local governments on how to integrate climate resilience into zoning, land-use plans and design guidelines.
- [Urban Heat Island Mitigation Strategies](#) is Institut national de santé publique du Québec’s comprehensive review of existing measures and reports on certain studies that have tested their efficacy in terms of cooling.
- This [research paper](#) (Urban Climate, 2025) reviews planning and design solutions to reduce heat stress in urban contexts.
- A [case study](#) of the City of Durban (South Africa) demonstrates how a local government in the Global South revised land-use planning to incorporate flood risk, sea-level rise and informal settlement upgrades.
- The Netherlands’ [Room for the River](#) initiative shows how national, regional and municipal governments work together to manage river floods and adapt wide territories to future climate risks through local action.
- [City-To-City Learning for Urban Resilience: The Case of Water Squares in Rotterdam and Mexico City](#) (Water, 2019) presents an analysis of how policy relevant knowledge on the notion of ‘Water Squares’ is exchanged between Rotterdam and Mexico City

Action 1

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Local planning or zoning documents updated to include climate resilience criteria
- Frequency of updates to land use and building code requirements.

LEADING INDICATORS

Looks forward at future outcomes and events

- % of new permits including resilience or sustainability clauses

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Decrease in exposure of new construction to high-risk zones

KPIs

Build Institutional Capacity for Climate Enforcement and Adaptation Planning

Goal: Equip municipalities with the authority, technical expertise, and staffing to ensure compliance with resilience standards and effectively plan for climate risks.

Description: Many local governments lack the institutional structures and/or enforcement capacity necessary to implement, monitor, and uphold climate adaptation measures. Building this capacity involves not just creating new departments or teams, but also training civil servants, inspectors, and enforcement officers (including building and urban police) on climate-related risks and resilience codes, and securing permanent funding. It also includes empowering local governments to investigate urban planning violations, ensuring that adaptation measures are respected.

- Developed by UNDRR, this [handbook](#) provides local government leaders with a structured framework for reducing risks and showcases successful tools and practices used across cities globally.
- ICLEI Local Governments for Sustainability's Governance & Institutional [Toolkit for Climate Resilient Urban Development](#) focuses on structural capacity, financing, staffing, enforcement mechanisms
- Case study of the [City of Melbourne](#), and the [Greater Melbourne Regional Climate Change Adaptation Strategy](#) (Australia): example where the local authority built internal capacity, established monitoring teams and adapted enforcement systems for resilience.
- This [learning paper](#) on institutional capacity for climate resilience explores how to strengthen institutions' ability to understand and address the development impacts of climate change. Drawing on practical lessons from the Action on Climate Today (ACT) programme, it introduces a capabilities framework to guide efforts aiming to mainstream adaptation across diverse contexts.
- This US EPA [article](#) provides answers to commonly perceived barriers to Green Infrastructures

Action 2

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of inspectors or enforcement officials trained in resilience standards

LEADING INDICATORS

Looks forward at future outcomes and events

- % of construction projects audited for compliance with resilience codes

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Decline in violations of zoning, code, or environmental resilience rules

KPIs

Develop Non-Monetary Incentives to Encourage Resilience

Goal: Use regulatory and administrative levers such as expedited permitting, to promote climate-resilient building and renovation practices.

Description: Where budgets are limited, non-financial levers can be powerful. Local authorities can incentivize resilient construction by streamlining permits for adaptive design, offering zoning variances for green roofs or flood mitigation, or recognizing resilient projects through local labeling programs. These mechanisms create low-cost incentives and reduce barriers for stakeholders who want to invest in resilience.

- UNDRR’s [Handbook for Local Government Leaders](#) equips local authorities with a clear roadmap for reducing climate and disaster risks, drawing on real-world examples and practical tools already applied in cities around the world.
- These US EPA’s [guidelines](#) show how local authorities use administrative tools and regulatory levers to promote resilient practices. These can be adapted for resilience in building retrofits and new builds.
- Case study: [Chicago Green Roof Grant & Permit Streamlining Programme](#). A concrete example of non-financial incentive (streamlined permits + recognition) to promote resilient building features (green roofs) which local governments can replicate.
- The City of Cape Town (South Africa)’s [Resilience Strategy](#) emphasizes enabling zoning regulations that support the creation of informal activity hubs to allow not only survival activities but also stable enterprises and to recover quickly from disruptions

INPUT INDICATORS

Measure the resources required to deliver

- Existence of municipal guidance or framework for resilience incentives (e.g., expedited permitting, zoning variances)
- Number of staff trained to assess climate-resilient projects for permitting
- Number of local partnerships established with developers, chambers of commerce, or builders’ associations

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of projects benefiting from non-monetary incentives annually
- Average permit approval time reduction for adaptive projects
- Number of public awareness or labeling campaigns promoting resilience-friendly construction

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Increase in share of building permits granted for resilience-integrated projects
- Reduction in average reconstruction or retrofit costs after climate events
- Positive feedback from developers or citizens on transparency and predictability of the permitting process

Action 3

Resources

KPIs

Long-term actions

Develop Local Adaptation and Climate Risk Management Plans

Goal: Formalize comprehensive local strategies that integrate climate resilience into planning and budgetary processes.

Description: Once institutional capacity, enabling regulations, and technical knowledge are in place, municipalities and regions should create formal adaptation and climate risk management plans. These plans should align with national adaptation plans and decarbonation goals, local urban planning documents, zoning regulations, and budget cycles, ensuring resilience is not treated as an add-on but as a core

element of territorial development.

Plans should set clear objectives across housing, infrastructure, and public services, while providing pathways for collaboration with private actors, utilities, and communities. They must be regularly updated to reflect new scientific data, hazard assessments, changing conditions, and lessons from implementation.

- U.S. National Institute of Standards and Technology (NIST) [Community Resilience Planning Guide](#)
- The [Climate-Proof Integrated Urban Planning Toolbox](#), initially developed by UKCIP and refined by Local Partnerships is a comprehensive guide and tool for local authorities on how to develop adaptation strategies, use risk assessment, and update plans.
- [Urban climate adaptation and mitigation action plans: A critical review](#) provides insights into how local governments are developing adaptation and mitigation planning frameworks and how they align with buildings and infrastructure.
- [Climate Risk & Vulnerability Assessment in Informal Settlements](#) (Land, 2024): while focused on informal

settlements in the Global South, this paper published in Land, offers important lessons on hazard exposure and vulnerability assessment in contexts with limited data.

- UNDRR [Disaster Resilience Scorecard for Cities](#) provides an assessment that allows local governments to assess their disaster resilience, structuring around UNDRR's [Ten Essentials for Making Cities Resilient](#). It also helps to monitor and review progress and challenges in the implementation of the [Sendai Framework for Disaster Risk Reduction: 2015-2030](#) and supports the baseline analysis for preparation of the disaster risk reduction and resilience strategies

INPUT INDICATORS

Measure the resources required to deliver

- Formal adaptation and risk management plans adopted by council

LEADING INDICATORS

Looks forward at future outcomes and events

- % of municipal budgets allocated to adaptation measures

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Improved local resilience or climate preparedness index

Create Collaborative Governance Structures with Civil Society and Local Experts

Goal: Establish participatory processes involving citizens, civil society, local professionals, and engineers to co-design adaptation priorities.

Description: Inclusive governance strengthens legitimacy and ensures that local adaptation solutions reflect lived experiences. Territorial engineering teams can serve as conveners and facilitators. Communities are not just beneficiaries of adaptation policies: they are gatekeepers of local knowledge and critical actors in ensuring accountability. Their ongoing participation enables real-time feedback on policy implementation, early identification of challenges, and

culturally grounded validation of proposed solutions. When empowered through transparent governance structures, community members and civil society organizations can monitor progress, challenge inefficiencies, and hold institutions accountable for equitable and effective delivery of adaptation interventions. This strengthens not only outcomes but also public trust in the adaptation process.

Action 1

Resources

KPIs

Action 2

- The [Help Them Help Themselves toolkit](#) focuses on participatory and co-creation methods for adaptation, enabling local governments to engage civil society & local experts in governance of adaptation.
- This United Nations Department of Economic and Social Affairs (UNDESA) [Handbook on Effective National to Local Governance for Climate Change Mitigation & Adaptation](#) provides a governance framework for vertical and horizontal integration of adaptation policy.

Helpful for sub-national governments establishing local adaptation governance with civil society input.

- The [Cities and Towns Urban Adaptation Support Tool](#) of the European Environment Agency (EEA) offers local authorities frameworks and case-studies for adaptation planning and inclusive governance; useful for participatory governance structures.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of public-private partnerships (PPPs) and community adaptation projects initiated

LEADING INDICATORS

Looks forward at future outcomes and events

- % of local adaptation projects co-funded by non-public actors
- % of projects including public consultations and number of stakeholders engaged

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Improvement in neighborhood-level adaptive infrastructure coverage

KPIs

Deliver Targeted Public Awareness and Outreach Campaigns

Goal: Build social acceptance and active participation in local adaptation measures.

Description: Subnational governments should roll out targeted outreach campaigns that inform citizens about local climate risks (e.g., flood-prone zones, heat islands, drought conditions) and promote adaptive behaviors such as water conservation, vegetation management, or emergency preparedness. Campaigns should use schools, neighborhood associations, and local media to reach diverse audiences, and emphasize household- and community-level

resilience actions that complement municipal measures. By making risks tangible and showing clear pathways for action, these campaigns foster public engagement and support for local adaptation initiatives. Well-informed citizens are more likely to comply with new regulations, apply for retrofit incentives, and actively participate in collective adaptation efforts.

Action 3

- [International Day for Building Safety](#), a global initiative to highlight the importance of building safety and the steps different actors can take to achieve it.
- C40 Cities' [Integrating Climate Adaptation toolkit](#) contains modules for engaging stakeholders, public workshops and translating hazard data for local audiences. (available in multiple languages)
- WRI's [Locally Led Adaptation](#) page contains multiple resources around the topic (e.g. a [Principles to Practice](#)

paper, a technical paper [Can the Global Goal on Adaptation Be Locally Led?](#), etc.). While focused on broader adaptation, they highlight inclusion, outreach and community-based engagement.

- The [Climate Adaptation in Cities](#) resources of the European Commission offers examples of city-level outreach, awareness-raising and public engagement on urban adaptation initiatives.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of awareness campaigns and public events held per year

LEADING INDICATORS

Looks forward at future outcomes and events

- % of population reached through communication campaigns

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Increase in citizen participation in resilience or emergency planning programs

KPIs

Link Climate Resilience with Urbanization Efforts

Goal: Incorporate climate adaptation measures into urban planning processes, ensuring that new developments and infrastructure projects consider urban resilience in the face of climate change.

Description: As urban areas grow, it is critical to embed resilience into the fabric of urbanization strategies to safeguard against climate risks such as flooding, heatwaves, and other extreme weather events and help assure the community remains vibrant and can recover quickly

- C40 Cities' [Integrating Climate Adaptation toolkit](#) directly supports linking adaptation with urban development/urbanisation strategies by integrating resilience into urban planning and land-use.
- UNDESA : [Governance and institutional frameworks](#) outlined support ensuring adaptation is embedded in urbanisation and local planning processes rather than treated as an add-on.

INPUT INDICATORS

Measure the resources required to deliver

- Inclusion of climate adaptation criteria in municipal procurement guidelines

LEADING INDICATORS

Looks forward at future outcomes and events

- % of public projects evaluated using resilience criteria

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in lifecycle costs and risk exposure of public infrastructure

Action 4

Resources

KPIs

UTILITY & ENERGY COMPANIES

Who is this
pathway for?

This pathway is designed for energy providers, grid operators, utility companies (electricity, gas, water), and energy service companies that support buildings and infrastructure. It targets both public and private actors managing centralized and decentralized energy systems. The pathway is particularly relevant to departments in charge

of grid resilience, customer programs, and strategic innovation, providing a roadmap to ensure energy systems enable, rather than hinder, climate-resilient buildings and communities.

As the backbone of modern society, utility and energy companies face rising pressure from climate-driven disruptions: extreme heat waves strain cooling demand, floods damage distribution networks, and droughts affect hydropower and water supplies. These impacts not only affect

the reliability of energy systems but also expose utilities to financial losses, reputational damage, and regulatory scrutiny. Simultaneously, the transition to electrification, decarbonization, and distributed energy systems makes resilience a strategic imperative.

Utilities must ensure continuity of service, safeguard infrastructure, and support customer adaptation. Beyond grid stability, they can play a key role in equity: by offering tailored programs for vulnerable households, utilities help ensure the benefits of resilience are widely shared. Whether through adaptation audits,

targeted subsidies, or climate-informed infrastructure planning, utility companies hold both the tools and responsibility to accelerate resilience in the built environment. Their role is pivotal in making the buildings sector ready for an increasingly volatile climate.

Ensure grid resilience while enabling climate-ready buildings and communities.

Most utilities have yet to fully integrate adaptation into planning, budgeting, and service design. In the short term, they must build internal expertise,

begin climate-informed audits, and pilot adaptive solutions. Medium term, they should develop new products, engage regulators, and

embed resilience into system upgrades. By 2050, utilities should act as resilience enablers, actively co-designing adaptive systems with cities,

developers, and regulators, and supporting equitable access to resilient energy solutions.

UTILITY & ENERGY COMPANIES

Short-Term Actions

Actions	Resources & case studies	KPIs
Set Up or Support Climate Resilience Financing Instruments	CPI's Building Financial Instruments for Climate Adaptation report	Total amount of capital mobilized for decentralized or resilient energy and water infrastructure
Build Capacity and Tools for Adaptation Audits	EPRI's Climate READi	% of audit tools and templates standardized across departments
Map Vulnerabilities and Strengthen Emergency Preparedness Across Networks	Ouranos's Monitoring and Evaluation for a Resilient Electricity Sector Report	Frequency of updates to climate vulnerability maps and asset-level assessments

Medium-Term Actions

Actions	Resources & case studies	KPIs
Influence Infrastructure and Urban Design Toward Resilience	Rocky Mountain Institute (RMI)'s Reimagining Utility Climate Risk Planning	Number of operational decentralized systems or community microgrids launched
Detect Community Level Stress and Strengthen Emergency Preparedness	UNEP's Climate Information and Early Warning System	Number of communication campaigns or alerts issued annually on heatwaves, grid stress, or drought
Support Clients Through Adaptation Audits and Targeted Climate Risk Communication	PNNL's Emerging Best Practices for Electric Utility Planning with Climate Variability	Number of commercial or industrial clients receiving adaptation audits or technical resilience advice

Long-Term Actions

Actions	Resources & case studies	KPIs
Deliver Incentives and Programs for Vulnerable Households	UNDP's Empowering Vulnerable Households to Access Affordable and Clean Energy	% of targeted vulnerable households enrolled in programs
Establish Community-Based and Community-Led Resilience Programs	SEPA Resilient by Design report	Number of active partnerships with municipalities or communities for shared energy resilience projects (e.g., microgrids, cooling centers)
Integrate Adaptation into National Energy Planning and Forecasting	The Climate resilience section of Power Systems in Transition , IEA	Leading Evidence of collaboration with regulators on integrating adaptation into long-term energy demand models
Drive Innovation Through Pilots and Standards	PNNL's Climate Adaptation Approaches for Water and Electric Utilities report	Development of draft or revised resilience standards submitted to regulators



Short-term actions

Set Up or Support Climate Resilience Financing Instruments

Goal: Enable investment in decentralized and resilient energy systems by lowering financial barriers.

Description: Utilities should collaborate with financial institutions, (re)insurance institutions, regulators, and development banks to create financing mechanisms such as leasing programs, ESCO (energy service company) models, targeted subsidies, and preferential loan products, that support the deployment of resilient energy solutions. These may include solar & storage systems, microgrids, smart thermostats, and demand-response technologies.

- Climate Policy Initiative (CPI)'s [Building Financial Instruments for Climate Adaptation](#) report provides detailed guidance on how to structure and scale adaptation-finance instruments (e.g., for energy networks). Utilities can use this to partner with financiers and set up leasing or subsidy programmes for resilient energy solutions.
- International Institute for Sustainable Development (IISD)'s [Innovative Financial Instruments and Their Potential to Finance Climate Change Adaptation](#) report focuses on how adaptation-finance is often under-invested, especially in developing countries, and gives examples that utilities in the Global South or North can follow for financing resilient energy-infrastructure.
- This [article](#) highlights the rise of resilience bonds and blended finance for adaptation. Demonstrates market-trends utilities can tap into (e.g., issuing resilience-bonds to fund microgrids or resilient energy storage for communities).

INPUT INDICATORS

Measure the resources required to deliver

- Number of dedicated financing instruments or partnerships established to fund resilience projects (e.g., ESCOs, leasing models, subsidies)

LEADING INDICATORS

Looks forward at future outcomes and events

- Total amount of capital mobilized for decentralized or resilient energy infrastructure

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Increase in deployment of climate-resilient technologies (e.g., solar+storage systems) financed through these mechanisms

Build Capacity and Tools for Adaptation Audits

Goal: Develop standardized tools, maps, training programs, and a skilled workforce to perform adaptation-focused energy audits.

Description: Utilities should develop internal expertise, tools, and staff training to perform adaptation-focused audits. They should allocate staff and funding, and pilot the integration of audits into existing client services. In the immediate term, audits may be outsourced to third parties, but governments and regulators should provide resources, maps, and climate data to accelerate internal capacity-building.

Action 1

Resources

KPIs

Action 2

- Rocky Mountain Institute (RMI)'s [Reimagining Utility Climate Risk Planning](#) describes a structured framework for utilities to perform climate risk assessments (identify, quantify, integrate into planning)
- Electric Power Research Institute (EPRI)'s [Climate READi](#) provides a large library of guidance, references and tools to help companies plan, design and operate their infrastructure with resilience in mind.
- Electricity Sector Council of Canada's [Adaptation through Risk Management: Electricity Sector Climate Adaptation Planning Guide](#) is a detailed sector-specific guide for utilities to integrate adaptation into business-planning, valuable for building internal audit and adaptation-capacity.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Budget allocated to staff training and audit tool development
- % of employees trained on adaptation audit methodologies
- Number of partnerships established with research institutions or technical agencies

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of adaptation audits performed per quarter
- % of audit tools and templates standardized across departments
- Integration of climate risk datasets into audit models or GIS systems

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Share of audited clients implementing recommended resilience measures
- Reduction in energy service disruptions or performance loss during extreme events
- Demonstrated cost savings or avoided damages for clients implementing audit recommendations

KPIs

Map Vulnerabilities and Strengthen Emergency Preparedness Across Networks

Goal: Anticipate risks to critical infrastructure and ensure effective response to climate-related disruptions.

Description: Utilities should conduct a comprehensive mapping of vulnerabilities across their networks, including substations, pipelines, power plants, and transmission lines, under different climate scenarios. This mapping must draw on downscaled data and probabilistic risk models provided by governments, regulators, and research institutions. Based on these assessments, companies should revise

and update emergency preparedness protocols, including outage response, load-shedding priorities, and disaster recovery plans. Tools to track service interruptions and early warning systems should be integrated into daily operations, allowing utilities to detect stress in communities and respond proactively.

- WRI [Aqueduct Water Risk Atlas](#): Portfolio-screening tool for current/future water stress, flooding, and drought. Helps triage assets and set site-level KPIs.
- EPRI's [Costs and Benefits of Proactive Climate Adaptation in the Electric Sector](#)
- Ouranos's [Monitoring and Evaluation for a Resilient Electricity Sector Report](#) details how utilities can build monitoring and evaluation frameworks, map vulnerabilities, integrate climate-scenario data into network planning and emergency response.
- This Adaptation Community's [Climate Risk Sourcebook](#) provides modular templates for risk assessment which utilities can adapt for network-vulnerability mapping (e.g., identifying substations at flood risk or transmission lines exposed to wildfire).

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Completion of a comprehensive climate risk and asset vulnerability map covering all critical infrastructure

LEADING INDICATORS

Looks forward at future outcomes and events

- Frequency of updates to climate vulnerability maps and asset-level assessments

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % reduction in service interruptions or damage incidents linked to climate events

KPIs

Medium-term actions

Influence Infrastructure and Urban Design Toward Resilience

Goal: Align energy infrastructure planning with resilient urban development.

Description: Utility infrastructure decisions (grid upgrades, substation location, decentralization strategies) shape long-term energy access and resilience. Utilities must proactively engage in territorial planning, advocating for microgrids, local production, and resilient system design. This is especially

crucial in areas where grid reliability is already under strain or central systems are vulnerable. Utilities should collaborate with municipalities, developers, and insurers to support climate-smart infrastructure decisions.

- Rocky Mountain Institute (RMI)'s [Reimagining Utility Climate Risk Planning](#) brief examines how utilities can integrate climate risk assessment frameworks into infrastructure planning processes (grid upgrades, microgrids, network design). Directly relevant when utilities engage with urban and infrastructure planning to align energy infrastructure with resilient urban development.
- European Environment Agency (EEA)'s broad [handbook](#) on integrating climate resilience into infrastructure

(including energy) across planning, design and implementation. Utilities can use it to influence urban/energy infrastructure decision-making in collaboration with municipalities and developers.

- Although focused on water and sanitation utilities, the principles of resilient infrastructure, decentralised services and utility-territory planning detailed in the International Water Association's [Climate Smart Utilities Initiative](#) also apply strongly to energy utilities as they participate in urban/territorial planning.

INPUT INDICATORS

Measure the resources required to deliver

- Regulatory and technical feasibility studies completed for microgrid deployment

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of operational decentralized systems or community microgrids launched

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % reduction in outage duration or grid recovery time after climate shocks

Detect Community-Level Stress and Strengthen Emergency Preparedness

Goal: Anticipate risks to critical infrastructure and ensure effective response to climate-related disruptions.

Description: Utilities can analyze usage anomalies, service interruptions, and outage reports to detect early signs of stress in neighborhoods especially under heat or cold extremes. Combined with updated load-shedding protocols and disaster recovery plans, this action enhances adaptive capacity both for the company and the communities they serve.

Action 1

Resources

KPIs

Action 2

- This National Renewable Energy Laboratory (NREL)'s [Power Sector Resilience Planning Guidebook](#) for utilities on resilience planning that includes mapping vulnerabilities, asset-risk assessment, and scenario planning is essential for utilities to detect stress signals across networks and strengthen preparedness protocols.
- United Nations Environment Programme (UNEP)'s [Climate Information and Early Warning Systems](#) highlights the role of early warning systems (EWS) in adaptation. Utilities can reference this to build or integrate early warning/monitoring systems that detect community stress (e.g., peak loads, outage precursors) in advance of extreme climate events.
- Smart Electric Power Alliance (SEPA)'s [Resilient by Design: Utility Strategies for Climate-Ready Distribution](#) describes how utilities are embedding resilience into distribution planning and operations, including practices for detecting operational stress and building emergency response readiness.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Establishment of a structured communication plan for climate risk alerts (via SMS, bills, apps, etc.)

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of communication campaigns or alerts issued annually on heatwaves, grid stress, or drought

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Documented improvement in client-side adaptive behaviors (e.g., reduced consumption during grid stress)

KPIs

Support Clients Through Adaptation Audits and Targeted Climate Risk Communication

Goal: Enable commercial and industrial clients to identify vulnerabilities, adopt adaptive measures, and respond to climate-related energy risks through a combination of tailored audits and proactive communication.

Description: By offering or facilitating audits that assess climate vulnerabilities (such as exposure to heatwaves, grid instability, or water stress) utilities can help clients prioritize resilience upgrades, from equipment cooling to backup power solutions. While third-party providers may initially lead these audits, utilities should work toward internalizing this capacity, leveraging their access to energy use data and infrastructure insights. At the same time, embedding climate risk messaging into routine client communications (such as energy bills, mobile apps, or SMS alerts) enables clients to anticipate and respond to extreme weather events, adopt adaptive behaviors, and improve energy efficiency under stress conditions. Together, these strategies position utilities as trusted, forward-looking partners in resilience, offering both practical guidance and timely signals to empower their customers.

- Pacific Northwest National Laboratory (PNNL)'s [Emerging Best Practices for Electric Utility Planning with Climate Variability](#) is a resource for utilities and regulators focusing on planning, asset management and contingency measures under climate risk. Useful for utilities developing audit tools and client-services around resilience.

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Development of in-house or partner-supported adaptation audit protocols and tools

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of commercial or industrial clients receiving adaptation audits or technical resilience advice

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of audited clients implementing recommended adaptation measures

KPIs

Long-term actions

Deliver Incentives and Programs for Vulnerable Households

Goal: Ensure equitable access to resilience solutions.

Description: Utilities should develop targeted subsidy or leasing programs for low-income households to access decentralized energy and adaptive technologies. These programs must be coordinated with national and local social equity goals.

- Energy cities' [Engaging with Vulnerable Households Guidance and Toolkit](#) provides a practitioner-toolkit for utilities (or local energy actors) on how to engage vulnerable households, design inclusive service models, and deliver benefits to low-income consumers
- United Nations Development Programme (UNDP)'s [Empowering Vulnerable Households to Access Affordable and Clean Energy](#) focuses on access to clean energy for vulnerable households, including frameworks for utilities and governments to coordinate on equitable access. Useful for utilities developing programs aligned with social equity.
- This [Energy efficiency support schemes for energy poor consumers](#) study from SciencePo's European Chair for Sustainable Development and Climate Transition of how utilities in Europe are targeting vulnerable households with efficiency and support schemes provides examples of how utilities can structure programs for resilience and affordability.

INPUT INDICATORS

Measure the resources required to deliver

- Amount of funding allocated to household resilience programs
- Number of partnerships with social housing providers or local governments
- Number of adaptive technologies included in eligible incentive schemes

LEADING INDICATORS

Looks forward at future outcomes and events

- % of targeted vulnerable households enrolled in programs
- Average time between application and delivery of adaptive solutions
- Level of community awareness and satisfaction with offered programs (survey-based)

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in reported energy vulnerability or outages among participating households
- Measurable improvement in adaptive capacity or reduction in indoor overheating events
- Sustained use and maintenance rate of adaptive technologies over 3+ years

Action 1

Resources

KPIs

Establish Community-Based and Community-Led Resilience Programs

Goal: Move beyond individual buildings to foster community-wide resilience and ensure adaptation efforts reach the most vulnerable.

Description: Utilities should partner with municipalities, civil society, and local communities to co-design and implement neighborhood-scale resilience initiatives. These programs could include shared battery storage systems, community-managed microgrids, public cooling centers, early-warning alert systems, and grassroots emergency preparedness networks. By supporting community-led governance, utilities help ensure that resilience efforts are rooted in local priorities, foster social cohesion, and provide energy, health, and spatial co-benefits.

Examples include community-managed early warning systems, locally maintained energy hubs, and participatory demand-response strategies that integrate resilience into local planning. Empowering communities to lead adaptation builds stronger systems of mutual support, enhances accountability, and ensures sustainability over the long term. Utilities, in this model, act not only as infrastructure providers but also as partners in building the social and institutional fabric of resilience.

Action 2

- This Smart Electric Power Alliance (SEPA) [Resilient by Design](#) report examines how 17 utilities are embedding resilience into distribution planning and collaborating with communities. Valuable case studies for utilities looking to implement community-led resilience programs.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of community-level resilience initiatives supported or co-financed by the utility

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of communication campaigns or alerts issued annually on heatwaves, grid stress, or drought

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Documented improvement in client-side adaptive behaviors (e.g., reduced consumption during grid stress)

KPIs

Integrate Adaptation into National Energy Planning and Forecasting

Goal: Ensure climate adaptation is fully embedded into future energy system design and demand projections.

Description: Utilities should use insights gained from adaptation audits, community resilience programs, and grid performance during extreme events to shape national-level energy planning and forecasting. This includes feeding real-world data on vulnerabilities, demand spikes, and resilience measures into the models that guide long-term energy policy, infrastructure investments, and demand scenarios.

- The [Climate resilience](#) section of [Power Systems in Transition](#) from the International Energy Agency (IEA) offers a conceptual framework and data on how electricity systems must evolve to be resilient. Utilities can use this to feed into national planning, demand forecasting and long-term infrastructure design.
- [Regulatory mechanisms for climate-resilient urban energy systems](#) (Sustainable Cities and Society, 2024) research paper discusses how utilities and regulators can ensure adaptation is embedded in energy system regulatory frameworks and planning processes

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Contribution of the utility to national or regional climate risk forecasting exercises

LEADING INDICATORS

Looks forward at future outcomes and events

- Evidence of collaboration with regulators on integrating adaptation into long-term energy demand models

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Inclusion of climate risk metrics in national energy security and reliability indicators

KPIs

Drive Innovation Through Pilots and Standards

Goal: Test, evaluate, and scale adaptation measures in the energy sector.

Description: Support pilot projects on building-grid interaction under extreme conditions and document results for replication. Collaborate with regulators and manufacturers to develop performance standards and testing protocols for resilient systems, ensuring innovation is scalable and credible. Integrating adaptation into mainstream planning processes helps ensure that future energy systems are designed to withstand heatwaves, floods, droughts, and grid stress, rather than treating resilience as a separate or siloed objective. Close collaboration with national governments, regulators, and research institutions is essential to align these inputs with broader energy transition and climate policy goals. In doing so, utilities shift from being reactive service providers to strategic partners shaping climate-ready national energy systems.

Action 4

- The [Electrical Utilities Criteria](#) from the Climate Bonds Initiative sets out science-based standards for utilities, including requirements for adaptation & resilience infrastructure
- Pacific Northwest National Laboratory (PNNL)'s [Climate Adaptation Approaches for Water and Electric Utilities](#) report is a comprehensive compendium of adaptation strategies for utilities, including many innovation examples and pilots. Helps utilities design, evaluate and scale adaptation measures.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- R&D budget dedicated to adaptation-related pilots
- Number of partnerships with regulators, manufacturers, and research bodies
- Existence of internal protocols for pilot evaluation and data sharing

LEADING INDICATORS

Looks forward at future outcomes and events

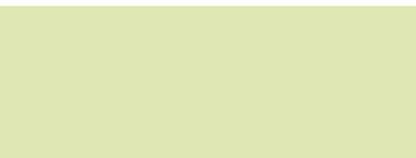
- Number of adaptation pilot projects initiated annually
- % of pilot projects evaluated and published with performance results
- Development of draft or revised resilience standards submitted to regulators

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Adoption rate of validated resilience standards by utilities or manufacturers
- Reduction in climate-related system downtime or infrastructure failure rate
- Increase in investment in resilient infrastructure aligned with new standards

KPIs



PROPERTY & PROJECT DEVELOPERS

Who is this pathway for?

This pathway targets real estate developers, project promoters, asset development managers, and land development companies responsible for conceiving, financing, and delivering new buildings and large-scale refurbishments. It also speaks to investors, design-build consortia, and property funds involved in project

initiation and coordination. It provides guidance for integrating adaptation and resilience into project planning, financial modeling, and stakeholder engagement across all phases of property development.



Property and project developers stand at the heart of the buildings and construction value chain, shaping the spaces where people live, work, and thrive. Their projects face increasing exposure to climate hazards from heatwaves and floods to soil subsidence that can damage assets,

reduce returns, and compromise safety. Yet adaptation is not only a necessity but a business opportunity: resilient buildings hold higher long-term value, lower insurance costs, and offer superior comfort and reliability for occupants. Integrating climate resilience early in project

design mitigates physical and financial risks, enhances market competitiveness, and aligns with emerging regulation and investor expectations. By anticipating future climate conditions and embedding adaptive design and materials, developers can

reduce repair costs, safeguard continuity, and attract risk-conscious buyers and tenants. Conversely, ignoring adaptation exposes firms to legal, reputational, and market risks as climate performance becomes a defining standard in real estate investment.

Turn resilience into a core business strategy and market advantage.

Today, most developers address resilience reactively or through compliance with minimal codes. In the short term, they must systematically

assess project climate risks and adjust designs accordingly. Medium term, they should integrate adaptation into business models, budgeting,

and disclosure. Long term, developers should act as catalysts of systemic resilience: embedding climate-readiness as a standard of

quality, value, and innovation in all built assets and portfolios.

PROPERTY & PROJECT DEVELOPERS

Short-Term Actions

Actions	Resources & case studies	KPIs
Engage Early with Insurers, Regulators, and Local Authorities	ULI Developing Resilience Toolkit: Part One: Risk Assessment and Resilient Design Process	% of projects incorporating design adjustments resulting from early engagement
Launch Climate-Resilience R&D Pilots	EU-level Technical Guidance on Adapting Buildings to Climate Change	Number of pilot projects testing adaptive designs, materials, or technologies
Build Capacity and Embed Resilience in Design and Project Requirements	Practical Guide to Climate-resilient Buildings & Communities (UNEP)	% of design briefs or contracts referencing updated regional resilience standards

Medium-Term Actions

Actions	Resources & case studies	KPIs
Integrate Climate Risk into Asset and Project Valuation Models	UNEP FI TCFD for Real Estate	% of projects where resilience KPIs are contractually binding or tracked in delivery phase
Commission Rapid Climate Vulnerability Assessments for Portfolios	Climate-Proof Integrated Urban Planning Toolbox , initially developed by UKCIP	Frequency of vulnerability updates per asset or per region
Integrate Adaptation into Design Briefs and Budget Planning from the Outset	Toolkit for Resilient Public Procurement Strategies to Minimise Risks (OECD/EC)	% of projects undergoing climate risk review during concept phase

Long-Term Actions

Actions	Resources & case studies	KPIs
Disclose Adaptation Strategies Publicly	Data, disclosures, and divergence: ESG regulations and compliance in real estate (Deloitte)	Inclusion of adaptation KPIs and resilience case studies in public reports
Showcase Demonstration Projects and Build Toolkits for Replication	Sustainable and Affordable Housing (WGBC)	Number of external presentations, publications, or partnerships to share lessons learned
Invest in Mixed-Income, Resilient Housing	Mixed-Income Housing Development Planning Strategies and Frameworks in the Global South (Onatu et al., 2024)	Share of resilient housing projects benefiting from blended finance or public-private funding



Short-term actions

Engage Early with Insurers, Regulators, and Local Authorities

Goal: Align development practices with evolving standards and unlock incentives.

Description: Before resilient design and financing strategies can be implemented effectively, developers must engage in proactive coordination with key institutional stakeholders. Establishing structured dialogues with insurers, permitting authorities, and municipal planning bodies allows developers to anticipate new resilience thresholds, evolving regulatory frameworks, and insurance risk requirements. These conversations also create opportunities to identify incentives, co-investment mechanisms, and streamlined permitting pathways for adaptive projects.

From insurers, developers need clarity on premium

structures, risk assessment criteria, and requirements for the insurability of adaptive features. From regulators and local authorities, they must receive updated zoning rules, resilience standards, and access to long-term urban adaptation plans. Developers, in turn, must demonstrate a willingness to engage early, adjust project scopes, and contribute actively to collaborative planning discussions.

Engaging early not only reduces approval delays and compliance risks but also positions developers as forward-looking partners, aligning projects with community resilience goals and enhancing long-term asset value.

- ULI's [Developing Resilience Toolkit Part One: Risk Assessment and Resilient Design Process](#) provides guidance on understanding the exposure of a portfolio to physical climate hazards and outlines principles on incorporating resilience thinking into asset design and operations.
- The [EU-level Technical Guidance on Adapting Buildings to Climate Change](#) and its companion [Best Practice Guide](#) together provide developers and practitioners with a comprehensive overview of evolving regulations,

standards, and assessment approaches for building resilience. These documents offer both regulatory context and practical examples to inform project planning and anticipate future insurance and policy expectations.

- [A Practical Guide to Climate-resilient Buildings & Communities](#) (United Nations Environment Programme, 2021) provides a practical checklist of interventions and stakeholder-engagement needs. Handy for early meetings with local authorities and coordinating parties.

INPUT INDICATORS

Measure the resources required to deliver

- Number of early-stage consultations held with insurers, regulators, and local authorities before project design is finalized

LEADING INDICATORS

Looks forward at future outcomes and events

- % of projects incorporating design adjustments resulting from early engagement

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in permitting delays or insurance premium surcharges for completed projects

Launch Climate-Resilience R&D Pilots

Goal: Test, validate, and de-risk adaptive design strategies, materials, and technologies before mainstream adoption.

Description: Developers should dedicate space and resources within upcoming projects to serve as testbeds for resilience innovations. These pilots can explore solutions such as modular retrofits, permeable paving, flood-proof designs, or water retention systems. By monitoring and documenting outcomes, developers generate reliable performance data that reduces uncertainty, reassures investors and insurers, and sets benchmarks for regulators and peers.

Action 1

Resources

KPIs

Action 2

- The [EU-level Technical Guidance on Adapting Buildings to Climate Change](#) provides methodologies for vulnerability and risk assessments, outlining what effective adaptive design looks like. Its accompanying [Best Practice Guide](#) complements this with real-world examples and case studies to illustrate implementation.
- In [An adaptive framework for assessing climate resilience in Buildings \(2024\)](#), researchers present a methodology applied in different climates for assessing resilience; useful for monitoring & validation of R&D pilots.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Share of annual R&D budget or project portfolio allocated to resilience pilots

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of pilot projects testing adaptive designs, materials, or technologies

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Uptake of validated resilient technologies or design strategies in mainstream projects

KPIs

Build Capacity and Embed Resilience in Design and Project Requirements

Goal: Ensure resilience is systematically integrated into project design while staying ahead of evolving codes and regulations.

Description: Developers should invest in training their design, procurement, and construction teams to strengthen expertise in climate-responsive techniques, adaptive materials, and lifecycle costing. In parallel, they must **build legal and policy intelligence** systems to anticipate changes in regional codes such as new rules on drought adaptation, soil movement, or fire buffers. Legal and compliance teams should monitor regulatory trends, while design leads translate these insights into updated templates and operational guidelines.

At the same time, developers should **make resilience a non-**

negotiable part of client briefs and project requirements, ensuring that adaptation is considered from the very start of the design phase. This alignment drives demand for resilient design choices, reduces risks of non-compliance or delays, and builds trust with funders, insurers, and communities.

- ULI's [Developing Resilience Toolkit Part Two](#) is intended for use by real estate development, design, and sustainability teams, property and asset management teams, investment committees, or other stakeholders seeking information on what strategies are available to reduce risk from specific or multiple hazards and their implications
- The [EU-level Technical Guidance on Adapting Buildings to Climate Change](#) provides a comprehensive framework for integrating resilience into building design and procurement, with references to standardization

systems such as the Eurocodes. Its companion document, the [Best Practice Guide](#), complements the technical guidance by showcasing practical examples, design strategies, and lessons learned to support implementation at project and policy levels.

- [A Practical Guide to Climate-resilient Buildings & Communities](#) (United Nations Environment Programme, 2021) simplifies adaptation-measures into checklists and is accessible to non-specialist members of the design/construction team; good for training.

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of internal training or guidance materials on regional resilience codes and legal trends

LEADING INDICATORS

Looks forward at future outcomes and events

- % of design briefs or contracts referencing updated regional resilience standards

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Decrease in rework or redesigns caused by changing regulatory requirements

KPIs

Medium-term actions

Integrate Climate Risk into Asset and Project Valuation Models

Goal: Make resilience and risk part of the financial logic of development and acquisition.

Description: Use tools like CRREM, life-cycle costing, and TCFD-aligned frameworks to assess the long-term value of assets considering acute (e.g., floods) and chronic (e.g., heat stress) climate risks. This step helps avoid stranded assets and aligns investments with evolving ESG standards.

- UNEP FI's [Changing Course](#) report (TCFD for Real Estate) provides sector-specific guidance and scenarios to integrate physical and transition risk into governance, metrics and targets, and investment decisions.
- UNEP FI's [Climate Risks in the Real Estate Sector](#) (2023 brief) is a concise overview of material physical and transition risks owners should manage, with implications for valuation.
- [Real Estate Climate Value at Risk](#) (RECVR) (Deloitte and Longevity Partners methodology) provides a valuation-driven methodology for real estate assets which incorporates climate & sustainability risk into cash-flows and value at risk. Useful for developers when embedding resilience into financial logic.
- [Climate risk and the opportunity for real estate](#) (McKinsey & Company report) highlights how physical and transition risks affect asset and portfolio valuation and what actions real estate players must take. A good high-level guide for developers.
- [MSCI Real Assets Climate Analysis: Real Estate Climate VaR Methodology](#). A forward-looking valuation tool for real estate assets covering physical & transition risks, with a long time horizon to 2100. Helps developers understand how resilience ties into long-term asset value.

INPUT INDICATORS

Measure the resources required to deliver

- % of project briefs that explicitly include resilience performance goals (e.g., overheating thresholds, flood tolerance)

LEADING INDICATORS

Looks forward at future outcomes and events

- % of projects where resilience KPIs are contractually binding or tracked in delivery phase

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Improvement in asset performance under stress events (temperature, moisture, flooding)

Commission Rapid Climate Vulnerability Assessments for Portfolios

Goal: Prioritize at-risk buildings for retrofitting or divestment.

Description: Engage consultants or internal analysts to map exposure across existing portfolios, using local hazard data (e.g., drought-prone soils, urban heat islands). It creates a baseline for strategic upgrades and de-risking.

Action 1

Resources

KPIs

Action 2

- [Vulnerability assessment for climate adaptation](#) (IPCC technical paper). Core methodology on vulnerability assessment useful for commissioning rapid assessments and ensuring they're built on solid structure.
- [Bat-ADAPT](#) (available on the [R4RE platform](#)), developed by OID, is a decision-making and mapping tool for climate risks in France and Europe, based on IPCC scenarios. It also features recommendations and assistance for planning and implementing adaptation actions.
- [ISO 14090:2019 Adaptation to climate change](#) (principles & requirements). Framework to embed adaptation into governance, risk, and decision-making; useful to structure portfolio-level programs.
- The [EU Technical Guidance on Adapting Buildings to Climate Change](#) provides a framework for assessing climate hazards, identifying vulnerabilities, and rating building resilience, with detailed annexes and references to existing standards. Accompanying it is a [Best Practice Guide](#), which offers practical case studies and replicable solutions to support owners and practitioners in adapting buildings effectively.
- The [Climate-Proof Integrated Urban Planning Toolbox](#), initially developed by UKCIP and refined by Local Partnerships is a step-by-step process to build asset and portfolio adaptation plans and for translating risk screens into actions.
- UNEP FI's [Changing Course](#) report (TCFD for Real Estate) provides sector-specific guidance and scenarios to integrate physical and transition risk into governance, metrics and targets, and investment decisions.
- ULI and Heitman's [Climate Risk & Real Estate Investment](#) report shows how leading investors price climate risk, adjust underwriting and hold-sell, and upgrade assets; useful for IC memos and strategy notes.
- [Climate Risk & Vulnerability Assessment in Informal Settlements](#) (Land, 2024). While focused on informal settlements in the Global South, this paper published in Land, offers important lessons on hazard exposure and vulnerability assessment in contexts with limited data. Developers active in emerging markets should draw from this.

INPUT INDICATORS

Measure the resources required to deliver

- Budget and staff time allocated to vulnerability assessments
- % of portfolio covered by rapid vulnerability assessments
- Number of partnerships with climate data providers or consultants

LEADING INDICATORS

Looks forward at future outcomes and events

- Frequency of vulnerability updates per asset or per region
- Number of priority assets identified for intervention or retrofit

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of identified priority assets with completed adaptation plans
- Reduction in financial exposure or insurance risk premiums on adapted assets
- Integration of climate risk metrics into internal investment decision frameworks

Integrate Adaptation into Design Briefs and Budget Planning from the Outset

Goal: Ensure that climate resilience is embedded in both the design intent and financial structure of new developments, securing long-term performance and value.

Description: To future-proof their projects, property developers and investors must treat adaptation not as an add-on, but as a core design and investment priority. This means embedding adaptation objectives directly into design briefs (specifying features such as passive cooling strategies, flood-resilient foundations, fire-smart landscaping, and moisture control systems) tailored to local hazard profiles. At the same time, these commitments must be backed by dedicated budget lines, supported by tools like life-cycle costing and ROI projections based on avoided damage costs. By aligning design and finance early in the process, developers can protect asset value, enhance occupant well-being, and avoid the risks of sidelining resilience during cost-cutting phases. This approach builds both climate readiness and market credibility into the foundations of each project.

- [Adaptation of buildings to climate change: an overview](#) (in *Frontiers in Built Environment*, 2024) surveys adaptive design strategies (passive cooling, moisture control, etc). Developers can use this to define design briefs and budgets incorporating adaptation features.
- [An adaptive framework for assessing climate resilience in buildings](#) () provides a practical framework for assessing design resilience. Helps translate design briefs into measurable requirements and budget planning.
- [Toolkit for Resilient Public Procurement Strategies](#)

[to Minimise Risks](#) (OECD/EC). A procurement-toolkit oriented to public-sector/resilient infrastructure, but developers can draw on the check-lists and strategies to embed resilience requirements (flood, heat, fire, materials) into tender documents, partner procurement terms, ground-lease conditions, etc.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- % of new project briefs explicitly referencing climate adaptation
- Share of project budgets allocated to resilience or adaptive design measures
- Availability of design templates incorporating hazard-specific measures

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of development teams trained on integrating resilience into project design
- Frequency of collaboration with adaptation experts (architects, engineers, ecologists) during pre-design phases
- % of projects undergoing climate risk review during concept phase

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Average reduction in operating disruptions due to extreme weather
- Change in asset value or occupancy rates for projects incorporating adaptation measures
- ROI of resilience investments compared to avoided damage and repair costs

KPIs

Long-term actions

Disclose Adaptation Strategies Publicly

Goal: Align with investor, tenant, and regulatory expectations.

Description: Publicly disclose resilience strategies in ESG reports and sustainability frameworks. Highlight adaptation as a driver of value creation, risk reduction, and reputation. Proactive disclosure positions developers ahead of regulatory and market shifts.

Action 1

- [Data, disclosures, and divergence: ESG regulations and compliance in real estate](#) (Deloitte) covers how real-estate players globally face increasing pressure to disclose adaptation/resilience activities and how disclosure frameworks are evolving; valuable guidance for positioning your adaptation strategy publicly.
- [How real estate and construction are improving climate disclosures](#) (EY) emphasises that while many firms focus on carbon mitigation, disclosure of climate-related physical risks (which is your adaptation domain) remains weak, indicating the opportunity for developers to lead.
- Disclosure standards of the EU taxonomy, CSRD, can be

used as examples of “how to disclose”. See for instance this [OID guide](#) (in French)

- [Adaptation: building climate-resilient real estate](#) (Deepki blog overview) focuses on how real-estate companies can integrate adaptation into governance, risk-management and importantly into public disclosures (e.g., via ESG frameworks, taxonomy alignment).

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of a company-wide disclosure policy on climate adaptation
- % of assets covered by disclosed adaptation data
- Membership in recognized reporting frameworks (e.g., TCFD, GRESB, CDP)

LEADING INDICATORS

Looks forward at future outcomes and events

- Frequency of reporting updates (annual, biannual)
- Inclusion of adaptation KPIs and resilience case studies in public reports
- Stakeholder engagement sessions organized around adaptation progress

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Improvement in ESG or GRESB scores related to climate adaptation
- Increase in investor or tenant confidence (measured via survey or retention)
- Reduced exposure to climate-related litigation or compliance risk

KPIs

Showcase Demonstration Projects and Build Toolkits for Replication

Goal: Drive systemic change by scaling resilience pilots into demonstration projects and codifying lessons learned for sector-wide adoption.

Description: Developers should expand successful resilience pilots into **flagship demonstration projects** that illustrate how adaptation can be both profitable and scalable. These projects serve as proof points that influence policy, attract financing, and inspire peers across the sector. Beyond implementation, developers should **codify successful approaches into toolkits or playbooks** that translate project lessons into practical guidance for others. Sharing these toolkits with industry peers, associations, and policymakers accelerates sector-wide learning, reduces uncertainty, and reinforces developers' leadership role as innovation drivers.

- [Sustainable and Affordable Housing](#) (World Green Building Council (WGBC) Report) contains case studies of affordable (including Global South) housing that is sustainable/resilient—developers can draw from these as demonstration projects and source inspiration for toolkits.
- [Can Africa afford green and resilient housing?](#) Edge-cases from across the continent (AUHF paper) Specific to Global South context (Africa), this study provides demonstration-type examples of resilient housing projects and financing models, highly relevant when scaling pilots.

Action 2

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of a documented resilience playbook or case study portfolio shared internally or publicly

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of external presentations, publications, or partnerships to share lessons learned

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Evidence of peer or partner replication of your company's resilience methods

KPIs

Invest in Mixed-Income, Resilient Housing

Goal: Embed adaptation strategies into affordable and rental housing to promote equity, resilience, and inclusive climate action.

Description: Developers should integrate resilience features such as passive cooling, flood-proof design, fire buffers, and water-efficient systems into mixed-income housing projects, ensuring that affordable and rental housing is not left behind in the adaptation transition. This approach addresses equity concerns by protecting vulnerable populations, reduces regulatory and reputational risks, and meets the growing demand from communities, policymakers, and investors for just and inclusive climate action.

Mixed-income, resilient housing also strengthens community resilience by distributing adaptive infrastructure (green roofs, stormwater systems, shared cooling centers) across diverse neighborhoods. By making resilience a core investment priority in affordable housing portfolios, developers contribute to long-term social stability while future-proofing assets in line with both climate and social goals.

- The [Operational Toolkit on the Use of EU Funds for Social and Affordable Housing & Accompanying Services](#) (European Commission) helps developers navigate financing, procurement, partner or government funding “stack”, and also contains case studies. Useful when embedding resilience features into mixed-income projects and aligning with policy and pricing levers.
- [Mixed-Income Housing Development Planning Strategies and Frameworks in the Global South](#) (Onatu et al., 2024) focuses explicitly on mixed-income housing in the Global South; useful for developers investing in inclusive/resilient housing to ensure equity, scale and adaptation features.
- [Improving sustainability of affordable housing using innovative design](#) (Scientific African, 2023) in South Africa deals with how resilient design features (passive cooling, water efficiency) can be integrated into affordable housing in a Global South context.
- [Mixed-Income Housing \(MIH\)](#) : this chapter of Sustainable Cities and Communities lays foundational concepts, typologies and governance issues around mixed-income housing in Global North settings and can inform a developer-toolkit’s governance/supply-side sections.
- [Mixed-Income, Purpose-Built Rental](#) (EY Canada Housing Research) includes policy-lever mapping for mixed-income housing in Canada. Good basis for a developer toolkit section on ‘financial model and resilience premium’ for mixed-income resilient housing.
- [Toolkit for Affordable Housing Policy](#) (European Commission / FUTURIUM) is useful for the policy & project-briefing for governance, procurement frameworks, institutional partnerships, mixed-tenure models. Helps embed resilience by showing how to align with policy and regulation and mixed-income delivery frameworks.

INPUT INDICATORS

Measure the resources required to deliver

- % of portfolio or pipeline projects dedicated to mixed-income or affordable developments integrating resilience

LEADING INDICATORS

Looks forward at future outcomes and events

- Share of resilient housing projects benefiting from blended finance or public-private funding

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in displacement or vulnerability among tenant populations in completed projects

Action 3

Resources

KPIs

FINANCIAL & INSURANCE INSTITUTIONS & DEVELOPMENT BANKS

Who is this
pathway for?

This pathway is designed for public and private financial institutions, commercial and development banks, multilateral lenders, insurers, and reinsurers involved in financing, underwriting, and supporting the buildings and construction sector. It targets professionals working in sustainable finance, risk management, product innovation,

and policy alignment. The pathway provides a structured approach to integrating climate risk and adaptation into lending criteria, investment decisions, and insurance products, ensuring long-term resilience and market stability.

Climate change represents a systemic financial risk. Floods, wildfires, heatwaves, and storms cause mounting asset losses, threaten collateral values, and disrupt business continuity, leading to cascading impacts on lending and insurance portfolios. For insurers and reinsurers, the increasing frequency and intensity of

climate hazards destabilize models built on historical data, making risk pricing unreliable and driving up claims. For financial institutions, property devaluation and stranded assets threaten balance sheets and investor confidence. Adaptation in the building sector therefore becomes a matter of financial stability, not only

environmental stewardship. **Resilient buildings lower exposure to loss, protect returns, and maintain insurability.** Financial and insurance institutions have the leverage to shift markets by aligning investment flows, insurance products, and credit conditions with resilience goals.

By embedding adaptation into project screening, disclosure, and pricing, they can de-risk portfolios, foster innovation, and mobilize capital for climate-ready development, supporting both national commitments and global frameworks like the Chailot Declaration and the Paris Agreement.

Align capital flows to make resilience a driver of value, not just compliance.

Today, adaptation is often treated as a disclosure item, not a performance driver. In the short term, institutions must build internal

climate-risk expertise and adopt adaptation screening tools. Medium term, they should embed resilience into financing, insurance,

and taxonomy frameworks. Long term, they must steer capital systematically toward adaptive assets, making

resilience a prerequisite for value creation and a safeguard of financial stability.

FINANCIAL & INSURANCE INSTITUTIONS & DEVELOPMENT BANKS

Short-Term Actions

Actions	Resources & case studies	KPIs
Finance Early Warning Systems	WHO Framework for addressing the interconnectedness of early warning to action and finance to strengthen multiscale institutional responses to climate shocks and disasters	Number of early warning or climate information systems financed, supported, or insured
Establish Specific Financing and Insurance Schemes	Building Financial Instruments for Climate Adaptation (CPI)	Total value of capital deployed through resilience-oriented instruments
Build Capacity to Assess Adaptation and Resilience in Portfolios	Practical Guidance on Implementing Adaptation and Resilience for Banks (UNEP FI)	% of financed or insured projects screened for physical climate risks

Medium-Term Actions

Actions	Resources & case studies	KPIs
Align All Financing with Climate Mitigation and Adaptation Goals	Guide for Adaptation and Resilience Finance (UNDRR)	% of new loans or investments passing adaptation and mitigation screening
Integrate Risk Assessment and Hazard Exposure Analysis in Insurance Underwriting	Implementation of Climate-related Adaptation Measures in Non-Life Underwriting (EIOPA)	% of clients benefiting from reduced premiums or interest rates after implementing adaptation actions
Design Inclusive Financing and Risk-Sharing Mechanisms to Scale Climate Resilience	Mobilising Adaptation Finance to Build Resilience (Climate Financial Risk Forum)	Volume of blended finance operations for resilient infrastructure and retrofits

Long-Term Actions

Actions	Resources & case studies	KPIs
Adopt Shadow Pricing for Climate Risk	Pricing of Climate Risks in Financial Markets (BIS)	% of investment or lending decisions applying shadow climate risk pricing
Develop Taxonomies for Green and Resilient Investments	Sustainability Risk Tool Dashboard (UNEP FI)	% of new financing tagged or classified under taxonomy categories
Create a Centralized Climate Data and Risk Assessment Platform	Project Viridis (BIS)	Number of internal teams or external partners using the data platform for risk assessment



Short-term actions

Finance Early Warning Systems

Goal: Support the development and maintenance of early warning systems for climate hazards.

Description: Financial institutions and insurers should create dedicated funding mechanisms such as grants, blended finance, or risk-pooling instruments to deploy and sustain early warning systems. By partnering with governments and technology experts, these systems can be scaled effectively, enabling timely responses to extreme weather events. Reliable early warnings improve community preparedness, reduce losses, and foster a proactive culture of risk management across the sector.

- This WHO [Framework for addressing the interconnectedness of early warning to action and finance to strengthen multiscale institutional responses to climate shocks and disasters](#) provides a conceptual framework linking EWS to finance and action. Helps insurers/DFIs understand how to structure funding mechanisms tied to EWS outcomes.
- [The Road to Banking Resiliency and Adaptation: Early Warning Systems and Scenarios Analysis](#) (Moody's): Focuses on the role of banks in resilience and early warning; relevant for insurers and lenders looking to support EWS through financing and risk-pooling instruments.

INPUT INDICATORS

Measure the resources required to deliver

- Budget share or total funding committed to early warning and risk monitoring systems

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of early warning or climate information systems financed, supported, or insured

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in insured or financed losses in areas covered by early warning systems

Action 1

Resources

KPIs

Establish Specific Financing and Insurance Schemes

Goal: Create dedicated financial products and insurance options that incentivize resilient construction and renovations, especially for vulnerable communities and high-risk projects.

Description: Financial institutions, insurers, and development banks should take the first step toward mainstreaming adaptation finance by designing specific schemes that directly reward resilience. These may include resilience bonds that channel capital into adaptation projects, grants or low-interest loans for retrofitting vulnerable buildings, or subsidized insurance products for developments that integrate climate-adaptive features. Thus, financial actors reduce risks for investors and developers, encourage experimentation with resilient materials and designs, and begin shifting market expectations. Governments and regulators can support by offering guarantees or co-financing, while developers and project owners must actively integrate resilience to qualify.

Action 1

- This [Essential Guide to Climate Finance](#) by the Climate Finance Resource Center can serve as a basis to apprehend new financing models.
- [Guide for Adaptation and Resilience Finance](#): United Nations Office for Disaster Risk Reduction (UNDRR) lays out what constitutes adaptation/resilience finance, lists 100+ investable activities, and helps financial institutions design lending/insurance products targeted at adaptation.
- [Building Financial Instruments for Climate Adaptation](#) (CPI) offers key lessons on structuring adaptation-focused instruments (bonds, blended finance) and shows how to create viable schemes that incentivise resilient construction and renovation.
- [Case study](#) by Banque de France of French insurers facing climate change risk and where they stand in implementing new resilience requirements.
- OECD's [Enhancing the insurance sector's contribution to climate adaptation](#) examines the contribution of the insurance sector to climate adaptation and explores new approaches.
- This [Insurance for Climate Adaptation](#) report by the Global Commission on Adaptation makes recommendations to maximize the benefits of insurance for climate adaptation.
- [The adaptation of real estate: what roles can the financial sector play?](#) by the Institute for Climate Economics (I4CE) explores how financial institutions such as banks, insurers, and asset managers can accelerate the adaptation of real estate to climate risks
- The European Central Bank and EIOPA introduced a [two-pillar mechanism](#) aimed at reducing the financial impact of climate-related disasters. The proposal outlines an EU-level reinsurance scheme to cover private losses and a reconstruction fund dedicated to public infrastructure recovery. Both mechanisms are designed to operate under preventive conditions, reinforcing the importance of proactive adaptation and risk reduction measures across Member States.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of new financial or insurance products designed to support adaptation (e.g., resilience bonds, parametric insurance, retrofit loans)
- Existence of frameworks or pilot programs for community-level financing (e.g., cooperative insurance, risk pools)

LEADING INDICATORS

Looks forward at future outcomes and events

- Total value of capital deployed through resilience-oriented instruments
- Number of local partnerships (municipalities, CSOs, SMEs) with active financial or insurance products in place

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Increase in the number of beneficiaries or assets protected by adaptation-related financial products
- Documented improvement in post-event recovery speed or coverage for vulnerable groups

KPIs

Build Capacity to Assess Adaptation and Resilience in Portfolios

Goal: Integrate adaptation considerations into day-to-day financial operations.

Description: Banks, insurers, and development finance institutions should train staff, update tools, and create internal standards for evaluating adaptation measures. This includes the ability to assess resilience investments, track adaptation outcomes, and disclose climate risks.

- [Practical Guidance on Implementing Adaptation and Resilience for Banks](#) (UNEP FI, 2025): a specific roadmap for banks regarding strategy, assessment and action around adaptation/resilience including staff training, updating internal tools and governance.
- [Integrating adaptation and resilience into transition plans](#) (Network for Greening the Financial System, NGFS) highlights how financial institutions can embed adaptation into their transition planning, assess counterparties' resilience, and align portfolios accordingly.
- [Strengthening Financial Systems for Climate Adaptation](#) (CGAP). Although with strong global-south focus (incl. low-income & vulnerable segments), this is valuable for insurers and DFIs who aim to build capacity and upgrade systems for portfolio screening, vulnerability assessment and inclusive risk finance.

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Adoption of mandatory adaptation risk screening procedures in investment policies

LEADING INDICATORS

Looks forward at future outcomes and events

- % of financed or insured projects screened for physical climate risks

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in portfolio exposure to high climate-risk assets

KPIs

Medium-term actions

Align All Financing with Climate Mitigation and Adaptation Goals

Goal: Ensure that all investment and lending decisions support both climate change mitigation and adaptation goals by gradually reducing or stopping financial support for projects in high-risk areas or that do not prioritize resilience measures.

Description: Develop criteria to assess projects based on their alignment with climate goals, particularly in areas prone to flooding, fires, or extreme weather. Institutions must conduct climate screening of all projects for their mitigation and adaptation alignment (Paris Agreement compliant). This includes reducing financing for non-adapted or high-risk projects, particularly in hazard-prone zones (e.g. floodplains, wildfire regions) and prioritizing funding for projects that incorporate adaptive, low-carbon, and sustainable practices. This action creates a clear market signal, shifts capital flows, and de-risks the sector over time.

- [Guide for Adaptation and Resilience Finance](#) (UNDRR, 2024) provides a clear framework of what qualifies as adaptation/resilience finance, a list of 100 investable activities, and screening criteria. Useful for banks and DFIs designing lending portfolios aligned with mitigation and adaptation.
- The Network for Greening the Financial System (NGFS) [Adaptation Task Force](#) provides regulatory & supervisory insight on how adaptation finance should be integrated in financial systems, enabling institutions to align financing with adaptation/mitigation goals and regulatory expectations.

Action 1

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of a formal climate alignment policy (Paris Agreement, Net-Zero, or Adaptation Roadmap)
- % of portfolio screened for physical climate risk and resilience
- % of staff trained on climate risk assessment and adaptation finance

LEADING INDICATORS

Looks forward at future outcomes and events

- % of new loans or investments passing adaptation and mitigation screening
- % of project rejections or reclassifications due to high climate exposure
- Number of financed projects with climate adaptation components (e.g., resilient infrastructure, floodproof assets)

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of total assets aligned with climate mitigation and adaptation targets
- Reduction in portfolio exposure to physical climate risks (e.g., floodplains, wildfire zones)
- Improvement in credit ratings or insurance premiums for adapted assets
- Share of financing directed to certified climate-resilient or sustainable projects

KPIs

Integrate Risk Assessment and Hazard Exposure Analysis in Insurance Underwriting

Goal: Adjust insurance premiums and coverage on detailed assessments of climate risks and resilience measures implemented in properties and projects and reward proactive risk-reduction efforts.

Description: Mandate comprehensive risk assessments for properties seeking insurance, assessing exposure to relevant hazards and adaptation measures in place. Premiums should reflect the level of risk reduction and resilience investments made by property owners, with higher premiums for high-risk properties lacking adaptation features. This approach integrates risk transfer and incentive mechanisms. Ultimately, insurers may withdraw coverage of institutional clients where risks are too high and unmanaged.

- [Assessing Climate Risk for the Insurance Industry](#) (UNFCCC, 2018): While older, it gives core methodologies for hazard exposure and risk assessment for insurers (both in Global North & South). Useful baseline when designing underwriting criteria.
- [Impact Underwriting – Implementation of Climate-related Adaptation Measures in Non-Life Underwriting](#) (European Insurance and Occupational Pensions Authority (EIOPA), 2023): Focuses on how insurers can embed adaptation measures into underwriting (e.g., flood-resistant walls, premium discounts), adjust premiums based on hazard exposure & resilience investment

INPUT INDICATORS

Measure the resources required to deliver

- Integration of risk-based incentives into insurance pricing or lending conditions

LEADING INDICATORS

Looks forward at future outcomes and events

- % of clients benefiting from reduced premiums or interest rates after implementing adaptation actions

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in cumulative insured losses or loan defaults related to climate events

Design Inclusive Financing and Risk-Sharing Mechanisms to Scale Climate Resilience

Goal: Mobilize capital for climate adaptation through financial tools and partnerships that make resilience investments accessible, affordable, and context-appropriate while equitably distributing risk and responsibility.

Description: Create adaptation-focused financing mechanisms and locally tailored risk-sharing models. This involves working in close partnership with governments, municipalities, and civil society to design context-specific financial products such as low-interest loans, tax credits, co-insurance pools, and public-private co-financing schemes, that lower barriers to investment in resilient infrastructure and retrofits. These solutions must reflect regional risk profiles, socio-economic realities, and institutional capacities, and should be developed in tandem with the operationalization of policy reforms. By structuring financing that acknowledges unequal capacities to act (particularly in underserved or high-risk areas) these mechanisms ensure that the costs and responsibilities of adaptation are equitably shared.

Action 2

Resources

KPIs

Action 3

- [Guide for Adaptation and Resilience Finance](#) (UNDRR, 2024) includes enabling mechanisms and criteria for instruments like adaptation loans, blended finance, guarantees.
- [Mobilising Adaptation Finance to Build Resilience](#) (Climate Financial Risk Forum, 2024) is designed by industry players (banks, insurers, development banks) to structure adaptation-finance instruments, focusing on scaling. Helpful when creating partnerships/ government risk-sharing models.
- [Climate adaptation finance: The challenge for investors and banks](#) (World Economic Forum, 2024) focuses on barriers and opportunities for adaptation finance, including global-south contexts (underserved markets, high risk zones). Useful when designing inclusive financing and risk-sharing mechanisms.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of partnerships or co-financing arrangements with public bodies for climate resilience

LEADING INDICATORS

Looks forward at future outcomes and events

- Volume of blended finance operations for resilient infrastructure and retrofits

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Increase in total private sector leverage ratio for adaptation finance

KPIs

Long-term actions

Adopt Shadow Pricing for Climate Risk

Goal: Incorporate the hidden costs of climate risk into financial decision-making.

Description: Financial institutions should integrate shadow pricing into ROI models by factoring in potential damage costs, insurance losses, and asset depreciation linked to climate hazards. By assigning an internal value to these risks, investors and lenders encourage the selection of more resilient projects and disincentivize investments in vulnerable locations. Over time, this practice helps align capital flows with long-term adaptation needs and reduces systemic exposure to climate-related losses.

- [The Shadow Price of Carbon in Economic Analysis](#) (World Bank, 2024). While focussed on carbon, this guidance helps institutions internalize externalities (i.e., the hidden costs of climate risk) into investment appraisals. It gives a template for shadow pricing of risk.
- [Pricing of Climate Risks in Financial Markets: A Summary of the Literature](#) (Bank for International Settlements (BIS) Papers No. 130, 2021) provides evidence that many assets are under-priced for climate risk; useful background when building internal shadow-pricing models.
- [Climate risk mispricing: Why better assessments matter in financing for development](#) (CIDOB Policy Brief, 2025). Focuses explicitly on development finance institutions and the need to integrate climate risk in emerging markets
- [Scenario-analysis example](#) by Bank of England covering asset-level climate risk via scenario modelling.

Action 1

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of internal guidance or model for pricing climate-related losses in investment evaluations

LEADING INDICATORS

Looks forward at future outcomes and events

- % of investment or lending decisions applying shadow carbon and climate risk pricing

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Improved resilience-adjusted ROI across portfolio

KPIs

Develop Taxonomies for Green and Resilient Investments

Goal: Provide clear and consistent criteria for identifying climate-resilient and sustainable projects.

Description: Financial institutions should work with governments, regulators, and international bodies to establish standardized taxonomies that define what qualifies as a green or climate-resilient investment. A transparent framework allows investors, banks, and insurers to prioritize projects that deliver tangible adaptation and mitigation

benefits. This clarity reduces uncertainty across the value chain, improves decision-making, and ensures that capital is consistently directed toward projects that strengthen resilience in the built environment while advancing national and international climate goals.

- The [Sustainability Risk Tool Dashboard](#) (UNEP FI) shows hundreds of tools, metrics and methodologies. Helps in building taxonomy design by mapping what is measurable, what counts as “resilient investment”.
- [Guide on climate-related and environmental risks](#) (ECB, 2020) provides regulatory expectations for institutions to integrate climate risks, foundational for taxonomy creation in the financial sector.
- Led by the Bank for International Settlements (BIS) and the Monetary Authority of Singapore, [Project Viridis](#) demonstrates how financial authorities can build centralized platforms to assess climate-related financial risks using existing data and taxonomies. It offers a useful model for green taxonomy design.
- [Guidance on apply the EU taxonomy](#) (OID)
- This CIDOB [Climate risk mispricing](#) brief discusses how DFIs in emerging markets are beginning to classify and price climate-resilient investments.
- The [Colombian Taxonomy](#) establishes a clear classification system to help public and private stakeholders including investors, financial institutions, issuers, and government bodies identify and assess investments that contribute to the country’s environmental objectives, strengthening transparency, and guiding sustainable finance.

INPUT INDICATORS

Measure the resources required to deliver

- Participation in national or international taxonomy development initiatives (e.g., EU Taxonomy, ASEAN, or ISO frameworks)
- Existence of internal taxonomy or classification system for green and resilient investments
- % of investment staff trained to apply taxonomy criteria

LEADING INDICATORS

Looks forward at future outcomes and events

- % of new financing tagged or classified under taxonomy categories
- Frequency of taxonomy updates to reflect new adaptation technologies or policy frameworks
- Number of clients supported in aligning projects with taxonomy requirements

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of total portfolio aligned with taxonomy-compliant projects
- Increase in total volume of capital directed to taxonomy-compliant adaptation projects
- External validation or certification of taxonomy application (e.g., through independent audits or ESG benchmarks)

Action 2

Resources

KPIs

Create a Centralized Climate Data and Risk Assessment Platform

Goal: Provide consistent, localized, and high-quality climate risk data to guide financing, underwriting, and project planning.

Description: Financial institutions should collaborate with governments, insurers, and research bodies to develop a shared platform that aggregates and updates climate and hazard information at multiple scales. This platform would include localized risk maps, vulnerability data, and resilience strategies, ensuring all actors operate with the same evidence base. Improved access to such data enables more accurate risk assessments, supports investment in safer locations, and informs the design of resilient infrastructure. By reducing uncertainty and harmonizing approaches, a centralized platform strengthens confidence across markets and lowers systemic financial risk.

- The [Climate Data Challenge](#) (UNEP FI, 2024) highlights data gaps facing financial institutions and the need for shared platforms
- [Climate Finance: Data & Data Platforms](#) (BFA Global, 2024) provides guidance on building platforms, data governance, analytics for climate-resilience and finance use cases (including inclusion in emerging markets).
- [Project Viridis](#) (by BIS) offers a blueprint for a centralized risk platform (asset-geolocation, hazard mapping, exposures across institutions).

INPUT INDICATORS

Measure the resources required to deliver

- Establishment of or contribution to shared databases integrating hazard, exposure, and loss data

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of internal teams or external partners using the data platform for risk assessment

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Enhanced accuracy of risk pricing and underwriting models

Action 3

Resources

KPIs

DESIGNERS (ARCHITECTS, ENGINEERS, ETC.)

Who is this
pathway for?

This pathway supports architects, engineers, landscape architects, urban designers, and all technical design professionals working in the planning, conception, and realization of buildings, public spaces, and infrastructure whether in private practice, public agencies, or project teams. It is also intended for professional federations, trade

associations, and networks that represent these designers. These organizations play a key role in diffusing knowledge, standardizing practices, and upskilling professionals across the sector to drive climate-resilient design at scale.

Designers are on the frontlines of creating the built environment. As climate risks become more severe, their responsibility to design for safety, comfort, and resilience is more urgent than ever. Architects must integrate climate foresight into both aesthetics and function, accounting for risks like heatwaves, flooding, or material

degradation. Engineers are similarly tasked with ensuring that buildings, structures, and systems function reliably under changing climate conditions. The pressure is not only technical: clients, insurers, regulators, and investors increasingly demand that design professionals anticipate future risks. This shift brings new

expectations but also new opportunities for innovation. **Designers can reinvent passive techniques, harness nature-based solutions, and shape spaces that anticipate future disruptions.** They also act as mediators between science, regulation, and stakeholders, making their role central to both

awareness and implementation. Adapting building stock and infrastructure to long-term risks while managing costs, complexity, and client expectations requires deep transformation in practice. This pathway helps ensure designers are not only compliant with evolving standards but at the forefront of resilience innovation.

Design against yesterday's climate is no longer fit for tomorrow's reality.

Design professionals are increasingly aware of climate adaptation but often lack tools, incentives, or mandates to act. In the short

term, architects and engineers must integrate basic climate risk assessments and advocate resilient design. In the medium term, they

should co-develop sectoral guidelines, retrofit strategies, and lead public-private collaboration. By 2050, design must be fully aligned with climate-resilient

development, shaping buildings that are durable, regenerative, and climate-proofed.

DESIGNERS (ARCHITECTS, ENGINEERS, ETC.)

Short-Term Actions

Actions	Resources & case studies	KPIs
Develop Comprehensive Resilience Training Modules and Cross-Disciplinary Education	Guidance on disaster management (UIA), risk management and sustainability (FIDIC)	Number of in-house or external training sessions held per year on adaptation topics (e.g., passive design, hazard analysis)
Present the Case for Resilience to Clients in Financial, Social, and Environmental Terms	Climate Resilience in Design (Fosters & Partners)	% of clients who approve or fund climate adaptation measures following the presentation of resilience cases
Create and Share Resilience Case Studies	Guidance on how to write a case study from Monash University	Number of external events, journals, or online platforms featuring the firm's resilience case studies

Medium-Term Actions

Actions	Resources & case studies	KPIs
Embed Resilience in All Design Briefs and Standards	Resilience Design Toolkit (AIA)	% of projects where climate risk assessments were conducted during design phase
Build Capacity through Specialized Resilience and Adaptation Training	AIA Resilience & Adaptation Online Certificate Program	Number of professional certifications or credits (e.g., CPD) earned by staff through adaptation-focused programs
Co-Design and Demonstrate Locally Rooted, Climate-Resilient Solutions	Traditional Architecture: A Natural Disaster Resilient Alternative (Advances in Engineering Management, Innovation, and Sustainability, 2024)	Number of prototypes, pilot projects, or co-developed design tools created through these collaborations

Long-Term Actions

Actions	Resources & case studies	KPIs
Lead the Development of Resilient Design Standards	Delivering Climate-Responsive Building Codes and Standards (ICC)	Number of new resilient design standards or technical guidelines co-developed or endorsed by the organization
Mainstream Adaptation into Architectural and Engineering Education and Certification	Integrating SDGs into architecture education (City and Environment Interactions, 2024)	Number of professional training or certification programs including climate adaptation as a core competency
Showcase Resilient Design as a Cultural and Market Norm	ROI: Codes, Standards, & Reporting on Resilient Design (AIA)	Number of resilient design showcases, exhibitions, or competitions organized annually



Short-term actions

Develop Comprehensive Resilience Training Modules and Cross-Disciplinary Education

Goal: Provide students and professionals with the foundational skills to integrate climate resilience into design practice.

Description: Academic institutions, professional bodies, and trade organizations should collaborate to create specialized training modules and curricula on climate adaptation and resilience. These modules should be tailored both for students in architecture and engineering programs and for practicing professionals, ensuring that knowledge reaches future and current generations alike. Courses should cover

- Many national professional institutions are increasingly providing training modules. They are encouraged to do more and to curate more appropriately for adaptation. ([AIA](#), [Ordre des architectes](#), etc.)
 - International associations of trades can provide resources and certification. The International Union of Architects provides [guidance on disaster management](#) and more generally on [architecture education](#), and
- so does FIDIC on [risk management or sustainability](#), and through its [charter](#). These bodies should work to integrate more adaptation into their certifications.
- [Climate Adaptation for Architects: A Design Toolkit](#) (Routledge, 2025) offers 45 adaptation tactics (heat, water, wind, resource scarcity) with design considerations and can form the backbone of training modules.

INPUT INDICATORS

Measure the resources required to deliver

- % of design staff who have completed formal training or certification in climate adaptation and resilience

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of in-house or external training sessions held per year on adaptation topics (e.g., passive design, hazard analysis)

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Increase in proportion of projects explicitly integrating climate-resilient design strategies

Present the Case for Resilience to Clients in Financial, Social, and Environmental Terms

Goal: Encourage clients to prioritize resilient designs by demonstrating the value of climate adaptation from various perspectives.

Description: At project inception, designers have a critical opportunity to shape decision-making by presenting a compelling, multi-dimensional case for climate resilience. This includes articulating the financial advantages not only in terms of avoided damage and insurance benefits, but also by emphasizing total cost of ownership (TCO) over initial capital costs. Demonstrating how resilient designs lead to lower operating expenses, maintenance costs, and long-term value retention can shift client priorities beyond first-cost thinking. In parallel, designers should highlight the social benefits (e.g., occupant safety, equity, continuity of service) and environmental co-benefits (e.g., nature-based cooling, water management). Referencing well-established models such as BRI, or UNDRR ARISE adds credibility. When framed effectively, resilience is no longer a premium feature but becomes a sound, future-proof investment.

Action 1

Resources

KPIs

Action 2

- IFC's [BRI](#) can provide case studies and showcase how to bring resilience to the attention of clients and investors.
- This [Climate Resilience in Design](#) article by Fosters & Partners shows how leading design firms integrate resilience into projects and communicate value across design & engineering teams and clients. Useful example to mirror in client briefs.
- The [EU Technical Guidance](#) and its accompanying [Best Practice Guidance on Buildings' Adaptability to Climate Change](#) contains case-studies and design solutions; designers can extract data & metrics (e.g., avoided damage, reduced operational cost) to build a business case for resilience to clients.
- A curated [catalogue of nature-based solutions](#) for urban resilience by the World Bank

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of project proposals including a cost-benefit or total cost of ownership (TCO) analysis for resilience measures

LEADING INDICATORS

Looks forward at future outcomes and events

- % of clients who approve or fund climate adaptation measures following the presentation of resilience cases

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Long-term reduction in client-reported climate-related maintenance or repair costs

KPIs

Create and Share Resilience Case Studies

Goal: Provide practical examples to guide design and planning.

Description: Designers should document and disseminate case studies that showcase successful resilience strategies and measurable outcomes. Sharing these examples through professional networks, academic platforms, and industry associations helps inform regulations, planning processes, and best practices, while inspiring stakeholders to adopt innovative solutions to climate adaptation challenges.

Action 3

- Guidance on [how to write a case study](#) from Monash University
- International professional associations like [The International Union of Architects](#) or [FIDIC](#) provide resources and case studies. (More can be done, and better curation and signposting would be helpful). Refer numerous websites.
- [Designing for Climate Adaptation: A Case Study Integrating Nature-Based Solutions with Urban Infrastructure](#) (Urban Science, 2025). A practice-based design methodology showing how urban interventions integrate resilience; good reference for designers documenting case studies.
- [Adaptation of buildings to climate change](#) (Frontiers in Built Environment 2024) presents an overview of research into climate-responsive building adaptation, identifying various factors determining a building's ability to regulate external climatic conditions in providing a habitable indoor environment.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of case studies or technical sheets developed and shared publicly or within professional networks

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of external events, journals, or online platforms featuring the firm's resilience case studies

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Measurable uptake of showcased design principles in new projects (internally or by peers)

KPIs

Medium-term actions

Embed Resilience in All Design Briefs and Standards

Goal: Ensure that building designs are cohesive, climate-resilient, and prepared to withstand both current and future climate risks by integrating adaptation needs early in the design phase.

Description: Establish a collaborative workflow where architects, engineers, and other disciplines incorporate climate resilience measures from the inception of projects. This involves embedding adaptation requirements across all design elements such as materials selection, structural integrity, and energy systems to withstand extreme weather and ensure long-term durability. Integrating climate and resilience considerations early in the design phase allows for harmonization of structural, mechanical, and architectural components, ensuring they are designed to handle both current and projected climate impacts. This approach not only reduces exposure to risks during the construction period but also enhances the building’s ability to endure and function efficiently over its lifespan, even in adverse conditions.

- [Resilience Design Toolkit](#) (American Institute of Architects) is a step-by-step method to integrate resilience into the design process (hazard identification, team alignment, integration of resilience measures, post-occupancy evaluation).
- [Resilient Project Process Guide](#) (AIA): Contains sets of questions per project phase and resilience attributes to embed in design briefs and standards.
- [“Resiliency Roadmap: Design Strategies for Resilient Buildings”](#): article outlining process of starting resilience conversation early and embedding it in design.
- [“Design for Climate, Design for Change”](#) toolkit by Carol Marra giving practitioners actionable steps to strengthen designs (Global North).
- [Comparison of Building Adaptation Projects and Design for Adaptability Strategies](#) (Journal of Architectural Engineering, 2021). This paper show that integrating adaptability in the design makes buildings more resilient
- [Chapter 14](#) of *Rethinking Building Skins* demonstrate that resilience is a design problem

INPUT INDICATORS

Measure the resources required to deliver

- % of design briefs or client contracts containing explicit climate adaptation clauses

LEADING INDICATORS

Looks forward at future outcomes and events

- % of projects where climate risk assessments were conducted during design phase

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in project-level exposure or vulnerability scores post-design phase

Build Capacity through Specialized Resilience and Adaptation Training

Goal: Equip designers with the knowledge and skills to incorporate resilience practices into their projects, keeping pace with evolving climate risks.

Description: This action calls for a broad commitment to capacity building through structured training programs, which go beyond individual initiative. Professional organizations, trade bodies, and academic institutions should actively develop and deliver dedicated curricula, workshops, and certifications focused on climate resilience. These programs should address key topics such as site-specific hazard analysis, resilient structural and passive design strategies, material selection, and nature-based solutions. By institutionalizing this knowledge across the sector, designers will be better prepared to respond to evolving risks and regulatory expectations, while also leading innovation in climate-smart construction.

Action 1

Resources

KPIs

Action 2

- The [Pan African Structural Engineering programme](#) by the Institution of Structural Engineers is designed to share technical knowledge and training with structural engineers across Sub-Saharan Africa.
- AIA [Resilience & Adaptation Online Certificate Program](#). Multi-course series for architects covering hazards, vulnerability, resilience strategies, design application.
- Content from the [Architectural Education Commission](#) of the international union of Architects

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Partnerships formed with universities, training centers, or professional associations for joint programs

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of professional certifications or credits (e.g., CPD) earned by staff through adaptation-focused programs

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Improvement in project resilience ratings (e.g., EDGE, LEED Resilience Pilot, RELi)

KPIs

Co-Design and Demonstrate Locally Rooted, Climate-Resilient Solutions

Goal: Develop and validate climate-resilient methods adapted to local conditions.

Description: Designers should partner with material manufacturers, engineers, and local communities to co-develop climate-resilient design solutions rooted in local context, culture, and climate realities. This includes reviving and adapting vernacular architecture and traditional construction methods such as earth-based materials, passive ventilation techniques, or flood-adaptive housing forms that have long proven effective in responding to local environmental challenges. These collaborative efforts should produce prototypes or pilots tailored to specific risks (e.g., flood-resilient façades, wildfire-resistant materials, or passive cooling systems), combining modern engineering with ancestral knowledge. Pilots must be documented and monitored to generate performance data and practical insights, supporting both local ownership and broader replication. This approach not only enhances technical robustness, but also preserves cultural identity, promotes resource-efficient design, and strengthens the credibility and scalability of adaptation solutions within and beyond the community.

Action 3

- The AIA [Resilience Design Toolkit](#) explicitly includes post-occupancy evaluation and iteration of resilient design strategies.
- [Traditional Architecture: A Natural Disaster Resilient Alternative in Advances](#) in *Engineering Management, Innovation, and Sustainability* (2024) shows how vernacular architecture proves better at resisting local hazards while discussing application of traditional construction.
- [Resilience of vernacular and modernising dwellings in three climatic zones to climate change](#) (Scientific Reports, 2021) discusses thermal comfort with traditional construction methods and materials.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of partnerships or R&D collaborations established with suppliers or developers

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of prototypes, pilot projects, or co-developed design tools created through these collaborations

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Performance improvement of tested solutions (e.g., durability, energy efficiency, reduced damage in stress testing)

KPIs

Long-term actions

Lead the Development of Resilient Design Standards

Goal: Shape the rules and norms that guide adaptation.

Description: Designers, through their professional organizations, should amend and evolve national and international standards for resilient design by incorporating latest research and best practices to ensure consistency, scalability, and credibility of adaptation in the built environment.

- [EU-level Technical Guidance on Adapting Buildings to Climate Change](#) (and its accompanying [Best Practice Guide](#)) gathers methods, specifications, case-studies and best practices for climate-resilient buildings, and how adaptation can be embedded in design and procurement. Provides a rich reference of normative and practical material designers can draw on when working with their professional bodies to evolve standards and guidelines.
- [Delivering Climate-Responsive Building Codes and Standards](#) (ICC) serves as an advocacy tool: showing legislators/regulators how design standards can evolve and be operationalised, giving designers leverage when collaborating with standards committees.
- FIDIC's [Infrastructure Adaptation for Emerging Economies](#) provides context and collective tools to develop standards and best practice.

INPUT INDICATORS

Measure the resources required to deliver

- Existence of an internal task force or working group on climate-resilient design standards
- % of staff or professional members engaged in drafting or reviewing national/international standards

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of new resilient design standards or technical guidelines co-developed or endorsed by the organization
- Frequency of updates to design specifications incorporating resilience principles

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Share of projects applying or complying with the new resilience standards
- Reduction in post-construction climate-related damages across compliant projects

Action 1

Resources

KPIs

Mainstream Adaptation into Architectural and Engineering Education and Certification

Goal: Ensure future generations of designers are resilience-ready.

Description: Schools of architecture and engineering should embed resilience and climate adaptation into curricula, supported by professional accreditation bodies. This ensures that resilience is not a niche skill but a universal requirement for practice

Action 2

- [Integrating SDGs into architecture education](#) (City and Environment Interactions, 2024) investigates how architectural curricula currently integrate climate and sustainability issues.
- [Sustainability in Architectural Education Global Best Practices](#). Summary of how leading institutions are adapting their programs.
- Global Examples of Best Practices: UCL's Bartlett School of Architecture offers a range of sustainability-focused courses such as "[Environmental Design and Engineering](#)" and "[Sustainable Urbanism.](#)" Students engage in real-world case studies and simulation

tools to assess energy use and material performance; Delft University of Technology's "[Architecture and the Built Environment](#)" faculty is renowned for research in circular design and building technology. Their curriculum combines digital tools with sustainable materials, systems thinking, and urban climate design ; National University of Singapore (NUS) offers a [Master in Integrated Sustainable Design](#), focused on tropical and urban sustainability challenges. Emphasis is placed on net-zero energy buildings and resilient urban systems, critical for fast-growing Asian cities.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of dedicated modules or courses on climate resilience and adaptation in design curricula
- % of faculty trained in climate-responsive design and adaptation

LEADING INDICATORS

Looks forward at future outcomes and events

- % of students completing resilience-focused coursework or projects before graduation
- Number of professional training or certification programs including climate adaptation as a core competency

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of new licensed professionals demonstrating competence in climate-responsive design
- Increase in demand for resilience training and certification among practitioners

KPIs

Showcase Resilient Design as a Cultural and Market Norm

Goal: Position resilience as central to the professions' identity and market value.

Description: Designers should lead public campaigns, exhibitions, and professional showcases demonstrating resilient projects. By making adaptation visible and aspirational, the sector can influence public perception, client demand, and ultimately the culture of construction.

- [ROI: Codes, Standards, & Reporting on Resilient Design](#). AIA resource emphasising that designing beyond codes yields resilience benefits and value to clients.
- [Resilience in the Built Environment: Key characteristics for solutions](#) (Sustainable Cities and Society 2022) identifies what resilient design looks like and how to evaluate it.
- [Moving toward resilience and sustainability in the built environment](#) (Structural Safety, 2025). A conceptual discussion on how design and operation must shift to resilience-first.

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of partnerships with cultural institutions, media, or industry associations to promote resilience
- Budget or resources allocated for resilience communication or showcase initiatives

LEADING INDICATORS

Looks forward at future outcomes and events

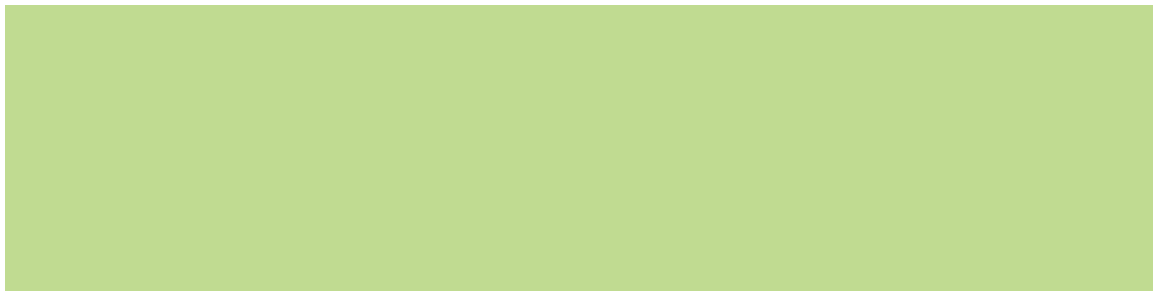
- Number of resilient design showcases, exhibitions, or competitions organized annually
- Number of awards or recognitions given to projects demonstrating outstanding adaptation strategies

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Change in client demand for resilient or adaptive design elements
- Increased inclusion of resilience language in tenders, RFPs, and client briefs

KPIs



MATERIALS & SYSTEMS MANUFACTURERS AND SUPPLIERS

Who is this pathway for?

This pathway targets companies that manufacture, supply and install construction materials, building systems, equipment, and technical components, including producers of insulation, windows, HVAC systems, structural materials, finishes, and tools. It also applies to distributors, construction product certification bodies, and associated

professional federations and trade groups. These actors provide the backbone of the construction sector's supply chain and have a central role in ensuring the resilience and sustainability of buildings through the materials and systems they design, produce, certify, and promote.

Material and system manufacturers face a critical juncture: their products must meet increasing demand for climate-resilient solutions while complying with new performance standards and decarbonization goals. Climate change affects raw material availability, logistics, durability requirements, and product performance in situ. As extreme events become more frequent and chronic risks like heat and humidity increase, **the demand grows for materials and systems that can reduce vulnerabilities and extend building lifespans.** Yet, these stakeholders also face regulatory, market, and environmental pressure to simultaneously reduce embodied emissions, ensure circularity, and deliver affordable solutions. Innovation in materials, whether in biobased options, modular systems, or multifunctional components, is key to reconciling adaptation and mitigation. Trade federations and industry groups play a major role in disseminating R&D, updating norms, and supporting standardization efforts. The stakes are high: manufacturers must shift from reactive compliance to proactive solution development, integrating long-term climate performance into R&D, testing, and design.

Adaptation must shape both innovation and market expectations across supply chains.

Many material and system providers are making strides in eco-design and emissions reduction, but adaptation remains a less integrated priority. In the short term, resilience performance needs to be embedded into product development and certification. In the medium term, business models must evolve to reflect lifecycle resilience and service-based offerings. By 2050, manufacturers and suppliers should become enablers of systemic adaptation through resilient, low-impact, and circular solutions deployed at scale.

MATERIALS & SYSTEMS

MANUFACTURERS AND SUPPLIERS

Short-Term Actions

Actions	Resources & case studies	KPIs
Develop and Disseminate Material Passports and Climate Performance Guidance	Climate-Resilient Materials for the Built Environment: A Data-Centred Primer by 2050 Materials	Number of updated or new resilience standards and technical guidance documents published annually
Create an Inventory of Validated, Low-Risk Building Materials	Assessing the sustainability of a resilient built environment (Journal of Cleaner Production 2024)	Number of cross-sector collaborations or partnerships (e.g., with research bodies or associations) for data harmonization
Invest in Education and Professional Training on Resilient Materials	Study on the Durability of Construction Materials and Structures (MDPI Special Issue).	Number of professionals trained or certified on resilient material use and installation

Medium-Term Actions

Actions	Resources & case studies	KPIs
Promote Systemic Integration of Technical Solutions	Planning and Designing Methods for Supporting the Built Environment Resilience by Accurately Accounting for Supply Chains (MULTICLIMACT D2.2)	% of product lines supported by open technical specifications and training modules for builders and designers
Enhance Regulations to Address Life and Property Safety	Next Generation Building Materials for Energy Efficiency and Climate-Resilience (Discover Applied Sciences, 2025)	Number of technical submissions or data sets provided to support new resilience standards
Invest in and Promote Innovation for Climate-Resilient Materials and Systems	Emerging Trends in Sustainable Building Materials: Technological Advances (Renewable and Sustainable Energy Reviews 2023)	Number of co-developed prototypes or pilot materials tested for resilience performance

Long-Term Actions

Actions	Resources & case studies	KPIs
Develop and Validate Standards for Raw Secondary Materials	(Re-)Use of Secondary Materials by the GlobalABC	Number of new certified raw or secondary materials introduced to the market
Collaborate Globally and Continuously Adapt Standards and Methods	BAMB (Buildings as Material Banks) open publications on Materials Passports and Reversible Building Design	Frequency of internal product review cycles considering updated climate data and hazard models
Invent New Incentives and Business Models for Circular Resilient Materials	OECD Business Models for the Circular Economy report	% of client contracts including circular material service models



Short-term actions

Develop and Disseminate Material Passports and Climate Performance Guidance

Goal: Enable informed decision-making by providing transparent information on product resilience, limitations, and appropriate applications.

Description: Materials and systems manufacturers should take the lead in creating and publishing material passports: standardized, digital documents that compile key data on product composition, resilience, recyclability, environmental impact, and performance under climate stressors (e.g., heat, flooding, wildfire, high winds, moisture, fungal and biological attack). These passports should clearly indicate limitations, optimal use cases, and performance ratings under specific hazard conditions, enabling designers, contractors, developers, and regulators to make better-informed decisions. Offering reliable data and transparent benchmarks builds trust with the market, supports regulators in establishing enforceable standards, and reduces uncertainty for insurers and investors. Providing this clarity ensures that products are not only technically available but also properly understood and widely adopted, positioning manufacturers as essential partners in advancing climate-resilient construction.

- [Climate-Resilient Materials for the Built Environment: A Data-Centred Primer](#) by 2050 Materials helps manufacturers understand how to set meaningful KPIs and publish transparent performance metrics (durability, hazard tolerance, life-cycle).
- BAMB (Buildings as Materials Banks)'s [best practice guide to Materials Passports](#) provides a guide for actors along the construction value chain and shows the benefits of materials passports and how these can be implemented into general building practice
- [Emerging Trends in Sustainable Building Materials: Technological Advances](#) () provides methodological guidance for manufacturers to evaluate new materials. Includes durability, resilience under climate stressors (heat, moisture, etc). Useful for drafting internal testing/standards documentation.
- [Novel Approaches for Building Materials Reliability and Durability from Intense Loading to Long-Term Behaviour](#) is an active topic research in Frontiers in Built Environment. It will offer advanced methodologies for assessing materials under extreme conditions.

INPUT INDICATORS

Measure the resources required to deliver

- % of product lines with published technical sheets detailing resilience properties (e.g., fire resistance, heat resistance, moisture durability, insect and fungal attack, recyclability)

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of updated or new resilience standards and technical guidance documents published annually

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % increase in product adoption due to improved performance clarity or compliance with resilience standards

Create an Inventory of Validated, Low-Risk Building Materials

Goal: Help builders and designers quickly identify the right products for specific climate hazards.

Description: Each manufacturer should create and share a clear, practical checklist or catalog of their own validated, low-risk materials and systems. These documents should outline which products to use in which scenarios (e.g., flood-resistant coatings, heat-tolerant roofing, wind-resistant façades), including product performance, limitations, and recommended applications. By organizing information in a hazard-targeted format, builders and designers can quickly sort and select the most suitable materials, reducing uncertainty and saving time during planning.

Action 1

Resources

KPIs

Action 2

- [Assessing the sustainability of a resilient built environment](#) (Journal of Cleaner Production 2024). This research review covers methodologies for linking hazard-induced damage and environmental loss. Useful when manufacturers validate and present their materials' low-risk status.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of datasets shared or contributed to public or sectoral resilience databases

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of cross-sector collaborations or partnerships (e.g., with research bodies or associations) for data harmonization

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Extent to which shared data is cited or integrated into national or international resilience frameworks

KPIs

Invest in Education and Professional Training on Resilient Materials

Goal: Empower industry professionals to integrate resilient materials effectively into construction projects.

Description: Materials and systems manufacturers should develop and promote training programs, hands-on workshops, and certification courses that focus on material selection, sustainable practices, and resilience strategies. These initiatives should target builders, contractors, designers, and other professionals across the value chain to ensure correct use, avoid misuse, and maximize the performance of resilient materials. Over time, this strengthens the capacity of the sector to mainstream resilient materials and ensures that innovations are not only developed but also successfully adopted at scale.

Action 3

- [Study on the Durability of Construction Materials and Structures](#) (MDPI Special Issue). Offers academic research on durability of materials; manufacturers can use such studies to underpin training content, validate claims, and educate users.
- [Next Generation Building Materials for Energy Efficiency & Climate Responsiveness](#) (Discover Applied Science 2025). Although energy-focused too, shows emerging materials and how they need evaluation and training for correct deployment.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Amount invested annually in professional training, workshops, or e-learning for builders, engineers, and distributors

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of professionals trained or certified on resilient material use and installation

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in misuse or installation errors of materials reported in quality audits or warranties

KPIs

Medium-term actions

Promote Systemic Integration of Technical Solutions

Goal: Ensure that manufacturers work collaboratively to create a seamless supply chain of resilient materials and systems, facilitating easy access for builders and designers.

Description: Engage in partnerships with other manufacturers to integrate compatible products and materials, streamline training programs, and enhance resource availability. This systemic approach ensures that builders can easily find and implement resilient solutions without encountering barriers due to a lack of coordination among suppliers.

- [Planning and Designing Methods for Supporting the Built Environment Resilience by Accurately Accounting for Supply Chains](#) (MULTICLIMACT D2.2) provides a conceptual framework for analysing supply-chain resilience in the built environment (including material/systems suppliers). Manufacturers can use this method to collaborate across suppliers, map interdependencies, assess supply-chain risks and design coordinated solutions (compatible products, joint training, streamlined supply).
- [Strategies for Enhancing Global Supply Chain Resilience to Climate Change](#) (International Journal of Management & Entrepreneurship Research, 2024). While not specific to building materials, it offers strategies for manufacturers in supply-chains (e.g., localisation, redundancy, flexible sourcing) which are directly applicable for integrating resilient materials systems across the value chain.
- [Climate-Change and Adaptation in Global Supply-Chain Networks](#) (The Review of Financial Studies 2024). Article documenting how climate exposure affects suppliers and their customers. Demonstrates importance of systemic integration: if material systems are disconnected (supplier risk, incompatible products, etc), it undermines resilience. Good for making the business case internally.

INPUT INDICATORS

Measure the resources required to deliver

- Existence of joint-development or interoperability agreements with other manufacturers
- R&D budget share dedicated to co-designed or cross-compatible systems

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of joint pilot projects or demonstrations showing multi-manufacturer resilience solutions
- % of product lines supported by open technical specifications and training modules for builders / designers

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Adoption rate of integrated solutions by builders and designers (% of sales linked to collaborative products)
- Reduction in installation errors or compatibility-related failures in projects using integrated systems

Enhance Regulations to Address Life and Property Safety

Goal: Advocate for regulatory frameworks that prioritize both life safety and property safety in building codes and resilience measures.

Description: Collaborate with policymakers to ensure that regulations encompass provisions for rapid recovery from disasters, including standards that support building resilience while ensuring occupant safety. This may involve integrating requirements for emergency access, structural integrity, and material performance under extreme conditions.

Action 1

Resources

KPIs

Action 2

- [Strong Building Codes for a Safer, More Resilient Future](#), World Bank review of building codes for resilience & disaster risk. Useful for manufacturers advocating with policymakers to ensure material/systems performance standards (durability, hazard tolerance) are embedded in regulations, linking to life & property safety.
- [Next Generation Building Materials for Energy Efficiency and Climate-Resilience](#) (Discover Applied Sciences, 2025) emphasises integration into codes. Shows how innovative materials need regulatory recognition (codes, performance standards) before uptake; manufacturers can use this when promoting regulation changes.
- [Managing Supply Chain Resilience in Climate and](#)

- [Disaster-Prone Environments](#) (Competitiveness Review, 2025). Though focussed on supply chains, this touches on regulation, safety, disaster-risk alignment which is relevant for materials/systems manufacturers pushing for regulatory change.
- UNDP examples of [locally led solutions in the Global South](#): shows emerging market and regulatory contexts where locally adapted material and systems and regulatory frameworks are critical. Manufacturers operating in or supplying to the Global South should reference this when advocating standard and regulation updates.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of regulatory working groups or code-development committees with manufacturer representation
- % of testing budget allocated to extreme-event performance (fire, flood, heat, wind)

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of technical submissions or data sets provided to support new resilience standards
- Existence of internal compliance roadmap aligned with updated codes and safety regulations

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of product portfolio certified under new resilience or safety standards
- Reduction in claims or failures linked to product malfunction during extreme events

KPIs

Invest in and Promote Innovation for Climate-Resilient Materials and Systems

Goal: Advance the development, validation, and market uptake of innovative materials and building systems that enhance resilience to climate impacts while meeting performance, affordability, and sustainability criteria.

Description: Invest in R&D focused on materials and systems that can withstand heatwaves, flooding, drought, and other climate-related stressors. This includes developing, testing, and validating products using clear, transparent performance standards and protocols for resilience. Beyond innovation, manufacturers must also work to ensure the commercial viability and uptake of these solutions by actively engaging with designers, builders, and developers through product demonstrations, pilot projects, and tailored guidance. This action requires aligning innovation with scalability, quality assurance, and targeted market outreach, so that new resilient solutions don't just exist but are chosen, trusted, and implemented.

- [Smart Materials for Biomimetic Building Envelopes: Current Trends and Potential Applications](#) (Results in Engineering, 2024) provides an advanced R&D perspective on resilient building-envelope materials (important for manufacturers designing next-gen systems).
- [Emerging Trends in Sustainable Building Materials: Technological Advances](#) (Renewable and Sustainable Energy Reviews 2023) shows how sustainable and resilient materials are evolving; manufacturers should align their innovation roadmaps accordingly.

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- % of annual R&D budget allocated to climate adaptation and resilience

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of co-developed prototypes or pilot materials tested for resilience performance

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Number of successful commercialization cases of tested resilient materials

KPIs

Long-term actions

Develop and Validate Standards for Raw Secondary Materials

Goal: Establish clear and rigorous standards for the use of secondary materials in construction, ensuring they meet safety, durability, and performance requirements.

Description: Materials and systems manufacturers should actively lead the development of rigorous standards for secondary raw materials, ensuring that recycled products meet requirements for safety, durability, and climate resilience. This involves testing, piloting, and publishing transparent performance data to prove efficiency and market readiness. Once validated, manufacturers should collaborate with regulators, certification bodies, and procurement authorities to integrate these standards into building codes, regulations, and large-scale procurement frameworks. Taking responsibility for both technical validation and regulatory mainstreaming accelerates adoption, reduces uncertainty for builders and designers, and levels the playing field for resilient, circular solutions. This dual approach ensures that innovative materials move from niche applications to systemic use, helping close resource loops while strengthening climate adaptation in the built environment.

- The EU's [Safe and Sustainable by Design chemicals and materials Methodological Guidance](#) provides some insight of secondary materials performance
- [\(Re-\)Use of Secondary Materials](#) by the GlobalABC offers context in the use of secondary raw materials.
- [Barriers, success factors, and perspectives for the reuse of construction products in Norway](#) (Journal of Cleaner Production 2022). To increase technical knowledge exchange on the use of secondary materials, governments can support training, education and research on the practices and skills needed to conduct selective deconstruction. These studies give data to advocate with governments
- [Circular economy in construction](#) (Heliyon, 2024) uses a comprehensive literature review to define the core components of a circular economy applicable to the building sector and to identify key research gaps and barriers that must be addressed to advance CE implementation in construction.
- [EN 12620: Aggregates for concrete](#) (incl. recycled aggregates) formal European spec covering aggregates from natural, manufactured and recycled sources; reference point for validating recycled inputs into concrete mixes
- The [Use of recycled aggregates in concrete](#) JRC Report (EU) showcases practical barriers and measures to scale recycled aggregates (technical, regulatory, economic) and market uptake guidance; good template for internal validation roadmap.
- Standards such as [Cradle to Cradle Certified Product Standard](#) are credible, multi-attribute certifications (material health, circularity, social, water) often used in public procurement that support secondary-material claims.

INPUT INDICATORS

Measure the resources required to deliver

- Existence of internal R&D program or partnerships dedicated to validating secondary material performance

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of new certified raw or secondary materials introduced to the market

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of total production incorporating certified secondary or recycled materials

Action 1

Resources

KPIs

Collaborate Globally and Continuously Adapt Standards and Methods

Goal: Ensure resilient materials and construction methods remain effective as climate conditions evolve.

Description: Manufacturers should participate in international knowledge platforms, consortia, and cross-sectoral partnerships to share best practices, align product standards, and contribute to global R&D. At the same time, they must commit to regularly assessing and updating construction methods and material performance, ensuring that resilience strategies remain reliable over time. This includes monitoring aging infrastructure, revising standards in light of new climate data, and adapting product lines to emerging hazards.

- [Level\(s\)](#) (EU framework of core sustainability indicators) includes circularity/adaptability indicators and user manuals. useful to align product data (EPDs, durability, adaptability) with a framework used by cities and clients.
- [BAMB](#) (Buildings as Material Banks) open publications on Materials Passports and Reversible Building Design offer a strong, practical basis for collaboration between manufacturers and designers on reuse-ready systems.

INPUT INDICATORS

Measure the resources required to deliver

- Membership in international or cross-sectoral resilience platforms (ISO committees, CEN, IEA task groups etc.)
- Annual budget share for climate-stress testing and long-term performance research

LEADING INDICATORS

Looks forward at future outcomes and events

- Frequency of internal product review cycles considering updated climate data and hazard models
- Number of knowledge-exchange events or collaborations with foreign research institutes per year

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of product standards revised or enhanced within the past five years to reflect new climate conditions
- Documented improvement in product durability and performance under emerging climate stresses (e.g., salt, heat, humidity)

Action 2

Resources

KPIs

Invent New Incentives and Business Models for Circular Resilient Materials

Goal: Transform how materials are produced, used, and valued by pioneering circular and adaptive business models.

Description: Materials and systems manufacturers should go beyond traditional recycling incentives and take the lead in inventing innovative models that fundamentally change how resources are managed. This could include experimenting with material leasing systems (where companies rent materials to builders and reclaim them at end-of-life), developing deposit-return schemes for construction components, or creating shared platforms that pool resilient products for multiple projects. Designing new incentives that reward reuse and penalize waste can shift market expectations and inspire systemic change. These approaches not only reduce landfill and resource extraction but also open up new revenue streams, strengthen client relationships, and ensure that resilient materials remain in circulation. Everything is yet to be invented, and manufacturers are uniquely positioned to set the pace by creating the frameworks, tools, and incentives that will define tomorrow's circular and climate-ready construction sector.

Action 3

- Though focused on reducing GHG emissions, this [Circular Buildings Toolkit](#) by Arup and the Ellen MacArthur Foundation is a free, practical toolkit with strategies and actions (including product-as-a-service and take-back) that can serve as a good blueprint for go-to-market playbooks.
- [Calculation and evaluation of circularity indicators for the built environment using the case studies of UMAR and Madaster](#) (Journal of Cleaner Production 2020) shows how to quantify circularity with a passported case study. Useful for KPI setting in your business model pilots.
- This OECD [Business Models for the Circular Economy report](#) presents a typology of five circular business models that could support the transition to a more resource efficient and circular economy.
- The Circular Building Coalition proposes a [business case](#) for reused building materials.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of innovative business models piloted (e.g., leasing systems, take-back schemes, product-as-a-service)

LEADING INDICATORS

Looks forward at future outcomes and events

- % of client contracts including circular material service models

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in total waste generated per unit of output and increase in material recovery rate

KPIs



CONTRACTORS, BUILDERS & HOMEBUILDERS

Who is this pathway for?

This pathway targets general contractors, builders, construction firms, and homebuilders, as well as on-site managers, supervisors, and trade professionals directly responsible for construction execution. It also includes professional federations, trade unions, and vocational training organizations that represent or

train the construction workforce. These actors transform design into reality, making them critical in ensuring that adaptation measures are effectively and safely implemented at scale across the built environment.

Contractors and builders are at the frontline of climate adaptation. They experience first-hand how heatwaves, flooding, and material degradation affect construction timelines, worker safety, and building quality. As climate risks intensify, traditional practices and schedules are becoming unsustainable.

Construction workers themselves are increasingly exposed to extreme heat, storms, and unsafe conditions, making adaptation not only an environmental priority but also an occupational safety issue. For builders, **adaptation starts with understanding local hazards** (soil instability, flood zones, fire-

prone areas) and adjusting methods and materials accordingly. Yet many small and medium firms lack access to reliable risk data, guidance, or training. Moreover, compliance with evolving resilience codes and standards adds complexity to an already pressured market. This pathway provides direction

on how contractors can build internal knowledge, integrate resilience measures into site management, and coordinate effectively with suppliers and designers to ensure that adaptation translates from plans into durable, safe, and affordable construction practices.

Adaptation starts on-site where resilience meets reality.

Builders are aware of climate-related challenges but often lack the technical tools and training to adapt their practices. In the

short term, they must strengthen knowledge on local risks and protect their workers on-site. In the medium term, adaptation must

become embedded in procurement, subcontracting, and construction processes. By 2050, builders should be delivering

resilient buildings as standard, with climate-adapted methods forming the norm across the construction industry.

CONTRACTORS, BUILDERS & HOMEBUILDERS

Short-Term Actions

Actions	Resources & case studies	KPIs
Strengthen Site-Level Preparedness and Worker Safety Through Training	US OSHA's Heat Illness Prevention Program	Number of worksite safety protocols adapted to climate stressors (e.g., heatwave response plans, hydration and shade provisions)
Stay Updated on Evolving Codes and Standards	ICC Digital Codes Premium	Number of compliance checks or internal audits conducted per year
Coordinate with Subcontractors and Suppliers	A Practical Guide to Climate-Resilient Buildings & Communities (UNEP)	Number of joint training or coordination sessions with supply chain partners per quarter

Medium-Term Actions

Actions	Resources & case studies	KPIs
Build with Integrity and Resilience Using Climate-Adapted Materials and Practices	Whole Building Design Guide on Resilient Design	Number of projects applying site-specific design features (e.g., floodproof foundations, ventilated façades)
Learn and Map Local Climate Risks & Offer Tailored Adaptation Checklists	World Bank Climate Change Knowledge Portal	Existence of adaptation checklists integrated into procurement and construction workflows
Communicate That Adaptation is Practical, Local, and Affordable	UNDRR Resilient Cities Handbook	% of client proposals or bids that include adaptation or resilience options

Long-Term Actions

Actions	Resources & case studies	KPIs
Leverage Local Expertise and Knowledge in Construction Practices	ICOMOS Climate Change and Heritage Working Group	% of project workforce comprised of local skilled workers
Improve the Range of Tested Materials and Share Case Studies	ASTM International Climate Standards	Number of case studies published internally or shared with industry peers
Institutionalize Adaptation in Professional Training and Certification	Many Green Buildings Organizations offer training programs (US , Indonesia , etc.)	Number of apprenticeships or training programs integrating adaptation modules



Short-term actions

Strengthen Site-Level Preparedness and Worker Safety Through Training

Goal: Protect workers and ensure construction sites are resilient to climate-related disruptions.

Description: Contractors and builders must first safeguard their own workforce by adapting work practices to climate hazards. This includes creating emergency plans for heatwaves, storms, and floods, revising schedules to avoid peak heat hours, providing hydration and shade, and ensuring site-level safety protocols protect both workers and occupants. Worker safety is the foundation of resilience, as extreme conditions increasingly threaten health.

At the same time, builders and site managers should undergo basic training on region-specific climate risks, tailored to local geographies and building types. Sectoral training programs and local governments can provide hazard-specific modules (e.g., safe practices for construction in high rainfall vs. arid zones), while chambers of commerce and professional associations can distribute toolkits and briefings.

- U.S. Occupational Safety and Health Administration (OSHA)'s [Heat Illness Prevention Program](#) offers a comprehensive framework with specific protocols for construction sites including work-rest schedules, hydration requirements, acclimatization plans, and emergency response procedures. Adaptable to local conditions with specific temperature thresholds and shade requirements.
- OSHA offers other [Heat Illness Prevention for Outdoor Work resources](#) (posters, toolkits). Concrete employer-site guidance on heat waves, hydration, shade, schedule adjustment (english and other languages)
- International Labour Organization (ILO)'s [Ensuring safety and health at work in a changing climate report](#) offers a global overview of how climate change impacts worker safety (heat, storms, poor air quality) and provides guidance relevant for contractors adapting site-practices.
- This short [article](#) from Dutum Construction highlights how construction firms are modifying schedules, site-practices, hydration protocols and training to account for climate risks.
- Best Practice Guidance: United Nations Environment Programme (UNEP) [A Practical Guide to Climate-Resilient Buildings & Communities](#). While broad, it includes content on construction site practices in developing contexts, good for Global South adaptation
- Lloyd's Register Foundation's [impact of climate change on safety at work](#) paper provides insight for construction, manufacturing, agricultural workers safety in the face of climate change

INPUT INDICATORS

Measure the resources required to deliver

- % of employees and subcontractors trained in local climate risk awareness and emergency procedures
- Annual budget allocated to climate safety measures (as % of safety budget)

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of worksite safety protocols adapted to climate stressors (e.g., heatwave response plans, hydration and shade provisions)
- Number of near-miss incidents related to climate hazards recorded and addressed

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in weather-related worksite incidents or absenteeism rates
- % of work sites with climate-specific emergency equipment (cooling stations, shade structures, hydration points)

Stay Updated on Evolving Codes and Standards

Goal: Ensure builders comply with climate-related regulations and adapt quickly to rising minimum standards.

Description: Contractors and homebuilders must actively track and integrate updates to building codes, zoning rules, and climate-related standards into their daily practices. Regulators should issue clear and proactive guidance, while industry associations can help by disseminating changes in simplified formats such as toolkits, briefings, or checklists. Staying aware of evolving requirements reduces compliance risks, improves quality of builds, and ensures resilience is consistently embedded in construction projects.

- ICC [Digital Codes Premium](#) is a subscription service providing real-time updates to International Building Codes with searchable database, comparison tools, and jurisdiction-specific amendments
- ASHRAE [Climate Design Data Portal](#) provides updated climate data for HVAC and building design
- This two-part resource offers (1) detailed [EU-level technical guidance](#) on integrating climate adaptation into building codes and standards, and (2) a [practical guide](#) showcasing best practices across Europe. It supports contractors and planners, especially those operating under or influenced by EU standards, in strengthening building resilience.

INPUT INDICATORS

Measure the resources required to deliver

- Frequency of regulatory updates reviewed and disseminated internally
- Time lag between code publication and internal policy updates (days/weeks)

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of compliance checks or internal audits conducted per year
- % of technical staff certified or tested on current climate-related codes

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of projects completed in full compliance with updated adaptation or resilience codes
- Number of non-compliance incidents or code violations per 100 projects
- Cost of rework due to non-compliance with updated standards

Action 2

Resources

KPIs

Coordinate with Subcontractors and Suppliers

Goal: Ensure climate-resilient materials and practices are correctly selected and applied across construction projects.

Description: Builders should work closely with designers, manufacturers, subcontractors, and procurement managers to align expectations and practices around the use of resilient materials and practices. Manufacturers can provide evidence of performance and clear guidance on where and how their products should be used (e.g., floodproof foundations, fire-resistant façades), while procurement teams source verified, low-risk materials. Coordinating across the supply chain ensures correct application, reduces misuse, and accelerates the adoption of resilience practices on-site.

- Building Transparency [EC3 Tool](#): Free database of Environmental Product Declarations (EPDs) allowing contractors to compare embodied carbon and climate performance of materials
- ASCE [Infrastructure Resilience Division](#): Framework for evaluating supplier capabilities in climate-resilient construction
- Researchers at CPWR and Washington State University Vancouver developed the *Safety Climate Assessment Tool* (S-CAT, now integrated into [SC-MIS](#)) used in construction to assess maturity of safety culture (which can be extended to resilience practices). While not purely for climate-resilience, it helps measure how well you coordinate across trades and with subcontractors. Can help ensure resilient materials and practices are correctly applied.
- [A Practical Guide to Climate-Resilient Buildings & Communities](#) (UNEP) includes sections on building materials, contractors and supply coordination. Useful for contractors when coordinating with designers, manufacturers and suppliers in deploying resilient systems.

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- % of subcontractors and suppliers required to meet adaptation or sustainability criteria
- Existence of standardized supplier/subcontractor climate criteria checklist

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of supplier partnerships formalized for resilient and low-risk materials
- % of project materials sourced from pre-qualified resilient suppliers
- Number of joint training or coordination sessions with supply chain partners per quarter

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in material failure or warranty claims linked to environmental exposure
- Material performance ratings in post-occupancy evaluations

KPIs

Medium-term actions

Build with Integrity and Resilience Using Climate-Adapted Materials and Practices

Goal: Ensure that buildings are not only physically resilient to climate stressors (e.g., heat, flooding, wind, drought), but also built with integrity, care, and compliance using quality materials, respecting design intent, and upholding professional standards.

Description: This action calls for a dual commitment:

Technical resilience by applying validated, climate-adapted solutions such as elevated foundations, passive cooling systems, water-sensitive site design, and fire-resistant façades tailored to local hazard profiles and site-specific conditions.

- Professional integrity by adhering to a “code of conduct” that includes:
- Respecting design intent and approved plans (especially adaptation features)
- Complying with local codes, standards, and adaptation guidelines
- Using certified (good quality) materials suitable for future climate conditions
- Avoiding shortcuts that undermine long-term building performance
- Investing in ongoing training to ensure the workforce has the skills needed to execute resilient construction properly.

- [EDGE](#) provides a dedicated emerging markets certification system with climate resilience focus.
- The Whole Building Design Guide on [Resilient Design](#) is a comprehensive resource from the National Institute of Building Sciences.
- UNEP’s [Practical Guide to Climate-resilient Buildings & Communities](#) specifically addresses how to use appropriate materials and design practices in different climate contexts (hot/arid, humid/coastal) including many self-built or resource-constrained buildings. Highly relevant for site-level integrity and resilience.
- The [EU’s technical guidance on adapting buildings to climate change](#) is accompanied by a [best practice guide](#). Together, they provide actionable methods for integrating adaptation into materials use, structural resilience, and building design.

Action 1

Resources

INPUT INDICATORS

Measure the resources required to deliver

- % of materials sourced from validated or certified resilience-tested suppliers

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of projects applying site-specific design features (e.g., floodproof foundations, ventilated façades)

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Measured performance improvement in buildings (e.g., thermal comfort, flood resistance, durability)

KPIs

Learn and Map Local Climate Risks & Offer Tailored Adaptation Checklists

Goal: Make adaptation site-specific by understanding the local hazards and integrating solutions accordingly.

Description: Builders should become literate in region-specific risks (e.g., wildfire-prone zones, unstable soils, flood basins) and collaborate with engineers and designers to co-produce risk-informed project plans. Checklists can help guide small- and medium-sized contractors on what to integrate at different project phases

- World Bank [Climate Change Knowledge Portal](#) provides global climate data and projections by location
- UNEP [Practical Guide to Climate Resilient Buildings](#) also includes checklists for new building projects in vulnerable settings.
- [Building Climate Resilience in Southeast Asia: Handbook](#) (BSR) contains tools, questionnaires and climate-risk mapping for Southeast Asia but with methodology transferable elsewhere.
- [How feasible is climate-resilient building design within the Global South?](#) (Energy and Buildings, 2025). This paper analysing design for adaptation in five Latin American cities highlights local hazard profiling, material and constructability constraints. Valuable for contractors mapping local risk.

INPUT INDICATORS

Measure the resources required to deliver

- % of staff trained on region-specific climate risks
- Availability of standardized site-risk assessment tools and templates
- Number of partnerships with local authorities or experts to access updated hazard maps

LEADING INDICATORS

Looks forward at future outcomes and events

- % of new projects with completed local climate risk mapping prior to design approval
- Existence of adaptation checklists integrated into procurement and construction workflows

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in construction defects or maintenance costs linked to climate-related issues
- Client satisfaction or perceived value related to climate-adaptive features

Action 2

Resources

KPIs

Communicate That Adaptation is Practical, Local, and Affordable

Goal: Encourage buy-in from clients and the public by reframing adaptation as an enabler of comfort, cost-efficiency, and quality of life.

Description: Many clients are more motivated by comfort, energy savings, or value appreciation than climate risk itself. Builders should emphasize co-benefits, such as thermal comfort or reduced water bills, and present “climate-smart” solutions as value-adding and accessible rather than burdensome

- UNDRR [Making Cities Resilient 2030](#) campaign offers a communication toolkit with tested messaging frameworks
- UNDRR [Resilient Cities Handbook](#): Practical guidance for urban resilience initiatives
- UNEP [Practical Guide](#) (again useful) emphasises co-benefits (comfort, water efficiency, durability) making adaptation accessible.
- Though broad, [Global Sustainable Buildings Guide 2024](#) (Baker MacKenzie) includes market incentives across jurisdictions (comfort, value, regulation) that can help contractors articulate the business case of resilience to clients.
- [Climate Resilient Construction and Building Materials](#) (Cambridge Scholars Publishing, 2025) provides material-specific evidence on resilience under climate stressors. Helpful for contractors to show clients that adaptation is not high-cost luxury but a reliable investment.

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of communication materials linking adaptation measures to comfort, cost savings, or asset value
- Number of staff trained in communicating co-benefits of resilient construction
- Number of communication tools/materials developed (brochures, videos, calculators)

LEADING INDICATORS

Looks forward at future outcomes and events

- % of client proposals or bids that include adaptation or resilience options
- Frequency of client engagement sessions or workshops on local climate-smart solutions
- Client awareness and understanding scores (pre and post engagement surveys)
- conversion rate: clients offered resilience options to clients selecting resilience options

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Share of clients choosing resilient design options when offered
- Market share growth or customer retention linked to adaptation-focused offerings
- Average project value uplift or increase when resilience features are added
- Number of client referrals specifically mentioning resilience expertise

KPIs

Long-term actions

Leverage Local Expertise and Knowledge in Construction Practices

Goal: Integrate local insights to enhance the cultural, technical, and environmental relevance of resilience strategies.

Description: Builders and contractors should actively engage local tradespeople and builders in the design and construction process, drawing on their practical expertise with regional conditions, traditional methods, and climate-appropriate materials. Over the long term, this collaboration can create a two-way knowledge exchange where modern resilient techniques are combined with time-tested local practices, resulting in solutions that are both innovative and rooted in community realities. By formalizing the role of local expertise in construction projects through advisory groups, participatory workshops, or co-developed design approaches, builders can ensure adaptation strategies are locally feasible, culturally relevant, and widely accepted.

- UNESCO World Heritage Centre's [Climate Change](#) provides documentation of traditional climate-adapted building practices
- ICOMOS [Climate Change and Heritage Working Group](#) outputs specific guidance for adaptation and methodologies for documenting traditional techniques
- UNDP [case studies](#) of locally led adaptation solutions.
- [Local solutions for green buildings and construction](#) (GlobalABC) focuses on the value of local trades, materials and context-specific building solutions. Good for contractors to engage local expertise in resilient building practices.
- [Traditional Architecture: A Natural Disaster Resilient Alternative](#) (Advances in Engineering Management, Innovation, and Sustainability, 2021) highlights what can be learnt from traditional construction and details the applicability of traditional construction methods.
- [Resilience of vernacular and modernising dwellings in three climatic zones to climate change](#) (Scientific Reports, 2021) investigates the impact of climate change on indoor thermal comfort in rural dwellings, adopting vernacular and modern materials.

Action 1

Resources

INPUT INDICATORS

Measure the resources required to deliver

- % of projects developed with participation from local builders or regional craftspeople
- Number of documented traditional/local techniques in project specifications

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of community or regional partnerships established to co-develop adaptive building solutions
- % of project workforce comprised of local skilled workers
- Knowledge exchange events organized with local building communities

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Improvement in project performance or cost efficiency due to locally informed practices
- Comparative cost analysis: projects with vs. without local expertise integration
- Community acceptance ratings for completed projects

KPIs

Improve the Range of Tested Materials and Share Case Studies

Goal: Accelerate validation and mainstream use of climate-resilient construction methods.

Description: Builders should take an active role in piloting innovative or underused materials and systems that show promise for adaptation, such as flood-resilient façades, passive cooling features, or modular retrofits. By testing these solutions directly on projects and documenting outcomes in case studies, builders can generate much-needed performance data and reduce uncertainty in the market. Publishing these case studies through professional associations, training programs, or industry networks helps normalize resilient practices, gives peers confidence to adopt them, and creates pressure for regulators to include them in official codes and standards.

- ASTM [International Climate Standards](#) for evaluating material climate performance.
- [How to build climate resilience into the construction industry](#) is a broad overview of resilience in construction globally, including the imperative of pooling case-studies and material and technology innovation from the World Economic Forum.

Action 2

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of pilot projects initiated to test adaptive materials or systems

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of case studies published internally or shared with industry peers
- Time from pilot initiation to mainstream adoption decision

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of validated techniques scaled or adopted in mainstream construction processes
- Peer adoption rate: number of competitors/peers adopting tested solutions

KPIs

Institutionalize Adaptation in Professional Training and Certification

Goal: Mainstream climate resilience across the construction workforce through mandatory education and licensing requirements.

Description: Over the long term, climate literacy and passive design principles should be fully integrated into all professional training pathways, from apprenticeships to advanced certifications. This includes embedding hazard-specific construction methods, resilient material use, and site safety under extreme conditions into continuing education programs, licensing exams, and mandatory recertification.

- Many Green Buildings Organisations offer training programs ([US](#), [Indonesia](#), etc.) to draw from, and expand to focus on adaptation needs for contractors and builders.
- [Resilience in the built environment: Key characteristics for solutions](#) (Sustainable Cities and Society, 2022) analyses resilience characteristics in built environment. Helps define competencies for training and certification of builders and contractors.

INPUT INDICATORS

Measure the resources required to deliver

- % of workforce enrolled in resilience-related certification or continuing education programs

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of apprenticeships or training programs integrating adaptation modules

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Increase in projects recognized or awarded for resilience excellence

Action 3

Resources

KPIs



BUILDING OWNERS AND MANAGERS, HOMEOWNERS & OCCUPANTS

Who is this
pathway for?

This pathway addresses individual homeowners, tenants, occupants, as well as private and institutional building owners, housing cooperatives, and property and facility managers. It also includes building syndicates, building associations, and co-ownership representatives. These actors are responsible for the day-to-day use, upkeep,

and value of residential and tertiary buildings. The pathway is also relevant for professional federations and trade groups representing owner and user interests in housing and building management.

As climate risks escalate, occupants, homeowners, and building owners face increasing exposure to hazards like heatwaves, flooding, and soil movement, particularly in the residential sector. These risks directly affect the safety, comfort, financial stability, and long-term habitability of their homes and buildings. Adapted buildings

can mitigate these threats by ensuring better thermal performance, protecting against acute weather events, and supporting healthier living conditions. Moreover, adaptation enhances property value, reduces maintenance and insurance costs, and boosts energy efficiency.

Facility managers, responsible for building operations, must ensure comfort and continuity of service while complying with evolving standards and regulations. Yet, these actors often lack access to climate risk data, clear guidance, and affordable retrofit solutions.

Decision-making can be hindered by split incentives between owners and occupants, low awareness, or financial constraints. They need accessible, trustworthy sources of advice, incentives for resilience upgrades, and a voice in policymaking to build lasting, people-centered resilience.

Everyone has the right to live in a safe and climate-resilient building.

Today, most building users and owners are under-informed and under-equipped to deal with climate risks. In the short term, they must be better supported

in identifying vulnerabilities and accessing retrofit solutions. By 2030, widespread climate literacy, clear regulatory signals, and support

systems must be in place. In the long term, resilient, affordable housing and facilities must become standard, empowering occupants and

owners to be active agents of adaptation and stewards of a safer built environment.

BUILDING OWNERS AND MANAGERS, HOMEOWNERS & OCCUPANTS

Short-Term Actions

Actions	Resources & case studies	KPIs
Develop a Thorough Understanding of Building Operations and Needs	ASHRAE Technical Resources for Facility Managers	% of critical systems (HVAC, insulation, drainage) with condition assessments completed
Rely on Technical Guidance and Trusted Contractors	EU technical guidance on adapting buildings to climate change and its best practice guide	Number of supplier or contractor audits focused on resilience performance
Build Trust and Establish Communication Channels with Occupants	Enhancing the Tenant Experience Through Effective Communication (Forbes, 2024)	Frequency of meetings, workshops, or bulletins with tenants on building safety and resilience

Medium-Term Actions

Actions	Resources & case studies	KPIs
Conduct a Quick Climate Risk Assessment	Guide to Climate Risk Assessment (EU Adaptation Mission Board)	% of identified priority actions with financing or design plans underway
Install Basic Resilience Upgrades	Guide to action for climate change adaptation by OID	Number of completed resilience retrofits (e.g., shading, insulation, water retention)
Invest and Update Emergency Plans to Actively Engage Occupants in Resilience	Emergency Planning Handbook by the Australian National Emergency Management Agency	% of occupants participating in emergency drills or awareness activities annually

Long-Term Actions

Actions	Resources & case studies	KPIs
Integrate Adaptation into Property Value and Real Estate Transactions	Munich RE brief on Real Estate and Resilience	Price premium or faster sale/rental rate for resilient buildings
Scale Community-Based Resilience Programs	UNDP's Community-Based Resilience-Building Guidance	Number of shared resources or programs implemented (e.g., backup power, cooling centers)
Advocate for Resilience Standards in Rental and Condominium Regulations	Moody's Mainstreaming Resilience in Real Estate	Existence of resilience-related clauses in lease, HOA, or co-ownership agreements



Short-term actions

Develop a Thorough Understanding of Building Operations and Needs

Goal: Establish a solid foundation for resilience planning by knowing the building inside out.

Description: Before assessing climate risks or planning upgrades, owners and facility managers must ensure they have comprehensive knowledge of their buildings. This means understanding the technical characteristics of the property (e.g., structure, HVAC systems, insulation, drainage), how the building is operated on a daily basis, and what the specific needs and vulnerabilities of occupants are. Skilled and attentive building managers play a key role in this process, as their knowledge forms the baseline for all subsequent adaptation actions.

- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) [Technical Resources for Facility Managers](#). Provides technical references and best-practice guidelines for building systems operations, which owners/managers need as they document and understand their building operations.
- [Chapter 10 - The New Resilient Built Environment: Perspectives From Investors and Owners of Private Buildings](#) of [Optimizing Community Infrastructure](#) offers insight into how building owners see their asset operations and vulnerabilities; useful context for owners/managers to frame their operational baseline.
- CIBSE [TM61 to 64](#) (Chartered Institution of Building Services Engineers) Practical technical manuals for building managers on energy performance, ventilation, and operational risk. TM63 (“Operational performance”) helps managers establish a baseline understanding of building systems.
- [IFMA](#) (International Facility Management Association) has many playbooks

INPUT INDICATORS

Measure the resources required to deliver

- Existence of a complete building dossier (plans, systems inventory, maintenance records, occupancy data)

LEADING INDICATORS

Looks forward at future outcomes and events

- % of critical systems (HVAC, insulation, drainage) with condition assessments completed

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Number of corrective or preventive actions completed following the assessment

Rely on Technical Guidance and Trusted Contractors

Goal: Ensure resilience measures are implemented by credible professionals with the right expertise.

Description: Owners and facility managers should seek out and work with qualified contractors trained in climate adaptation, ensuring that all resilience upgrades and retrofits are carried out with high technical quality. Certification bodies can support this by developing labels or accreditation schemes for climate-resilient construction professionals, helping owners identify trustworthy service providers. By selecting and overseeing certified contractors, building managers increase confidence that resilience investments are durable, effective, and aligned with best practices.

Action 1

Resources

KPIs

Action 2

- The EU's [technical guidance on adapting buildings to climate change](#) is accompanied by a [best practice guide](#) which includes advice for owners, operators and users when selecting and working with contractors.
- US DOE [Building Energy Asset Score Tool](#) helps building owners and managers benchmark their building envelope, HVAC, and energy systems to understand vulnerabilities and identify retrofit priorities.
- Accredited professionals ([RICS](#), [LEED](#), [BREAM](#), [Passive House](#), etc.) can assist owners and managers in resilience audits and adaptation-aligned retrofits. The guidance

listed here helps identify qualified contractors and verify quality of work. [LEED Resilience Pilot Credits](#) for instance offer credit templates requiring documentation from qualified professionals. Useful for owners verifying that contractors understand adaptation best practices.

- [Enhancing the Tenant Experience Through Effective Communication](#) (Forbes, 2024), while not strictly about contractors, emphasizes quality of service via credible professionals, translatable to selecting certified/resilient contractors.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- % of renovation or maintenance contracts awarded to certified climate-resilient professionals

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of supplier or contractor audits focused on resilience performance

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduction in repair frequency or maintenance costs related to climate impacts

KPIs

Build Trust and Establish Communication Channels with Occupants

Goal: Ensure resilience measures are accepted, supported, and effectively implemented by all building users.

Description: Building owners and managers should create transparent and consistent communication channels with tenants and occupants, such as newsletters, resident meetings, or digital platforms. By sharing timely information on resilience efforts, emergency protocols, and building

upgrades, managers can foster trust and encourage active participation. Involving residents early and regularly ensures that adaptation measures are understood, supported, and tailored to the needs of those who live or work in the building.

Action 3

- [Using proactive communication to prevent issues and resolve disputes](#) in tenancies by the Government of Queensland demonstrates communication protocols between managers and owners and occupants. Good model for resilience-upgrade communication.
- [Enhancing the Tenant Experience Through Effective Communication](#) (Forbes, 2024) emphasizes quality of service via credible professionals, and offers valuable insights.
- [Mastering Tenant Communication: Tips for Building and Strata Managers](#). Practical communication strategy for engaging occupants; directly supports building trust and participation in adaptation measures.

- [Narratives of a Fractured Trust in the Swedish Model: Tenants' Emotions of Renovation](#) (Culture Unbound, 2019). Dominika V. Polanska and Åse Richard develop the concept of "fractured trust" to conceptualize the emotional reaction of tenants.
- [Communicating seismic building risk with commercial building tenants](#) (Bulletin of the New Zealand Society for Earthquake Engineering, 2025). This research paper by Miranda, C., Eade, C., Brown, C., Becker, J., & Doyle, E. illustrates demands put on building owners and developers to address seismic risk are shaping the performance of our building stock.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of a tenant communication plan or platform addressing climate resilience topics

LEADING INDICATORS

Looks forward at future outcomes and events

- Frequency of meetings, workshops, or bulletins with tenants on building safety and resilience

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of occupants reporting satisfaction with communication and resilience measures

KPIs

Medium-term actions

Conduct a Quick Climate Risk Assessment

Goal: Identify the specific climate hazards that threaten the property (e.g., heat, flood, wind) to inform all other adaptation actions.

Description: This is the entry point for informed decision-making. By using free online tools or checklists, owners and managers can understand exposure to risks such as flash flooding, heatwaves, wildfires, or windstorms, and prioritize actions accordingly. It builds awareness and allows for cost-effective, hazard-specific upgrades

- [Guide to Climate Risk Assessment](#) (EU Adaptation Mission Board) provides a step-by-step methodology (including templates) for assessing exposure, vulnerability, and risk of climate hazards, which building owners can adapt for individual properties.
- DNV [B-READY](#) (Building Resilience Assessment Tool) translates climate-related risks into building-specific resilience strategies covering more than 140 aspects of building resilience (site design, shell & structure, systems, operations). Owners and managers can use this to rapidly scan how a given building is exposed to climate hazards (flood, wind, heat) and get recommended resilience measures.
- OID's [Bat-ADAPT](#) climate risk assessment tool (R4RE) enables owners to assess resilience of a building/asset and produce a resilience score and suggest the more suitable adaptive actions

INPUT INDICATORS

Measure the resources required to deliver

- Completion of climate vulnerability assessment (including flood, heat, drought, wind)

LEADING INDICATORS

Looks forward at future outcomes and events

- % of identified priority actions with financing or design plans underway

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % reduction in asset vulnerability or expected losses under future climate scenarios

Install Basic Resilience Upgrades

Goal: Improve the building's physical resilience through affordable retrofits.

Description: Simple solutions such as storm shutters, reflective paint, or rainwater tanks significantly reduce vulnerability. These upgrades can often be installed without major renovations and offer immediate benefits in comfort, energy efficiency, and risk mitigation.

- [Guide to action for climate change adaptation](#) by OID is a decision-making tool that helps implement an adaptation strategy by offering a variety of solutions and the essential information needed to implement them.
- A [guide to retrofitting](#) by the University of the Built Environment
- The [EU's technical guidance on adapting buildings to climate change](#) is accompanied by a [best practice guide](#). Together, they provide actionable and practical solutions and case studies owners can replicate in projects. It is important to note that this document aims to provide a general overview of climate adaptation measures, for a wide variety of building types. Gives the general ins and outs of adaptation.
- [Retrofitting for Flood Resilience](#) (RIBA Publishing, 2019) offers detailed strategies for building-level resilience upgrades like elevated foundations, flood-resistant features. Owners and managers can use this as a reference when planning basic upgrades.

Action 1

Resources

KPIs

Action 2

Resources

INPUT INDICATORS

Measure the resources required to deliver

- % of capital budget allocated to adaptation-related retrofits

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of completed resilience retrofits (e.g., shading, insulation, water retention)

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Improvement in operational metrics (energy efficiency, comfort, avoided downtime)

KPIs

Invest and Update Emergency Plans to Actively Engage Occupants in Resilience

Goal: Strengthen preparedness and safety in the face of climate-related disruptions by regularly updating emergency plans with active occupant engagement.

Description: Effective climate adaptation requires both clear protocols and collective participation. Building owners and facility managers should regularly review and update and invest in emergency plans to address risks such as power outages, floods, and extreme heat by ensuring up-to-date contact lists, evacuation procedures, and resource supplies are in place. Just as crucial is engaging the people who live or work in these buildings. Tenants and occupants should be

made active participants in resilience efforts through signage, simple guides, meetings, or drills. This inclusive approach ensures that everyone, especially vulnerable populations like the elderly, children, or those with limited mobility, is informed, prepared, and able to respond appropriately. By embedding resilience into both operations and daily routines, buildings become not only technically equipped but socially ready for climate shocks.

- Though targeting community leaders and officials, this [Climate Adaptation Planning Guidance for Emergency Managers](#) from FEMA (US) can serve to inspire facility managers and building owners draw emergency plans
- [Emergency Planning Handbook](#) by the Australian National Emergency Management Agency provides principles for good practice in emergency planning and draws on and complements current practices. The handbook introduces the strategic context and importance of

emergency planning, the emergency planning process, the potential elements of an emergency plan, the actions needed to implement the plan and to monitoring and evaluation. The handbook is for use by: private sector businesses, critical infrastructure owners and operators, community group

- From OID's [Guide to action for climate change adaptation](#), chapter on [setting up emergency systems](#).

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Presence of a designated emergency coordinator or resilience officer within the management team
- Frequency of reviews and updates of the building's emergency plan (e.g., annually or after major events)
- Availability of basic emergency supplies and systems (first aid kits, backup power, cooling or refuge areas)
- Budget allocation for resilience training and occupant engagement

LEADING INDICATORS

Looks forward at future outcomes and events

- % of occupants participating in emergency drills or awareness activities annually
- % of staff and residents trained in basic emergency procedures
- Number of communication channels (signage, digital alerts, printed guides) used to reach occupants
- Regular testing of alert and evacuation systems (yes/no; frequency per year)

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Time required to mobilize emergency response teams during drills or real events
- % reduction in reported incidents or damages during extreme weather compared to baseline
- Occupant satisfaction and perceived sense of safety (survey-based)
- Documented lessons learned and corrective actions implemented post-event

KPIs

Long-term actions

Integrate Adaptation into Property Value and Real Estate Transactions

Goal: Incentivize resilience by embedding it into how properties are valued, marketed, and transferred.

Description: Owners and managers should advocate for and adopt practices that recognize resilience upgrades in appraisals, property listings, and sales contracts. This includes highlighting floodproofing, passive cooling, or other adaptive features in real estate documentation and ensuring appraisers and brokers factor these into valuations. By making resilience visible in the real estate market, buyers and renters can make informed decisions, while owners are rewarded for proactive adaptation efforts.

- RICS' [ESG Data List for Real Estate Valuations](#) sets out indicators for valuers to include ESG factors in valuation reports. Owners and managers can use this to highlight adaptation-features (resilience upgrades) in property documentation and marketing.
- This Munich RE brief on [Real Estate and Resilience](#) explains how resilience measures (e.g., less hazard exposure) contribute to asset value and lower insurance and financing risk. Useful when owners document value-added adaptation for transactions.
- Forbes [Why Resilience, Not Perfection, Builds Real Estate Value](#) piece discusses how adaptation and resilience are progressively factored into value rather than being a niche premium in this article

INPUT INDICATORS

Measure the resources required to deliver

- Existence of documentation highlighting resilience features in valuation reports or property listings

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of real estate agents or valuers engaged to include resilience in assessments

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Price premium or faster sale/rental rate for resilient buildings

Action 1

Resources

KPIs

Scale Community-Based Resilience Programs

Goal: Strengthen resilience by linking individual buildings to neighborhood-level initiatives.

Description: Building owners, facility managers, and homeowners should progressively connect their properties to local resilience programs, such as shared backup energy systems, neighborhood emergency plans, and community cooling or refuge centers. By pooling resources and coordinating with neighbors, municipalities, and utilities, communities can spread costs, improve preparedness, and ensure that no household faces climate hazards in isolation. Collective approaches reduce vulnerability, build social cohesion, and create cost savings by sharing infrastructure and knowledge.

- UNDP's [Community-Based Resilience-Building Guidance](#) provides a method for designing and implementing community-based resilience programmes. Useful for owners/managers connecting building-level adaptation to neighbourhood initiatives.
- R4C's [Building Urban Resilience With Communities](#) is a guide that offers guidance on selecting neighbourhoods, coordinating community resilience efforts
- Resilient Cities Catalyst's [Resilient Neighborhoods Program](#) demonstrates how building-level owners and managers engage with broader resilience hubs and community-scale coordination
- ANRU (France) ["Quartiers Résilients"](#) initiative: A large-scale urban renewal programme linking building- and neighbourhood-level resilience in France. Owners and managers can mirror similar clustering of upgrades and shared services.

Action 2

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Membership or participation in local resilience or emergency preparedness networks

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of shared resources or programs implemented (e.g., backup power, cooling centers)

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Reduced disruption time during local climate events compared to non-participating properties

KPIs

Advocate for Resilience Standards in Rental and Condominium Regulations

Goal: Institutionalize adaptation by embedding resilience criteria into property governance and tenant agreements.

Description: Building owners and managers should actively support policy advocacy and association-level reforms to include resilience measures in rental contracts, co-ownership rules, and homeowner association bylaws. This can cover requirements for energy efficiency, floodproofing, passive cooling, or emergency planning as part of shared responsibilities between landlords, tenants, and co-owners. Adaptation must become part of routine building management rather than an optional or one-off effort.

- RICS' ESG Data List for Real Estate Valuations can be used to negotiate with regulators and associations.
- Moody's Mainstreaming Resilience in Real Estate explores how resilience is becoming embedded in real estate markets, which supports advocacy efforts for regulation and standard

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of landlord or co-ownership associations joined or engaged in advocating for resilience standards

LEADING INDICATORS

Looks forward at future outcomes and events

- Existence of resilience-related clauses in lease, HOA, or co-ownership agreements

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- % of buildings under management with resilience standards embedded in governance documents

KPIs

CIVIL SOCIETY ORGANISATIONS

Who is this pathway for?

This pathway is intended for civil society organizations (CSOs), including NGOs, advocacy groups, professional associations, foundations, grassroots movements, academic and research institutions, consumer groups, and social justice networks engaged in the built environment. It also includes citizen-led initiatives, coalitions

focused on climate justice or housing rights, and any organized community actors aiming to influence, monitor, or support building-sector adaptation policies, projects, and public-private decision-making.

Civil society organizations play a critical watchdog, advocacy, and bridge-building role in the adaptation of the buildings and construction sector. Climate risks like rising temperatures, flooding, air pollution, and infrastructure failures disproportionately affect vulnerable populations. Yet many are excluded from

policy and design processes. CSOs act to ensure these groups are not left behind. They monitor government and private sector actions, raise public awareness, promote transparency, and advocate for inclusive and equitable adaptation solutions. In a sector often driven by technical or investment logic,

CSOs bring a focus on rights, justice, participation, and the lived experience of climate impacts. They are also powerful mobilizers of collective action, community resilience, and local knowledge. However, their influence is sometimes constrained by limited access to decision-making

spaces, restricted funding, and lack of alignment with sector stakeholders. Ensuring that adaptation efforts are not only technically sound but socially just depends on stronger partnerships with CSOs, who must be empowered to co-design, scrutinize, and scale just climate responses in the built environment.

Justice and resilience must go hand in hand in the built environment.

Today, CSOs are often siloed from adaptation decision-making, despite being closest to the communities most affected. In the short term, they

must be structurally included in planning and oversight. By 2030, they should be recognized as co-creators of climate-resilient policies,

empowered through stable funding, access to data, and institutional partnerships. In the long term, CSOs must be embedded

in governance frameworks and social contracts that ensure accountability, justice, and participation in climate adaptation.

CIVIL SOCIETY ORGANISATIONS

Short-Term Actions

Actions	Resources & case studies	KPIs
Promote Locally Informed Understanding of Climate Hazards	Community-Based Adaptation Toolkit (IISD)	% of documented local practices integrated into awareness or advocacy materials
Identify and Mobilize Trusted Community Champions and Watchdogs	Integrating climate action into CSO programming: How-to guide (ACFID)	% of champions receiving training on climate risks and local adaptation
Curate and Share Targeted Adaptation Knowledge	Help Them Help Themselves: A Toolkit to Facilitate Transformative Community-Based Climate Change Adaptation (IOER)	Evidence of uptake or replication of shared practices by other CSOs or local authorities

Medium-Term Actions

Actions	Resources & case studies	KPIs
Monitor Failures and Hold Actors Accountable	Climate Accountability Toolkit by the Clean Air Partnership	Tangible policy changes or inclusion of CSO recommendations in local/national plans
Commit to Watchdog Roles and Build Grassroots Networks	Green Accountability Platform	Instances where watchdog actions resulted in corrective or policy improvements
Raise Community Awareness and Translate Climate Risk into Local Action	MIP4Adapt Citizen Engagement Manual	Number of citizens trained, services offered, or partnerships facilitated

Long-Term Actions

Actions	Resources & case studies	KPIs
Scale Community-Based Resilience Programs	US HUD Community Resilience Toolkit	Number of neighborhoods or settlements adopting standardized community adaptation plans
Embed Climate Justice and Advocacy into Social and Housing Policy	Build Change Housing Justice and Disaster Resilience	Number of advocacy campaigns addressing justice and equity in adaptation
Create a Culture of Climate Engagement and Share Replicable Toolkits	Habitat International Coalition	Evidence of replication or scale-up of CSO-led models by other organizations



Short-term actions

Promote Locally Informed Understanding of Climate Hazards

Goal: Ground resilience strategies in both scientific projections and local knowledge.

Description: CSOs should encourage a future-oriented yet locally grounded understanding of climate risks. This means combining forward-looking climate projections with historical weather patterns, while also capturing, documenting, and integrating local knowledge, best practices, and traditional building solutions. By highlighting how risks are evolving and how communities have adapted in the past, CSOs can provide valuable insights that inform both local resilience

strategies and innovation by other stakeholders, such as material manufacturers and urban planners. Collaboration with climate scientists, risk experts, local communities, and academic researchers will enrich this process and ensure that adaptation measures are scientifically sound and culturally relevant and accessible for non-specialist audiences.

- [Community-Based Adaptation Toolkit](#) (IISD): a practical toolkit for CSOs to combine community-knowledge, hazard assessment and adaptation planning. Helps ground scientific projections with local and traditional knowledge.
- A UNDP [Guidance Note on Community-Based Resilience-Building](#) spans disaster risk management, climate adaptation, health risk management, conflict prevention, peace building, and ecosystem management.
- This PlanAdapt [Adapting to Climate Change](#) article focuses on how CSOs can work with scientists, governments and local communities to produce contextually-relevant hazard knowledge and integrate local perspectives in adaptation planning.
- [Methodologies and Tools to Evaluate Climate Change Impacts and Adaptation](#) (UNFCCC): a compendium listing frameworks and tools for climate impact and adaptation analysis.

INPUT INDICATORS

Measure the resources required to deliver

- Number of studies or workshops organized to document local risks and traditional practices

LEADING INDICATORS

Looks forward at future outcomes and events

- % of documented local practices integrated into awareness or advocacy materials

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Evidence that locally informed insights influenced planning, design, or materials use

Action 1

Resources

KPIs

Identify and Mobilize Trusted Community Champions and Watchdogs

Goal: Build resilience leadership by relying on established, respected figures within communities.

Description: CSOs should focus on identifying existing community leaders and groups such as teachers, tenant associations, neighborhood committees, or renters' groups who already hold the trust and confidence of local residents. These individuals and organizations can act as champions to lead resilience initiatives and as watchdogs to monitor accountability and adaptation commitments. This dual

role strengthens both leadership and transparency at the community level. CSOs should provide training, resources, and networking opportunities to empower these actors and connect them across regions through national platforms. This approach ensures continuity, avoids creating artificial leadership structures, and embeds resilience work into the social fabric of communities.

Action 2

- [Integrating climate action into CSO programming : How-to guide](#). Australian Council for International Development (ACFID) guides CSOs on building internal capacity, partnerships, and identifying champions within communities to lead adaptation.
- [Climate Security Case Study: Climate Security Observatory](#) from Alliance Biodiversity & CIAT provides examples of CSOs collaborating with community actors and governments to embed local leadership and watchdog functions in adaptation strategies.
- [Civil society organizations' institutional climate capacity for community-based conservation projects: Characteristics, factors, and issues](#) (Current Research in Environmental Sustainability, 2023) details what enables CSOs themselves to act effectively. Useful when training and mobilizing local champions and watchdogs.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of active local “champions” or watchdogs identified and supported

LEADING INDICATORS

Looks forward at future outcomes and events

- % of champions receiving training on climate risks and local adaptation

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Number of community initiatives led or co-led by identified champions

KPIs

Curate and Share Targeted Adaptation Knowledge

Goal: Provide communities and stakeholders with accessible, actionable resources that link climate hazards to solutions.

Description: CSOs should take the lead in creating a structured, accessible and user-friendly repository of adaptation knowledge. This hub would collect and organize case studies, practical examples, and technical guidance from researchers, practitioners, and community initiatives, ensuring the information is accessible across sectors such as planners, tenants, developers, and local governments.

- [Community-led Climate Adaptation Solution Toolkit](#) designed by the Adaptation Research Alliance for community groups in informal settlements and local areas. Includes case-studies, practical tools and adaptations. CSOs can host this knowledge for local actors.
- [Help Them Help Themselves: A Toolkit to Facilitate Transformative Community-Based Climate Change Adaptation](#) by the Leibniz Institute of Ecological Urban and Regional Development (IOER) focuses on community co-creation, participatory tools, and mobilizing local knowledge. Excellent for CSOs creating repositories of adaptation knowledge for non-specialist audiences.

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of case studies or resources collected and categorized by hazard or sector

LEADING INDICATORS

Looks forward at future outcomes and events

- Frequency of updates to the repository and number of downloads or shares

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Evidence of uptake or replication of shared practices by other CSOs or local authorities

KPIs

Medium-term actions

Monitor Failures and Hold Actors Accountable

Goal: Track inaction, greenwashing, or mismanagement, and drive transparency and change thereby reinforcing trust and preventing maladaptation.

Description: CSOs can document and publicize failures by landlords, developers, or public bodies to deliver on adaptation promises. Through watchdog functions, community reporting tools, or complaints mechanisms, civil society helps ensure resilience actions are not only planned, but implemented and maintained.

- [Tracking Adaptation Finance: An Approach for Civil Society Organizations to Improve Accountability for Climate Change Adaptation](#) by the World Resources Institute (WRI) shows how CSOs can monitor adaptation finance flows (who is funding what, where) and thereby hold governments/developers accountable for promises vs. actual implementation.
- [Climate Accountability Toolkit](#) by the Clean Air Partnership is a practical toolkit for transparency and accountability in climate plans and actions very useful for CSOs that want to monitor whether adaptation commitments are being met and to document failures.
- The [Accountable Adaptation research program](#) focuses on measurement and accountability in adaptation. Helps CSOs develop metrics and watchdog mechanisms to track progress (or lack thereof) around adaptation actions.

INPUT INDICATORS

Measure the resources required to deliver

- Existence of an internal legal/policy monitoring system or designated focal point

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of policy briefs or analyses produced annually

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Tangible policy changes or inclusion of CSO recommendations in local and national plans

Action 1

Resources

KPIs

Commit to Watchdog Roles and Build Grassroots Networks

Goal: Ensure accountability and sustain local adaptation through trusted civil society leadership.

Description: CSOs should commit to becoming permanent watchdogs, actively tracking policy and regulatory frameworks and monitoring their concrete implementation. By building a grassroots network of trusted community leaders, civil society can promote transparency, hold institutions accountable, and ensure that adaptation strategies are not only adopted but maintained over time. This commitment anchors resilience in both governance and local ownership.

- [Civil society organizations' institutional climate capacity for community-based conservation projects: Characteristics, factors, and issue](#) (Current Research in Environmental Sustainability, 2023) looks into what CSOs need to build capacity (governance, networks, grassroots links) to serve as watchdogs and maintain long-term presence in adaptation governance.
- MIP4Adapt has developed a [Citizen Engagement Manual](#). Although framed for citizen engagement, this manual helps CSOs set up grassroots networks, engage community champions, and maintain ongoing oversight roles.
- The [Green Accountability Platform](#) is specifically designed to support CSOs and grassroots organisations in accountability for climate finance and action

Action 2

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of a network or coalition of CSOs with shared climate adaptation goals

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of reports or alerts published on compliance, implementation, or funding use

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Instances where watchdog actions resulted in corrective or policy improvements

KPIs

Raise Community Awareness and Translate Climate Risk into Local Action

Goal: Empower communities to understand and act on climate risks at the neighborhood and household level by combining awareness campaigns with accessible, data-informed communication.

Description: Civil society organizations play a vital role in helping residents make sense of local climate risks and identify meaningful responses. By launching local awareness initiatives (such as climate walks, participatory mapping, community workshops, neighborhood flyers, and digital campaigns) and at the same time translating technical climate data into citizen-friendly formats like simplified maps, infographics, or short videos, CSOs can turn

abstract information into tangible, place-based knowledge. These efforts help uncover local vulnerabilities (e.g., poorly insulated homes, heat-exposed streets, flood-prone areas), while fostering a shared understanding of risk and collective ownership of adaptation. The result is informed and empowered communities that are better prepared to take action at the scale that matters most: their own streets, homes, and neighborhoods.

- MIP4Adapt has developed a [Citizen Engagement Manual](#). This user-friendly guide for communities to understand and act on climate risks, is framed for citizen engagement. Ideal for CSOs to convert technical hazard data into accessible formats.
- [Community-based participatory climate action](#) (Global Sustainability, 2023) explores methods for community participation and translating technical climate information into local action
- UN Habitat's [Climate Change Vulnerability and Risk – A Guide for Community Assessments, Action Planning and Implementation](#) provides actionable steps for community assessments of risk. CSOs can adapt this to develop local resilience workshops, maps of local hazard exposures, community briefings.

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of Permanent Community Adaptation Hubs (physical or digital) established and operational

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of citizens trained, services offered, or partnerships facilitated

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Evidence of improved community preparedness or reduced vulnerability over time

KPIs

Long-term actions

Scale Community-Based Resilience Programs

Goal: Move from pilot projects to systemic adoption of community-driven adaptation.

Description: Civil society should expand successful community-led resilience programs (such as neighborhood cooling centers, participatory early warning systems, or grassroots retrofitting projects) to a larger scale. By creating networks of community initiatives, CSOs can amplify impact and ensure resilience is rooted in local priorities, particularly in underserved neighborhoods while building stronger horizontal links between communities across regions.

- U.S. Department of Housing and Urban Development (HUD) [Community Resilience Toolkit](#) provides step-by-step guidance for community stakeholders to build resilience infrastructure, coordinate neighbourhood networks, and scale up from individual projects.
- Edith Cowan University [Climate Justice & Resilience Resource Library](#) offers toolkits, case studies and templates aimed at community service organisations, focusing on underserved groups

Action 1

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of community organizations formally engaged in resilience initiatives
- Annual funding secured or allocated for scaling community-based resilience projects
- Number of trained local facilitators, champions, or volunteers supporting community programs
- Number of formal partnerships or MOUs established with municipalities or private actors

LEADING INDICATORS

Looks forward at future outcomes and events

- % of scaled programs integrating cross-sectoral partnerships (housing, energy, water, waste)
- Frequency of peer-learning events or exchanges between communities
- Number of neighborhoods or settlements adopting standardized community adaptation plans
- Level of community participation in project design and monitoring (e.g., via participatory meetings)

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Number of households or individuals benefiting from community-led adaptation measures
- Reduction in climate-related losses or disruptions in targeted communities (e.g., flood damage, heat-related health cases)
- Increase in local policy inclusion of community-based adaptation practices
- Evidence of program replication in new regions or by other organizations

KPIs

Embed Climate Justice and Advocacy into Social and Housing Policy

Goal: Normalize adaptation as a societal priority while ensuring equity and protection for the most vulnerable.

Description: CSOs should lead efforts to embed adaptation into the cultural, political, and legal fabric of society. In addition to ongoing campaigns, public education, and advocacy initiatives, this includes advocating for climate justice provisions in housing and urban policy, such as integrating resilience into tenant protections, upgrading informal settlements, safeguarding informal workers, and guiding climate-sensitive public budgeting. This helps protect housing rights, improve working conditions, and ensure that vulnerable groups (often most exposed to climate risks) are included in adaptation planning.

Action 2

- Build Change [Housing Justice and Disaster Resilience: A Critical Link](#) advocates for integrating housing justice and climate-resilience, especially for low-income and informal settlements
- World Resources Institute (WRI) [How Improved Housing Can Strengthen Climate Resilience & Urban Services](#) explores how housing and urban services must be part of climate adaptation, particularly for vulnerable communities
- NAAP's [People's Guide to Transforming Crisis & Advancing Equity in the Disaster Continuum Toolkit](#) is tailored to community resilience and climate justice, with emphasis on inclusion, equity and vulnerable populations.

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Number of formal consultations or partnerships with housing authorities or legal advocates

LEADING INDICATORS

Looks forward at future outcomes and events

- Number of advocacy campaigns addressing justice and equity in adaptation

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Adoption of climate justice principles in public housing, planning, or labor policy

KPIs

Create a Culture of Climate Engagement and Share Replicable Toolkits

Goal: Normalize adaptation as a societal and political priority, while enabling other CSOs to replicate proven models.

Description: Civil society should embed climate adaptation into the cultural and political fabric of society through ongoing campaigns, public education, and advocacy efforts that shape public opinion and policy agendas. To accelerate this shift, CSOs can also create and share practical toolkits for their peers, packaging proven methods for running campaigns, mapping risks, or advocating for regulatory reform. This will reduce the learning curve for new initiatives, foster horizontal knowledge-sharing, and build capacity across the sector.

- A European-wide [CLIMAS](#) project produces tools and guidelines for engaging citizens in adaptation
- [Habitat International Coalition](#) enables horizontal knowledge-sharing across regions, and supports CSOs in building networks and replicable campaign toolkits for climate justice in housing and resilience.
- Climate Justice & Resilience [Resource Library](#) offers templates, infographics, campaign and advocacy materials that CSOs can customize and redistribute, supporting normalization of adaptation through culture and communications.

Action 3

Resources

INPUT INDICATORS

Measure the resources required to deliver

- Existence of at least one adaptation or advocacy toolkit produced and published

LEADING INDICATORS

Looks forward at future outcomes and events

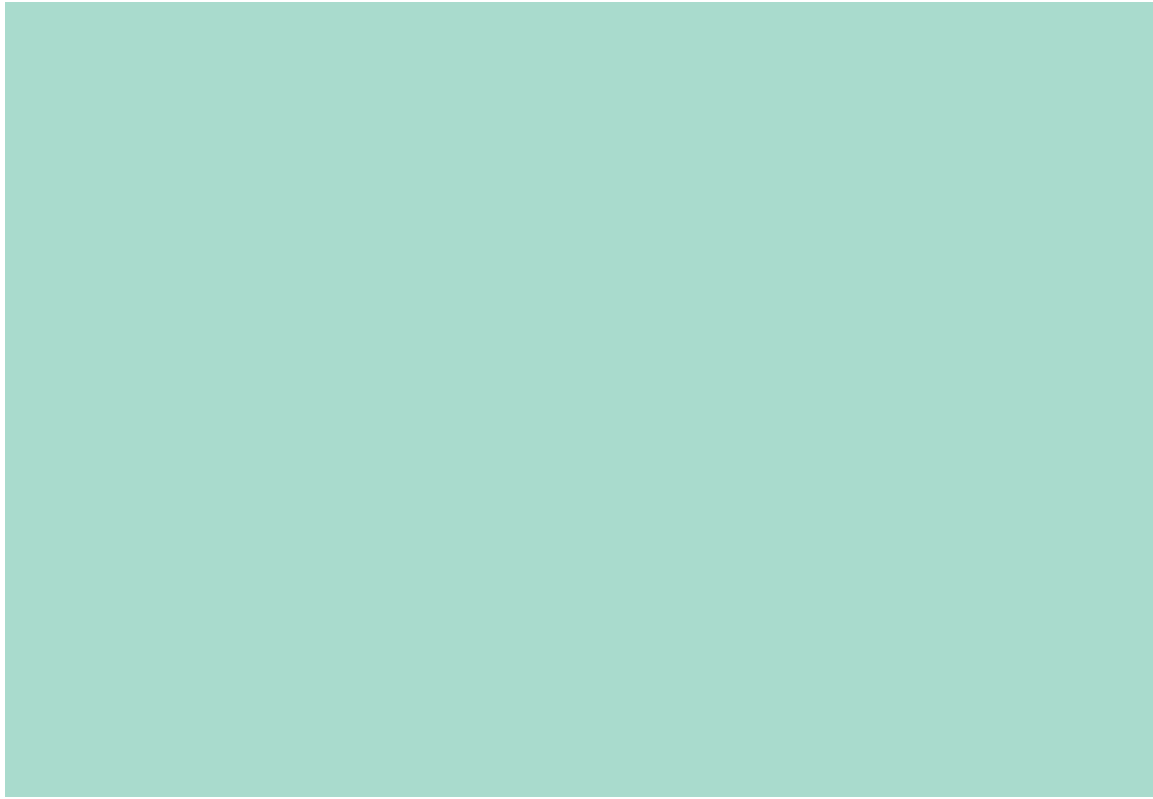
- Number of peer organizations trained or supported to use the toolkit

LAGGING INDICATORS

Looks back at whether the intended result was achieved

- Evidence of replication or scale-up of CSO-led models by other organizations

KPIs



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