Collaborate Globally and Continuously Adapt Standards and Methods

Action 2

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.

Resources

- 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.

KPIs

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)

Invent New Incentives and Business Models for Circular Resilient Materials

Action 3

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.

- 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.

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

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 Organisations 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 i*mpact 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

Action 2

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.

Resources

- 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.

KPIs

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

Coordinate with Subcontractors and Suppliers

Action 3

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.

Resources

- 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.

KPIs

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

Medium-term actions

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

Action 1

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.

Resources

- 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.

KPIs

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)

Learn and Map Local Climate Risks & Offer Tailored Adaptation Checklists

Action 2

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

Resources

- 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.

KPIs

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

Communicate That Adaptation is Practical, Local, and Affordable

Action 3

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

Resources

- 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.

KPIs

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

Long-term actions

Action 1

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.

Resources

- 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.