AT2030

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Inclusive Climate Infrastructure Design

Playbook

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Researched and authored by:
- Aishwarya Soni, Inclusive Design Consultant, GDI Hub;
- Bala Nagendran Marimuthu,
  Senior Researcher - Climate and Cities, GDI Hub; and
- Mikaela Patrick, Head of Research and Delivery, GDI Hub.

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Aishwarya Soni

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About Global Disability Innovation (GDI) Hub

www.disabilityinnovation.com

Global Disability Innovation (GDI) Hub accelerates ideas into impact for a more just world— for disabled people and all people. We are a world-leading delivery and practice centre, a Community Interest Company, an Academic Research Centre at University College London (UCL), and the first World Health Organization (WHO) Global Collaborating Centre on Assistive Technology. Our diverse portfolio and unique structure enable rapid translation of research into practice.

Launched in 2016 as a legacy of the London 2012 Paralympic Games, GDI Hub has worked in 40+ countries, with a reach of more than 64 million people since its inception, developing homegrown technologies alongside producing new knowledge and research. In collaboration with global partners, we deliver accelerators and market-shaping initiatives — building disability innovation ecosystems with a focus on low- and middle-income countries.

About AT2030

www.at2030.org

The AT2030 programme, funded by UK International Development, tests ‘what works’ to improve access to life-changing assistive technology (AT) for all. From creating deep community leadership to generating new evidence and insights, AT2030 answers critical research questions and develops foundational methodologies, addressing intersectional challenges and research and evidence gaps.

AT2030 embeds disability innovation into national policy landscapes, stimulating demand, activating country pilots, strengthening systems, and creating enabling market environments in low- and middle-income countries.

Right image: Even-surfaced and permeable pavements enable people with disabilities to comfortably move, while allowing rainwater to filter directly into the ground rather than creating surface runoff. Source: Mart Production.

Executive Summary

What is ‘inclusive climate infrastructure design’?

Inclusive climate infrastructure design is an approach to **co-designing physical spaces, services, and systems that anticipate, prepare for, and adapt to changing climate conditions** while simultaneously enabling accessibility and equal participation for all people, particularly people with disabilities. Such infrastructure can **prevent, absorb, recover from, and adapt to disruptions caused by current and future climate risks while strengthening the resilience capacity of people with disabilities.**

Why do we need inclusive climate infrastructure?

More than half of the world’s 1.3 billion people with disabilities live in towns and cities and are disproportionately exposed to the impacts of climate change and climate-related disasters. Climate risks — including heatwaves, floods, droughts, sea-level rise, and storms — disrupt essential infrastructure and services and amplify existing barriers faced by people with disabilities. Inaccessible housing, transport, and public spaces, particularly in low- and middle-income countries, increase exposure to climate hazards, interrupt the use of assistive technology, limit access to information and evacuation, and undermine safety, wellbeing, and long-term resilience.

At the same time, around 60% of the built environment that will exist by 2050 has yet to be constructed, presenting a critical opportunity to shape infrastructure that is both climate-resilient and inclusive of the needs of people with disabilities — through inclusive design. While guidance separately exists for disability-inclusive infrastructure and climate-resilient infrastructure, they are rarely integrated.

What is the Playbook about?

The Inclusive Climate Infrastructure Design Playbook seeks to bridge this gap by serving as a starting point for collaboratively designing and delivering disability-inclusive, climate-resilient infrastructure. Developed through a participatory research process combining a review of global built examples and virtual interviews and workshops with urban practitioners and people with disabilities, the Playbook identifies actionable principles and recommendations for inclusive climate infrastructure design across three essential built environment sectors:

Housing

Transport

Public spaces

How to use this Playbook?

This Playbook is intended as a practical resource to inspire and inform the design and delivery of integrated disability-inclusive and climate-resilient infrastructure. Users are encouraged to adapt the **guiding principles** (covered in **Chapter 3**), **foundational actions** (covered in **Chapter 4**), and **sector-specific recommendations** (covered in **Chapters 5 - 7**) to their local contexts and apply them collaboratively with people with disabilities and other stakeholders to create infrastructure that is accessible, equitable, and resilient.

The most inclusive and resilient urban futures will not be achieved through isolated interventions or sectoral siloes, but will emerge through coordinated, transdisciplinary action that recognises the interdependence of infrastructure systems and centres the experiences and leadership of people with disabilities.

Glossary

People with disabilities or persons with disabilities or disabled people: As defined by the United Nations Convention on the Rights of Persons with Disabilities (CRPD), "persons with disabilities include those who have long-term physical, mental, intellectual, or sensory impairments which in interaction with various barriers, may hinder their full and effective participation in society on an equal basis with others."

Note that there are different preferences regarding terminology, with disabled people used more commonly in the United Kingdom (UK) where GDI Hub is located, and people with disabilities used more commonly internationally. Terms can be chosen on a case-by-case basis and, if possible, in consultation with disabled people in the context within which work is taking place. This document adopts 'people with disabilities,' unless referring to a quote.

Accessibility: Refers to enabling access to infrastructure, products, services, and facilities for all people with disabilities. Accessibility is driven by technical standards or design guidelines for the physical and digital infrastructure. While accessibility delivers access to equal participation, inclusive design goes beyond access and delivers systemic inclusion.

Assistive product: Physical products (e.g., hearing aids) and digital products (e.g., screen reading software), specifically developed to advance individuals' functioning and independence.

Assistive technology (AT): Is the application of organised knowledge and skills related to assistive products, systems, and services.

Infrastructure: Is the physical and organisational structures, services, and facilities that support society[1]. Good infrastructure should contribute to inclusive prosperity, including health and wellbeing. For the purpose of the Playbook, physical structures and spaces that contribute to the participation of people with disabilities in daily life and society fall under the remit of infrastructure.

Inclusive design: Can help all human beings experience the world around them in a fair and equal way by creating safe and accessible environments, services, and products for all members of society. Inclusive design is a mindset and a methodology that embraces diversity to create a world that is more intuitive, elegant, and usable for all of us.

Resilience: The United Nations Office for Disaster Risk Reduction (UNDRR) defines resilience "as the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management."[2]

Implementation: For this report, implementation is the stage that follows the city planning and design process for creating an inclusive built environment. It is the stage where planning and policy commitments and design decisions are executed on the ground.

Note on Language

Adopted from UK-based charities Walk, Wheel, and Cycle Trust and Transport for All

Walking/wheeling: We use the term 'walking/wheeling' to make explicit that pedestrian environments must be made accessible to those using wheelchairs and other wheeled mobility aids, not just those on foot. Wheeling is defined to only cover modes that use pavement space at a similar speed to walking. It does not include the use of e-scooters or cycles.

Cycling: We use the term 'cycles' instead of 'bicycles' to acknowledge that many people with disabilities use adapted cycles, which may not have two wheels. Cycling, therefore, refers to journeys made on cycle types as seen in low-and middle-income countries, including tricycles, handcycles, cargo-bikes, two-wheeled pedal bikes, and e-bikes.

1 Agarwal and Steele, Disability considerations for Infrastructure Programmes. 2016.

2 UNDRR, The Sendai Framework Terminology on Disaster Risk Reduction. "Resilience". 2017.

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Click on chapter name to jump directly to the page

Left image: Accessible electric buses enable people with disabilities to independently move around in their city without exposure to dangerous fumes and encourage sustainable mobility by choice. Source: Transport for London

01 Introduction

More than half of the 1.3 billion people with disabilities worldwide[3] live in towns and cities.[4] The geographical locations of cities, combined with factors such as higher residential densities, extensive built-up areas, large impervious surfaces, and a lack of green space,[5] place cities at greater risk from the impacts of ongoing climate change and climate-related disasters. These include rising temperatures, sea-level rise, droughts, floods, cyclones, landslides, and heatwaves. Such events can damage infrastructure and disrupt essential systems and services, with particularly severe consequences in low- and middle-income countries.[6]

Although climate change affects all populations, people with disabilities are disproportionately impacted and are two to four times more likely to be injured or lose their lives during climate-related disasters.[7] Further, the lack of inclusive climate-resilient infrastructure acts as a risk multiplier for people with disabilities: increasing exposure to climate threats; disrupting assistive technology usage; limiting access to evacuation, information, and essential services; affecting their ability to withstand and recover from climate disruptions;[8] and undermining their safety and wellbeing.

Designing and delivering disability-inclusive and climate-resilient infrastructure will not only enhance the immediate wellbeing of people with disabilities but also strengthen their long-term resilience to climate change and climate-induced disasters.

60% of the built environment that will exist in 2050 is yet to be constructed,[9] presenting **a critical opportunity to shape climate-resilient infrastructure that is also inclusive of the needs of people with disabilities.** While guidance separately exists for disability-inclusive infrastructure and for climate-resilient infrastructure, they are rarely integrated. This results in limited focus on strategies and solutions for simultaneously applying both disability inclusion and climate resilience considerations within urban infrastructure design and development.

The Inclusive Climate Infrastructure Design Playbook seeks to bridge that gap by serving as a starting point for collaboratively designing and delivering disability-inclusive and climate-resilient infrastructure.

Building on a wide range of built examples from around the world, practitioner guidance, and lived experiences of people with diverse disabilities, the Playbook guides inclusive climate infrastructure design within three essential built environment sectors: housing, transport, and public spaces.

3 WHO, Fact Sheet- Disability and Health.
4 Pineda, Meyer, and Cruz, The Inclusion Imperative. Forging an Inclusive New Urban Agenda. 2017.
5 OECD, Infrastructure for a Climate-Resilient Future. 2024.
6 OECD, Infrastructure for a Climate-Resilient Future. 2024.
7 Stein, Disability in a Time of Climate Disaster. 2023.
8 UN Habitat, Cities and Climate Action | World Cities Report. 2024.
9 UNEP, Global Status Report for Buildings and Construction. 2024.

Research indicates that 73 percent of individuals with disabilities would encounter challenges during evacuations, with 6 percent unable to evacuate entirely. [10]

10 UNDRR, 2013 Survey on living with disabilities and disasters – Key Findings. 2014.

Purpose of the Playbook

The Playbook offers **insights and inspiration about how to design housing, transport, and public spaces that are disability-inclusive and climate-resilient.** It is not a comprehensive guideline or action plan, but is instead a tool to foster imagination, creativity, and ambitious thinking about how best to deliver essential urban infrastructure that maximises the inclusion of people with disabilities and improves their resilience to climate risks.

Who is the Playbook for?

This Playbook is primarily intended for **urban and built environment designers and practitioners, inclusive designers, climate practitioners, and city authorities** who are involved in the design, procurement, or construction of urban infrastructure.

It also equips **people with disabilities, Organisations of Persons with Disabilities (OPDs), civil society organisations (CSOs), and development organisations** with knowledge and tools to advocate for inclusive climate infrastructure.

Structure of the Playbook

The Playbook outlines the need for disability-inclusive and climate-resilient infrastructure, presents guiding design principles and foundational actions, and illustrates how these can be applied across urban scenarios in three built-environment sectors: housing, transport, and public spaces.

The companion set of case studies (due to be released in Sep' 2026) will spotlight real-world examples of disability-inclusive and climate-resilient infrastructure across these sectors, spanning a range of scales and typologies and drawn from urban areas facing diverse climate risks.

Left image: For people with disabilities, a lack of inclusive climate-resilient infrastructure increases exposure to climate threats, disrupts assistive technology usage, limits access to evacuation, information, and essential services, and affects their ability to withstand and recover from climate disruptions. Source: Press Trust of India

How was the Playbook developed?

We conducted a **rapid desktop review of grey literature** across multiple online platforms and **identified 50+ built urban projects,** particularly in low- and middle-income countries, that demonstrate both disability-inclusive and climate-resilient design. We **interviewed 17 key informants** to gather in-depth insights into the design and delivery of selected projects, presented as 15 case studies in a companion resource (due to be released in Sep' 2026).

We also **hosted two virtual participatory workshops, where we invited 14 urban and built environment sector practitioners** — five of whom identified themselves as people with disabilities — to review the case studies for relevance and replicability, refine design principles, and co-create recommendations.

Limitations

Our criteria to include only built projects meant that work-in-progress or proposed projects were excluded from the desktop review. Since the scope of the Playbook is limited to the physical design of urban infrastructure, the review did not consider the nature of the design processes. The literature search was limited to projects presented in English, which may have prevented the showcasing of projects documented in local languages. Only projects with data available online could be captured; community-led and informal infrastructure initiatives or programmes that may have fewer resources to publicise or monitor impact are underrepresented. Due to a lack of data, informal settlements are not discussed in depth, despite being areas with climate-vulnerable housing that must be addressed as a priority.

All data and information collected and synthesised on the case studies were primarily self-reported, based on information available online and key informant interviews. Since GDI Hub did not visit the projects in person and conduct any audits, we cannot confirm whether the spaces and services are used, operated, or maintained as stated.

Right image: Well-shaded inclusive play areas allow children with disabilities to play outside for longer durations, while protecting them from the harsh sun. Source: Game Time.

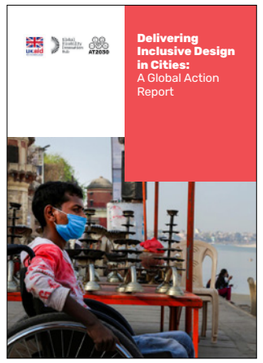
GDI Hub's work in inclusive climate infrastructure

As part of the AT2030 sub-programme, GDI Hub conducted four years of inclusive infrastructure research across six cities worldwide. The research established that a city co-designed with all urban residents and stakeholders, including people with disabilities, will better adapt and evolve with long-term resilience. From this context, GDI Hub adopts climate resilience and innovation as integral components for building inclusive cities and is exploring pathways to simultaneously implement inclusive design and climate action at the local level.

Adopting a disability rights-led approach to climate action, our goal is to enable an accessible and climate-resilient urban built environment and reinforce the role of assistive technology (AT) in strengthening community resilience. We aim to leverage inclusive research and innovation methodologies to test and document what works for disability-inclusive local climate action and accelerate implementation globally.

Read more about GDI Hub's Inclusive Infrastructure research here.

Global Comparison Report



Global Action Report

Left image: GDI Hub uses inclusive, participatory approaches to engage with people with diverse disabilities. Source: Global Disability Innovation Hub.

02 Defining the Scope of Inclusive Climate Infrastructure Design

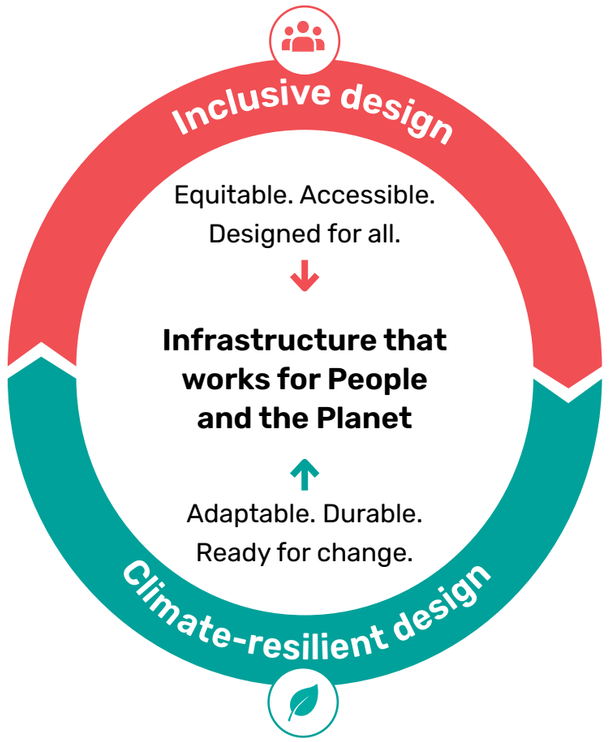
Building on the descriptions by the Organisation for Economic Co-operation and Development (OECD)[11] and the United Nations Office for Disaster Risk Reduction (UNDRR),[12] we propose the following definition:

Inclusive climate infrastructure design is an approach to co-designing physical spaces, services, and systems that anticipates, prepares for, and adapts to changing climate conditions and simultaneously enables accessibility for and equal participation of all people, particularly people with disabilities.

The resulting infrastructure can prevent, absorb, recover, and adapt after disruptions caused by current and future climate risks in a timely and efficient manner, and enhance the resilience capacity of people with disabilities.

11 UNDRR, Principles for Resilient Infrastructure. 2022.

12 UN Habitat, Cities and Climate Action | World Cities Report. 2024.



Inclusive design and climate-resilient design are two complementary and mutually reinforcing pillars of inclusive climate infrastructure design.

Combining principles of inclusive design and climate-resilient design, inclusive climate infrastructure design:

- responds to the needs of people with diverse disabilities and of intersectional backgrounds
- focuses on creating user-friendly experiences
- uses durable and sustainable materials
- prioritises eco-friendly construction and operation methods
- leverages innovative low-carbon technologies to address climate impacts

In this Playbook, inclusive climate infrastructure design focuses on urban spatial design solutions that support resilience for people, particularly people with disabilities. This aligns with the growing call for resilient infrastructure to shift from merely protecting physical assets to actively addressing the social vulnerabilities of urban residents.[13]

13 UN Habitat, Cities and Climate Action | World Cities Report. 2024.

Inclusive design is a mindset and a methodology that embraces diversity to create a world that is more intuitive, elegant, and usable for all of us.

Inclusive design as a mindset and a methodology

Inclusive design[14] is a people-centred approach to research, design, and innovation that can help all human beings experience the world around them in a fair and equal way by co-creating safe and accessible environments, products, and services. Inclusive design is a mindset and a methodology that embraces diversity to create a world that is more intuitive, elegant, and usable for all of us.

Inclusive design is not merely about making spaces accessible, but it goes further to create environments that recognise and respond to diverse lived experiences. It involves active engagement of people with disabilities in the design process and thoughtful integration of accessibility features and inclusive practices into the core of architecture, urban design and planning, ensuring that every public space, building, and transport system is navigable and functional for all citizens. By doing so, inclusive design promotes social inclusion and equality and enhances the quality of life for people with disabilities.

Left image: Participatory processes involving people with disabilities are central to inclusive climate infrastructure design. Source: Global Disability Innovation Hub.

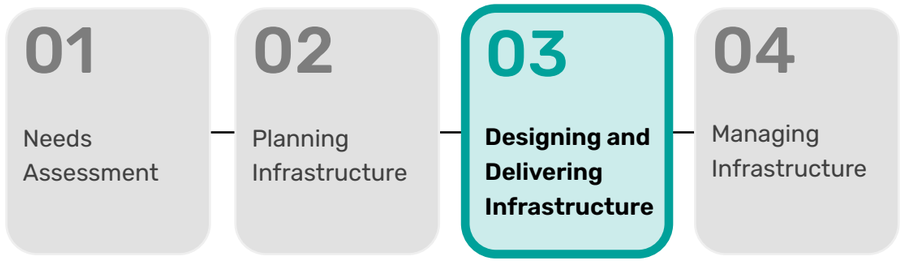
14 GDI Hub, Inclusive Design Strategy. 2022.

Infrastructure lifecycle approach

Adopted from the Global Center on Adaptation,[15] the infrastructure lifecycle approach outlines the four key stages of infrastructure development. These include:

1 Needs Assessment
2 Planning Infrastructure
3 Designing and Delivering Infrastructure
4 Managing Infrastructure

Inclusive design and climate resilience considerations must be embedded throughout the lifecycle of infrastructure development and operations.



Infrastructure lifecycle approach indicating the four key stages of infrastructure development, adopted from the Global Center of Adaptation.

The Playbook primarily focuses on the third stage of the lifecycle, i.e. designing and delivering infrastructure. We fully recognise that managing infrastructure, i.e. operations and maintenance, is essential to sustain long-term resilience and achieve intended design outcomes. However, covering these aspects meaningfully would require on-ground assessment, which falls outside the scope of this Playbook.

15 GCA, Gender Responsive, Socially Inclusive, and Climate-Resilient Infrastructure. 2026.

Sectoral focus: Housing, Transport, and Public Spaces

Informed by the priorities identified in the Global Action Report for Delivering Inclusive Design in Cities,[16] the Playbook looks at the design and delivery of three essential infrastructure systems, spaces, and services that are key to the inclusion and wellbeing of urban residents with disabilities, and that contribute to their 'equal' social and economic participation:

Housing, focusing on newly built single- and multi-dwelling units (including temporary accommodation) and retrofitted single-dwelling units.

Transport, looking at multiple modes (including door-to-door paratransit, bus rapid transit systems, rail, walking and cycling corridors, cycle sharing systems, aerial and water transport).

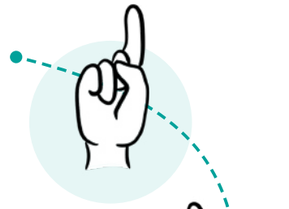
Public spaces, including outdoor parks, playgrounds, and community centres.

Inclusive and affordable housing enables people with disabilities to manage daily tasks, exercise autonomy at home, and receive home-based care and support without putting additional pressure on household budgets. Accessible transport connects people with disabilities to education, employment, health services, and leisure activities. Inclusive public spaces provide access to nature, improve health and wellbeing, and enable participation in community life. **Underpinning these three types of infrastructure with climate resilience ensures that these spaces and systems remain accessible, safe, and functional during and after disruptions caused by slow-onset and sudden-onset climate events.**

16 GDI Hub, Delivering Inclusive Design in Cities: Global Action Report. 2024.

03 Guiding Principles

1
Plan for and integrate inclusion from the outset



2
Strengthen personal and community resilience through co-design and collaboration

3
Embed resilience through data-driven, scenario-based planning

4
Respond to local climatic, environmental, and socio-cultural contexts

5
Offer choices for varying disability needs

Numbers visually represented in International Sign Language (ISL).

Graphic idea adopted from SG Enable's 'Design Playbook for Inclusive Spaces'.

6
Enable flexible and adaptable spatial design to accommodate evolving needs and climatic risks

Left image: Curb-side green buffers with curb cuts capture, slow, and filter surface run-off before it reaches municipal drainage systems, while enabling smooth transitions between pavement and carriageway for mobility aid users. Source: Global Disability Innovation Hub.

1 Plan for and integrate inclusion from the outset

In all climate adaptation and mitigation measures, inclusion must be embedded early on in the design process rather than added later — be it new build or retrofits. Doing so ensures that the infrastructure facilitates dignified, equal, and intuitive use for people with diverse disabilities and fosters a sense of belonging and ownership.

Key actions include:

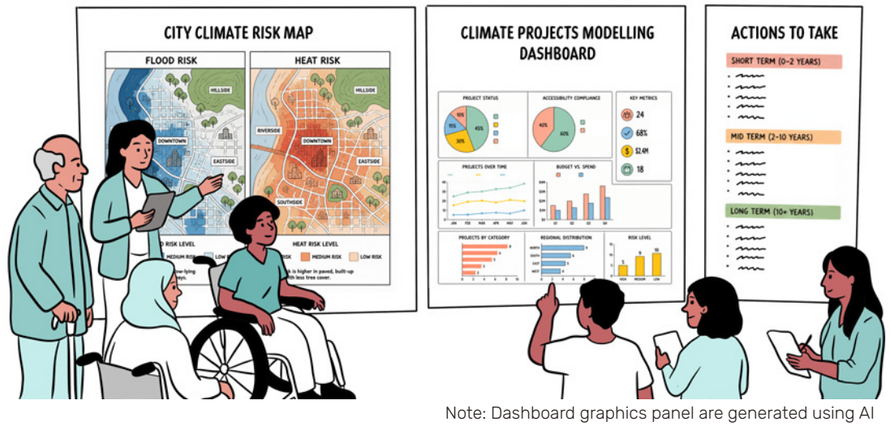
- integrating inclusive design principles into design briefs and technical specifications;
- embedding accessibility requirements into procurement, requests for proposals, and tender documents;
- allocating dedicated capacity and budget for inclusive design processes and installation of inclusive design elements; and
- conducting accessibility reviews at each milestone of design and delivery.

2 Strengthen personal and community resilience through co-design and collaboration

When resilience is defined as a top-down mandate, it often fails. It is most effectively cultivated as an inclusive, collective dialogue. Infrastructure should therefore be co-designed and co-developed with people with disabilities to ensure it is inclusive, contextually relevant, and strengthens the ability of individuals and communities to anticipate, respond to, and recover from climate risks. Efforts should be taken to involve underrepresented groups within people with disabilities.

Key actions include:

- engaging people with disabilities and Organisations of Persons with Disabilities (OPDs) throughout the design and delivery process;
- embedding co-design and inclusive participatory approaches that advance local knowledge and preparedness of people with disabilities;
- incorporating user feedback into design iterations;
- integrating community-identified risks and coping strategies into design solutions; and
- ensuring solutions enhance both individual safety and collective resilience in times of disruption.



Note: Dashboard graphics panel are generated using AI

3 Embed resilience through data-driven, scenario-based planning

As climate risks become more frequent, intense, and uncertain, infrastructure must be designed to anticipate a range of climate change -induced events, while ensuring it remains safe and usable for all. Embedding resilience requires moving beyond reactive post-disaster responses to proactively planning for adaptation, disruption, failure, and recovery.

Key actions include:

- applying anticipatory design approaches[a] that account for diverse user needs across multiple climate risk scenarios;[b]
- incorporating safe-to-fail[c] mechanisms that maintain accessibility during disruptions;
- embedding accessibility into redundancy design of critical systems; and
- ensuring safety and continuity of infrastructure use for people with disabilities during and after climate events.

a Anticipatory design approaches involve proactively modelling and building solutions for future climate shifts, rather than relying solely on past or current conditions.

b Multiple climate risk scenarios map different future urban scenarios to understand possible climate risks (such as impacts of heatwaves, wildfires, floods, droughts) to formulate robust and flexible strategies that can adapt to changing climate conditions.

c Safe-to-fail mechanisms limit damage and prevent catastrophic breakdowns when a system, process, or component fails.

4 Respond to local climatic, environmental, and socio-cultural contexts

Infrastructure must reflect the specific local conditions in which it is located, including exposure to climate risks, environmental characteristics, and cultural practices. Context-sensitive design of infrastructure improves its relevance, usability, and resilience.

Key actions include:

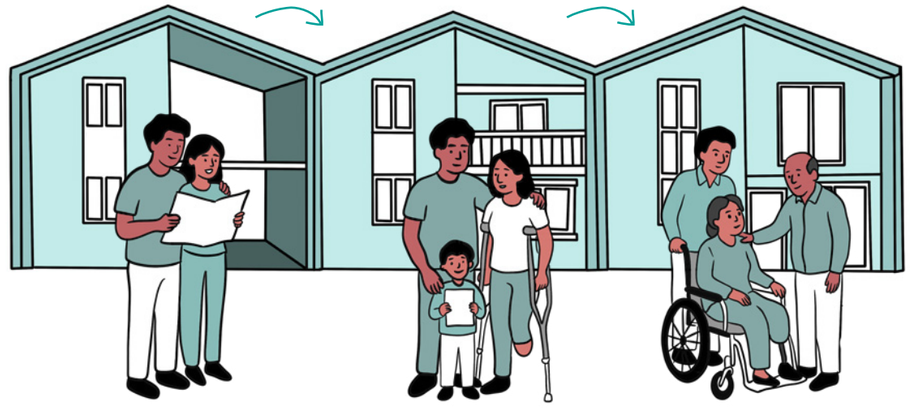
- integrating ethnographic, qualitative insights drawn from the lived experiences of people with diverse disabilities, from the lens of urban socio-cultural and economic systems;
- responding to local ecological communities and biodiversity characteristics;
- leveraging indigenous and local knowledge to inform material choices and construction methods; and
- aligning spatial layouts with prevalent cultural practices.

5 Offer choices for varying disability needs

People with disabilities have diverse needs and preferences, and no single solution can work for everyone. Infrastructure should therefore offer different ways to access, navigate, and use spaces and services.

Key actions include:

- providing multiple accessible routes and entry points;
- offering varied communication formats (visual, auditory, tactile, sign language, closed captions);
- programming for a range of mobility, sensory, and cognitive needs; and
- allowing for customisations and adjustable or adaptable features.



6 Enable flexible and adaptable spatial design to accommodate evolving needs and climatic risks

As personal and community needs change and climate risks evolve, infrastructure should be designed to adjust over time without needing a complete redesign. Moreover, infrastructure must be compatible with technological evolution, including advancements in assistive technology applications.

Key actions include:

- using modular design approaches;
- allowing for retrofitting and upgrades;
- designing systems and components for easy repair and replacement;
- enabling multi-functional use of spaces; and
- planning for multiple climate risk scenarios over time.

An inclusive city is also a resilient city. It is necessary to break the siloes between sectors and ensure inclusion and resilience are designed hand-in-hand.

An inclusive city, co-designed with all urban residents and urban stakeholders will be designed to adapt and evolve to challenges and be designed with long-term resilience and adaptation in mind.

Image: Step-free water fountains in Granary Square, London, offer heat relief to local community. Source: Time Out.

04 Foundational Actions

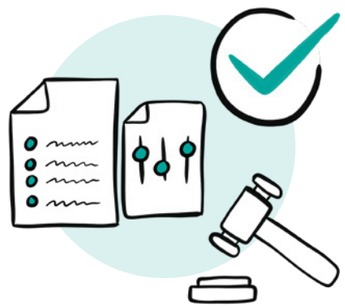
These foundational actions must be considered alongside the sector-specific recommendations discussed in Chapters 5 - 7, as their combined application is essential to achieving inclusive and resilient outcomes.

Dedicate budgets for disability inclusion in climate-resilient infrastructure

Climate infrastructure investments should explicitly dedicate a recurring fund for disability inclusion and accessibility across infrastructure design, implementation, and maintenance phases. This includes the expenses towards engaging inclusive design experts, implementation of accessibility features, fair compensation of people with disabilities who are involved in advisory, co-design or auditing roles, and costs towards ongoing maintenance. Doing so ensures that the scope of disability inclusion does not get reduced, deprioritised, or eliminated in the design process or implementation.

Strengthen design and delivery capacity and foster shared responsibility

Build capacity on inclusive, resilient design across governance levels, from decision-makers, planners, and engineers to contractors and on-ground delivery teams. Encourage community stewardship by involving Organisations of Persons with Disabilities (OPDs) in the decision-making and design process. Include local communities in the construction process and embed their role in long-term maintenance, as users are more likely to care for and repair spaces they helped create.



Enforce compliance through adaptive regulations, standards, and codes

Mandate minimum requirements for disability-inclusion and climate-resilience using legally binding frameworks, but keep them flexible for informal spaces and systems. Regulations should guide compact, mixed-use, and transit-oriented development while preserving and integrating ecological assets. Standards should prescribe technical specifications depending on the location, scale, and type of infrastructure. Codes should enforce structural integrity, risk-sensitive design (e.g., elevated floors for flood protection, stormwater systems, and maintaining a minimum distance from the shoreline), and accessibility.

However, these must acknowledge the realities of informal settlements. In Asia and Africa, a large population, including people with disabilities, lives in informal settlements. Due to their concentration in disaster-prone zones and limited adaptive capacity, informal systems are most vulnerable to the impacts of climate change and face greater damage during climate events. Therefore, mandates for informal settlements must consider flexible, incremental improvements that enhance safety, climate resilience, and disability inclusion without displacing existing systems.

Promote inclusive innovation for climate infrastructure

Innovation in design — be it materials, digital tools, assistive products, or blue-green systems — can improve wellbeing for people with disabilities, during both everyday conditions and climate disruptions. Examples include AI-based text-to-speech tools for accessible early warning updates on mobile phones, solar-powered portable cooling solutions with tactile controls, biodegradable polymers for roof cooling, and electric fittings that convert wheelchairs into motorised tricycles. Innovation can also extend to financing, such as the Incremental Climate Adaptation Loan (ICAL) by Build Change and KOMIDA in Indonesia, which supports low-income households to implement scalable heat adaptation measures.

Innovation processes and ecosystems should be intentionally inclusive, ensuring that people with disabilities and other marginalised groups are not excluded from the design, development, financing, and implementation of new technologies and approaches. Local governments have a critical role in embedding disability inclusion within urban innovation programmes by supporting disability-led enterprises and strengthening inclusive low-emission ecosystems. This will maximise opportunities for people with disabilities to lead climate-responsive lifestyles, act as innovators, and contribute creative solutions to complex climate challenges.

Right image: Inclusive walking, wheeling, and cycling infrastructure enables people with disabilities to independently access work, education, essential services, and social opportunities. Source: Global Disability Innovation Hub.

05 Inclusive, Affordable, and Resilient Housing

Against an increasingly uncertain future, a home is the ultimate protection for all.[17,18] Yet, people with disabilities face multiple challenges in accessing affordable, accessible housing that enables them to live safely, independently, and with dignity.

People with disabilities are more likely to have lower incomes due to employment barriers and limitations associated with the nature of their impairments.[19] As a result, they often struggle to afford accessible housing and related support services or to finance necessary home modifications, including adaptations that improve resilience to climate-related risks.[20]

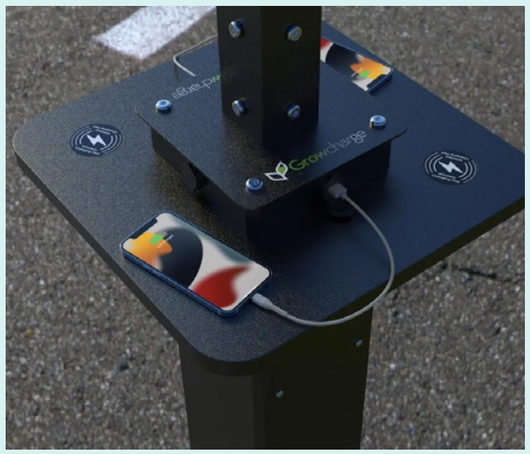
Globally, 80% of cities do not have affordable housing options for the majority of their population,[21] forcing residents and migrants in low- and middle-income countries to live in informal settlements,[22] the only affordable and available option. Although there are no global data on the number of people with disabilities living in informal settlements, many are likely to reside in these environments, which are commonly inaccessible and lacking in basic amenities. Their spatial layouts and structural conditions also make informal settlements highly vulnerable to extreme events such as heatwaves, flooding, and storms.

17 Build Change, The Build Change Guide to Resilient Housing: An Essential Handbook for Governments and Practitioners. 2021.
18 WGBC, Sustainable and Affordable Housing Report. 2023.
19 OECD, Crisis on the Horizon. 2021.
20 OECD, Crisis on the Horizon. 2021.
21 King and Weston, Solving World's Housing Crisis Requires More than New Construction. 2026.
22 King and Weston, Solving World's Housing Crisis Requires More than New Construction. 2026.

Designing and delivering inclusive, affordable, and resilient homes, both as **social housing and within informal settlements**, must be prioritised to:

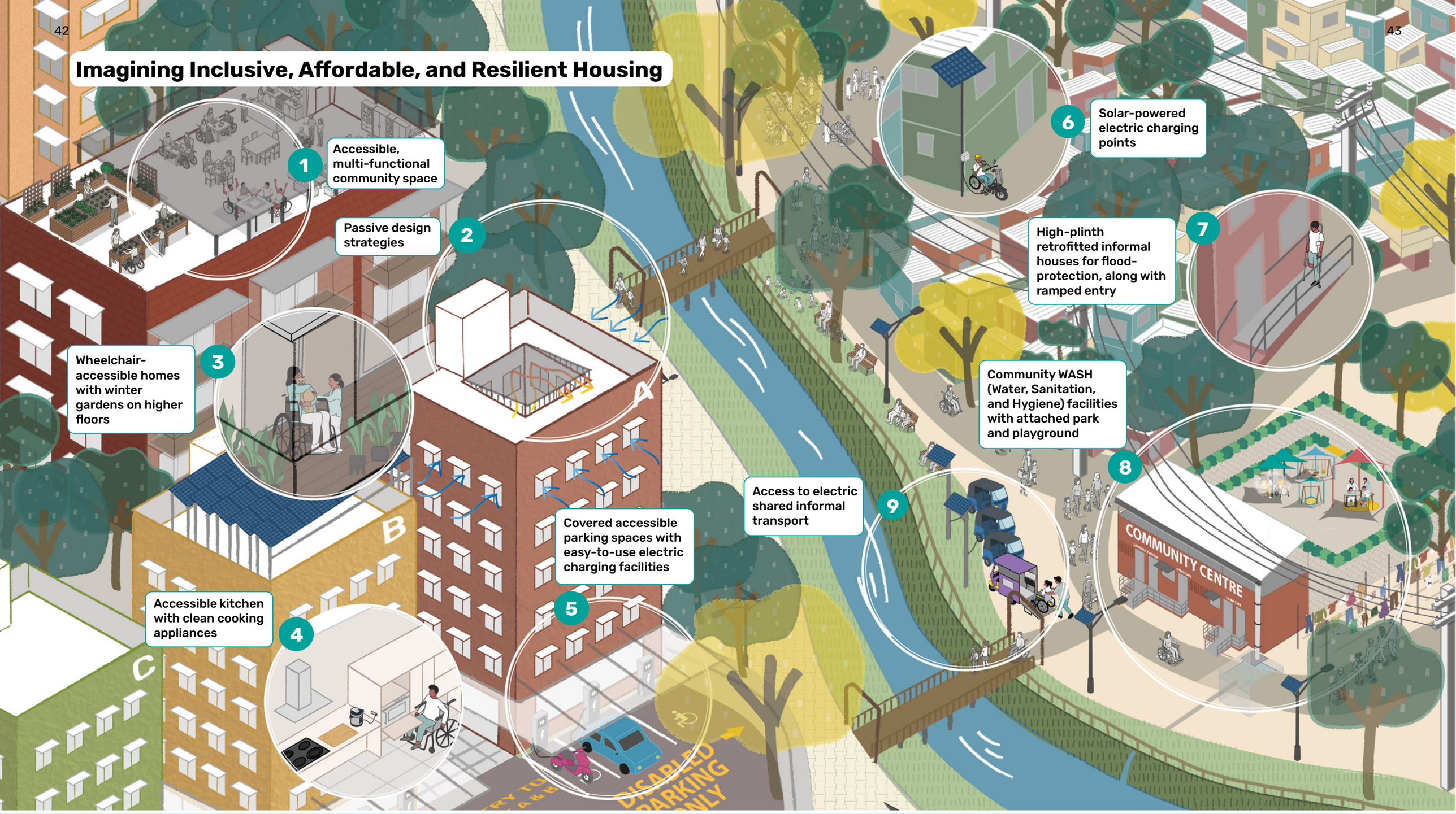
- **provide a solid foundation** for economic security, health, well-being, and independence of people with disabilities;
- **avert devastation and financial losses** caused by disasters; and
- **enhance their resilience capacity** to better withstand and recover from current and future climate risks.

Clean cooking appliances in homes allow for precise temperature control, reduce fire and burn risks, and result in better indoor air quality, benefiting people with disabilities.
Source: Prabhat Education Foundation



Solar-powered charging stations in housing complexes can support charging mobile phones, wheelchairs, and other assistive technology. Source: (Left) Sun Charge Systems. (Right) Growcharge

Imagining Inclusive, Affordable, and Resilient Housing



1. Enhances social ties with neighbours, who are likely to be the first responders in emergencies and support systems whilst sheltering in place
2. Uses natural heat flows to cool spaces; reduces energy bills, lowers carbon emissions, and enhances indoor air quality and comfort
3. Improves energy efficiency through passive heating and ventilation, enables exposure to sunlight, enhances air quality, and provides elevated views for wheelchair users; safe-to-fail mechanisms for elevators and provision of 'evacu-chairs' can ensure rapid evacuation of wheelchair users living on higher floors
4. Integrates with existing assistive technologies, allows for precise temperature control, reduces fire and burn risks, and improves air quality
5. Reduces exposure to harsh sun and rain while entering and exiting the vehicle; easy charging enables independent mobility
6. Generates clean energy to power assistive devices, such as electric wheelchairs or hearing aids, and household appliances
7. Prevents rainwater from entering homes; ramp and steps accommodate diverse disability needs
8. Protects public health, serves as an emergency shelter, links to other community services, and strengthens social resilience against climate shocks
9. Provides critical urban connectivity and access to livelihood opportunities

Recommendations

These sector-specific recommendations must be considered alongside the foundational actions outlined on **Pages 36 - 38**, as their combined application is essential to achieving inclusive and resilient outcomes.

Balance affordability, resilience, and accessibility in housing provision

Housing policies and programmes should simultaneously prioritise affordability, accessibility, and climate resilience, recognising that these objectives are mutually reinforcing rather than competing priorities. Focusing on only one dimension can create unintended trade-offs — for example, resilient housing that is unaffordable, accessible housing that is vulnerable to climate hazards, or low-cost housing that fails to meet the needs of persons with disabilities.

Co-design housing with people with disabilities and communities

Engage people with disabilities and local communities in the co-creation of climate-responsive housing using inclusive, participatory approaches. Empower them to contribute to design solutions that address their specific needs and exposure to risks.

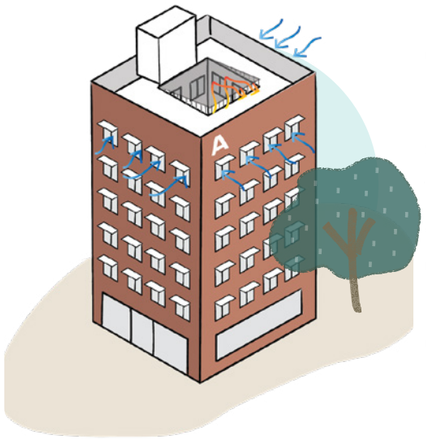
People without design training cannot be expected to read conventional architectural drawings. To ensure people with disabilities can participate on an equal basis, creative, accessible, and inclusive co-design methods should be used, such as face-to-face discussion, marking out the layout in full scale using chalk or stakes, using virtual reality simulations, or a tactile layout on a smaller scale, to help visualise the proposed work.

Ensure continuity of essential services within housing

Design housing to maintain access to water, sanitation, energy, and communication during climate-led disruptions. This includes decentralised backup systems, e.g., water storage, off-grid and solar power generation, hand-powered phone chargers, solar lamps, fans, and kettles.Ensuring service continuity enables people with disabilities to remain safely at home and maintain assistive technology usage, further strengthening their ability to cope during and after climate disasters.

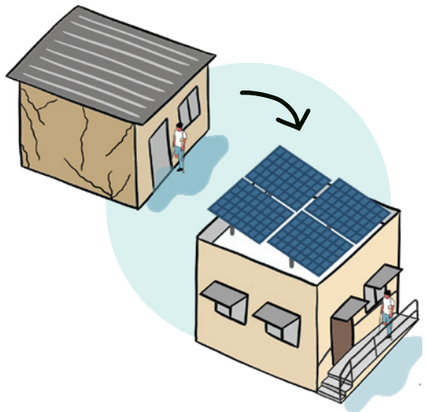
Design for safe shelter-in-place and assisted evacuation

Housing should support both safe occupancy during climate events and accessible evacuation when required. This includes step-free layouts, clear circulation routes, refuge areas, visual and auditory alerts, and accessible exits. Designing for both scenarios ensures that people with disabilities can either remain safely at home or evacuate with dignity, depending on the nature of the risk.



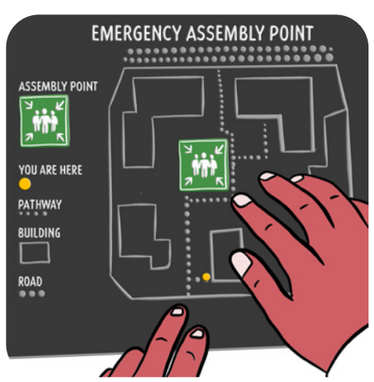
Integrate passive design to maintain comfortable indoor temperatures

Use passive design strategies such as ventilation, shading, insulation, and orientation to regulate indoor temperatures. These measures reduce the need for artificial lighting, heating, and cooling — thus lowering energy demand and carbon footprint. As a result, homes remain habitable during extreme weather or power outages, which is critical for people with disabilities who may be more sensitive to temperature changes.



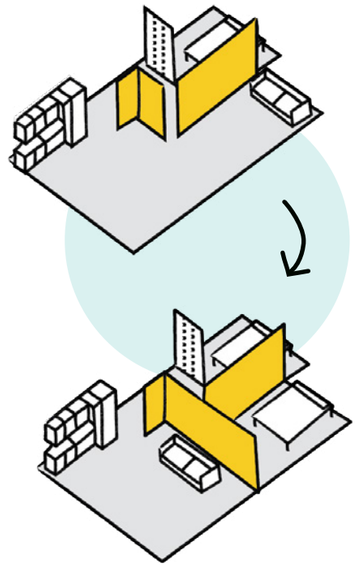
Retrofit existing social housing to reduce risk and improve accessibility

Retrofitting for climate resilience and energy efficiency provides an opportunity to integrate accessibility features and offers a more sustainable approach for the sector by reducing carbon emissions associated with new construction. While new builds must embed disability inclusion and resilience from the start, existing social and affordable housing must be upgraded to integrate accessibility and improve resilience to climate risks. Retrofitting allows people with disabilities to remain in familiar environments, reduces displacement, and strengthens their ability to withstand and recover from climate shocks.



Incorporate multi-sensory accessibility for safety and navigation

Design housing to support diverse sensory and cognitive needs, particularly during emergencies. This includes visual, auditory, and tactile cues; safe lighting; and intuitive layouts — enabling people with disabilities to perceive risks, navigate spaces, and respond effectively during disruptions.



Enable customisation through standardised yet flexible design

Adopt modular and flexible design approaches that enable homes to be adapted to the changing needs of occupants over time. Flexible design minimises the need for costly renovations by supporting accessibility modifications and AT integration as residents age or experience changes in abilities. It also allows alternative spatial layouts for intergenerational living as families expand and children grow. Additionally, it prepares urban housing stock for future climate adaptation and enhanced protection and reinforces intergenerational equity in access to inclusive and resilient living spaces.

Ageing in place allows older adults with disabilities to maintain familiarity, social connections, and autonomy, while intergenerational living strengthens family support networks and improves social cohesion.

Use context-appropriate, low-carbon, and locally sourced materials and techniques

Design housing that responds to local climate risks and leverages knowledge of local materials and construction methods. Locally available materials and familiar techniques can be easier and more affordable to repair and maintain, enabling quicker recovery after disasters. This strengthens both household and community resilience by ensuring housing solutions are durable and adaptable to local conditions, alongside supporting affordability and sustainability.

06 Inclusive, Low-Emission, and Resilient Transport

The lack of affordable and accessible transport infrastructure and services forces people with disabilities to navigate the urban environment in an unsafe manner or spend more time at home, curtailing their ability to partake in social, educational, and employment opportunities and affecting their overall wellbeing.

Air pollution from fossil-fuel-based vehicles can worsen health impacts for people with disabilities, particularly for people with pre-existing health conditions and compromised immune systems. Further, public transport systems in low- and middle-income countries are particularly prone to damage caused by climate change and extreme climate events due to ageing infrastructure, underfunding, and poor maintenance, further impacting the resilience of people with disabilities, many of whom cannot afford private transport.

> ***Innovating for inclusive transport means asking: How does a wheelchair get in? How does it stay locked in place? How comfortable is that person in their wheelchair? That's always the guiding principle.***
>
> Research Participant, India

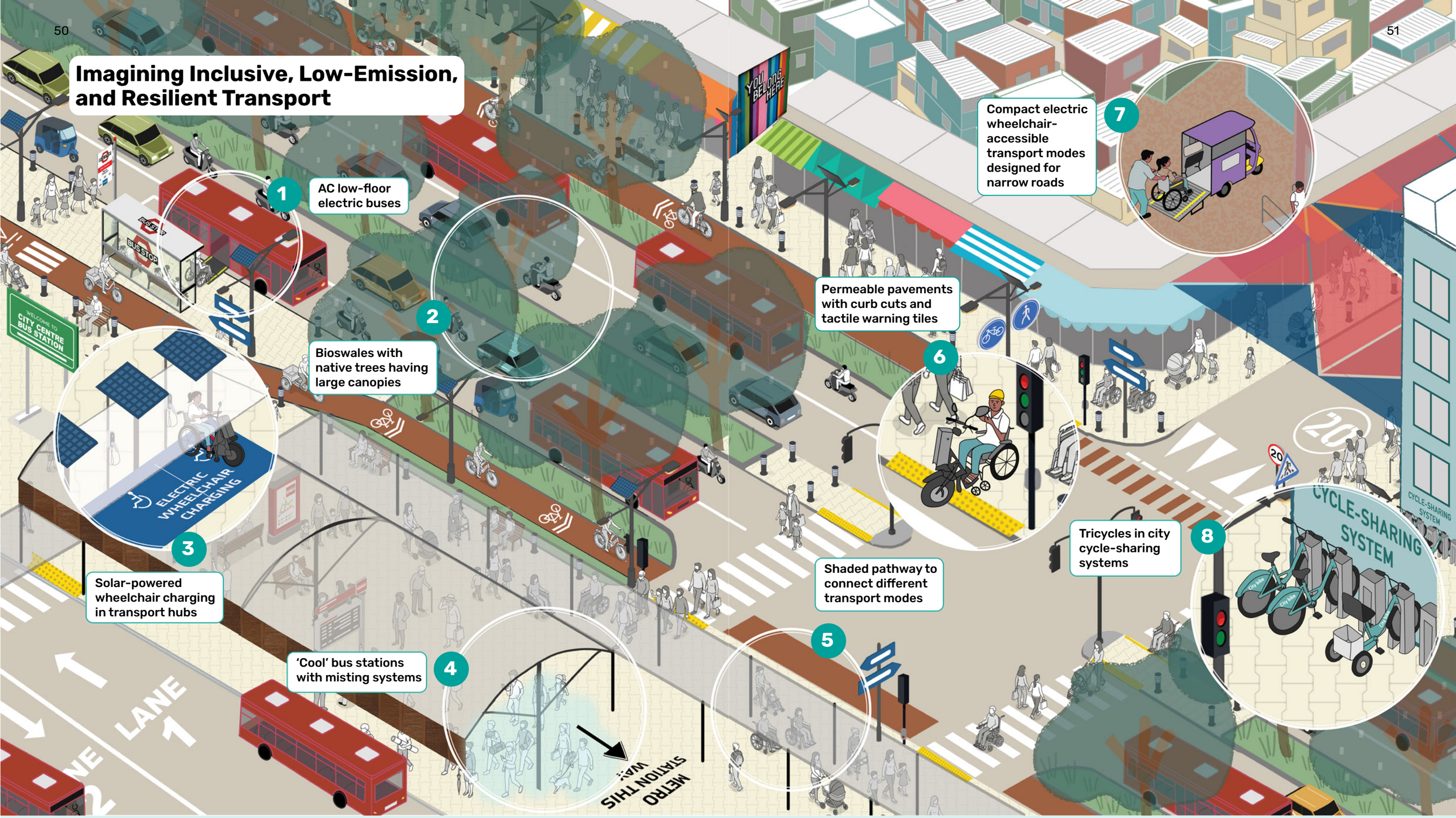
Expanding inclusive, low-emission, and climate-resilient transport systems, such as safe walking, wheeling, and cycling networks, bus and rail services, and shared and intermediate public transport, can:

- **enable independent, safe, comfortable, and more reliable trips** during and after climate disruptions for people with disabilities;
- **improve air quality** by reducing vehicular emissions; and
- **prevent breakdowns and minimise service disruptions** during extreme weather events or crises.

A bus stop in Ahmedabad, India with high-pressure misting systems drop ambient temperatures by 6 - 7°C and traditional vetiver grass and straw curtains naturally regulate heat and provide shade. Source: Mahila Housing Trust.

Shaded pathways in multi-modal transport hubs protect people with disabilities from exposure to the sun and rain during transfers between modes. Source: Heat Action Platform.

Imagining Inclusive, Low-Emission, and Resilient Transport



1. Utilises green, zero tailpipe emission technology that significantly reduces air and noise pollution; air-conditioning provides thermal comfort during hot days; low-floor design allows for wheelchair boarding
2. Reduces surface runoff and localised flooding, filters out pollutants, recharges groundwater aquifers, and lowers the cost of expensive traditional stormwater; acts as a physical buffer between pavement and cycle track users and vehicular traffic
3. Allows electric wheelchair users and other electric-powered mobility aid users to charge their devices on the move and be outdoors for longer durations
4. Combines shading and water-efficient misting systems to drastically reduce local temperatures on hot days, and provides heat relief for passengers with disabilities waiting at bus stations
5. Reduces exposure to sun and rain, making walking and wheeling between transport modes a viable and safe option
6. Reduces surface runoff by absorbing rainwater and snowmelt into the ground below
7. Provides independent door-to-door transport for individuals with mobility impairments, particularly in informal settlements
8. Enables cycling for people with balance or strength limitations and older adults

Recommendations

These sector-specific recommendations must be considered alongside the foundational actions outlined on **Pages 36 - 38**, as their combined application is essential to achieving inclusive and resilient outcomes.

Embed inclusion and resilience in walking, wheeling, and cycling infrastructure

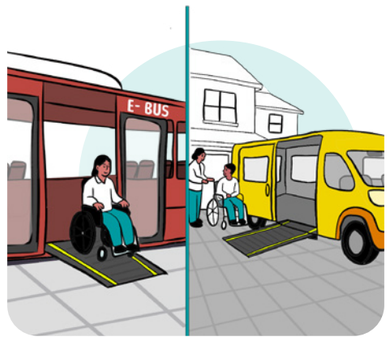
A majority of people, including people with disabilities, begin and end their public transport trips by walking, wheeling, or cycling. Therefore, it is critical to integrate accessible walking, wheeling, and cycling infrastructure elements (such as pavements with dropped kerbs and tactile marking, cycle lanes and cycle parking for tricycles, cycle-sharing systems including tricycles and adaptive cycles, and crossings) with stormwater management and sufficient shade to protect from rain, wind, and sun.

Co-design transport systems and services with people with disabilities

Lived disability experience can help identify specific issues and barriers such as inaccessible evacuation routes, unclear information, or obstructions in first- and last-mile connectivity within transport systems. These often-overlooked areas can endanger people with disabilities during extreme events. Involving people with disabilities in design reviews, vehicle testing, infrastructure auditing, and evacuation training ensures that transport systems and services are inclusive and safe in everyday conditions and during disruptions.

Integrate inclusive and resilient informal transport solutions into city-wide public transport systems

Informal shared motorised transport services in low- and middle-income countries, such as minibuses, *matatus, colectivos, jeepneys,* and shared autorickshaws, have flexible routes and reach areas that are underserved by formal public transport modes. With appropriate regulation for accessible vehicle design, synchronised ticketing systems with public transport, and campaigns to address social stigma and discrimination, these services can be made inclusive and safer for people with disabilities. Further, linking these services to city-wide public transport networks can facilitate comfortable end-to-end journeys, enhancing independence and access to opportunities for people with disabilities.



Maximise inclusion and resilience through a twin-track approach

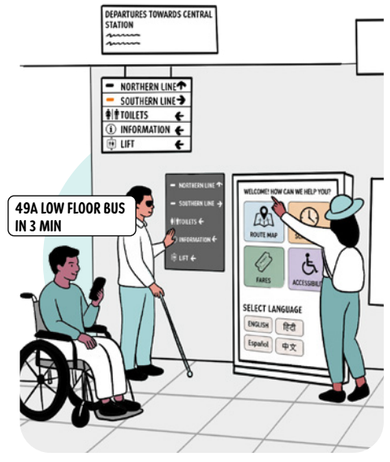
A twin-track approach combines accessibility in mainstream systems with targeted solutions for people with disabilities. While ensuring disability inclusion in low-emission public transport, walking, wheeling, and cycling networks is vital, specialised door-to-door demand-responsive services, such as wheelchair-accessible vans and taxis, are necessary for people with specific support needs. Embedding climate resilience across both tracks ensures continuity of mobility and enables people with disabilities to travel safely, independently, and with dignity.

Provide accessible updates about service disruptions

Easy-to-access and up-to-date information about public transport service schedules and routes must be provided via multiple channels (such as signage boards, smartphone apps, website, and telephone helpline) to enable trip planning for people with disabilities. During climate events, clear announcements about service disruptions and alternate routes must be made at stations or stops, inside vehicles, and via digital platforms. Information should be easy-to-understand and accessible in multiple formats and languages, through signage, audio announcements, sign language, and closed captions, that are also compatible with AT. Where necessary, provide alternatives, such as an accessible van or taxi, to reach the nearest operational stop.

Strengthen accessible evacuation systems and emergency preparedness

Ensure that public transport infrastructure is designed to support safe, rapid, and inclusive evacuation during emergencies. This includes step-free evacuation routes within stations and vehicle designs that allow for dignified evacuation of people using mobility aids. Train customer-facing staff and first responders on disability-inclusive emergency protocols, develop clear and accessible communication materials regarding safe evacuation, conduct drills regularly, and appoint points of contact across agencies to ensure rapid evacuation of people with disabilities during climate disasters.



Mandate inclusion and resilience in new infrastructure, alongside retrofitting existing transport systems

The low-carbon transition serves as a strategic opportunity to simultaneously embed inclusive design and climate resilience as mandatory criteria within the design, procurement, and contracting processes for proposed transport systems and services, including in vehicle fleets. This can ensure that accessibility, climate-responsive materials and standards, and long-term adaptability are built into future transport systems. While design and deployment of new transport systems can be time- and resource-intensive, prioritise retrofitting existing infrastructure through measures such as adding low-floor access ramps to buses, improving lighting and safety features along cycling networks, installing cool roofs or enhanced ventilation systems at stations, and setting up passenger information systems.

Enhance resilience of transport systems through proactive maintenance

Institutionalising scheduled maintenance shutdowns (e.g., annual week-long closures) and precautionary service suspensions during extreme weather events provides transport agencies with dedicated windows for critical maintenance, safety checks, and climate adaptation measures, thereby enhancing system reliability, passenger safety, and long-term resilience.

07 Inclusive and Resilient Public Spaces

Public spaces, understood here as places of civic participation and gathering, are central to urban life. These include parks, playgrounds, community centres, squares and plazas, and open-air markets. For people with disabilities across all ages, these spaces provide opportunities for visibility, independence, recreation, access to nature, and social participation, contributing to a greater sense of belonging and positive mental health.

Yet, many such spaces remain inaccessible for people with disabilities. Barriers such as steps, uneven surfaces, and a lack of basic amenities such as accessible toilets and seating affect independent mobility and comfort. Overcrowding, poor acoustics, or unclear spatial organisation lead to disorientation. In addition, social stigma and discriminatory attitudes can make these environments feel unwelcoming or unsafe. Prolonged exposure to heat and sun is particularly severe for individuals with high photosensitivity, such as people with albinism or epilepsy.

Further, as a result of rapid urbanisation in cities globally, there is an increase in impervious surfaces and a decrease in green spaces and vegetation, triggering the urban heat island effect and exacerbating flooding risks, greatly impacting people with disabilities.

> ***When facilities are not built with shade or tree cover to shield from the scorching sun, it becomes a limitation for people with sensory impairments, particularly albinism.***
>
> Research Participant, Kenya

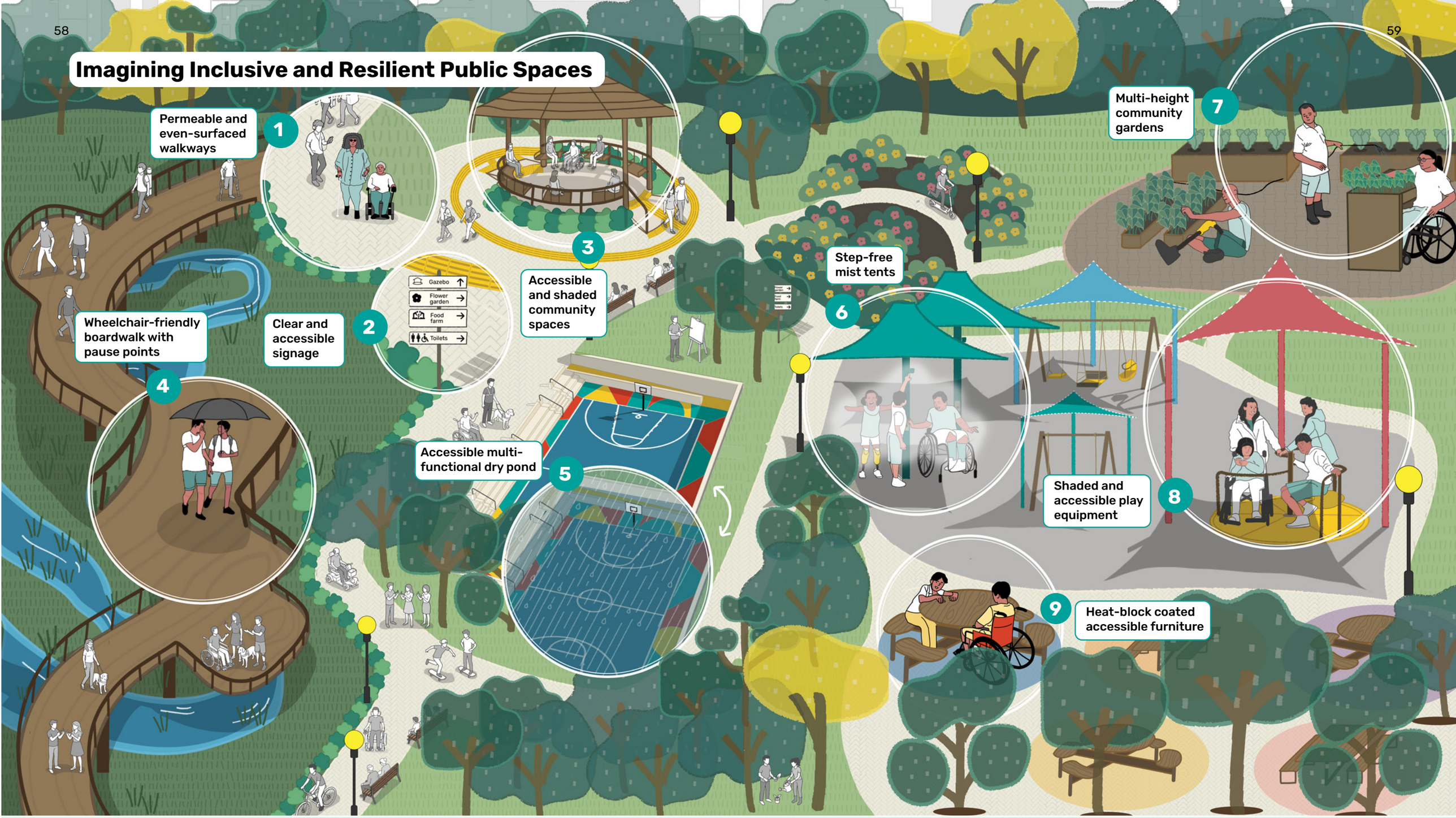
Inclusive, resilient public spaces, therefore, are key to:

- **restore and integrate blue-green infrastructure** that reduces climate risks;
- **strengthen social infrastructure** by creating environments where people with disabilities can connect, build relationships, and support one another in the face of climate change; and
- **enhance access to green spaces** that improve the physical and mental health and wellbeing of all people, including people with disabilities.

Permeable and even-surfaced pavements reduce stormwater runoff and allow people in wheelchairs to comfortably access all parts of the park

Reclining seats under tree shade that allow park visitors to lounge and rest comfortably in Tebet Eco Park, Jakarta, Indonesia. Source: Haryo Bimo

Imagining Inclusive and Resilient Public Spaces



1. Allows rainwater to filter directly into the ground and reduces surface run-off
2. Empowers visitors to navigate independently, prevents disorientation and encourages exploration
3. Provides respite from harsh weather and offers a safe and comfortable outdoor environment for socialising
4. Raised above potential flood levels and can be used even after heavy rains; protects wetland and swamp ecosystems
5. Serves recreational purposes during dry spells; temporarily holds rainwater and prevents stormwater drains from overflowing
6. Instantly drops ambient outdoor temperatures and alleviates heat stress during hot summers
7. Enhances community-level food security; enables people with disabilities to connect with nature and community for mental wellness
8. Prevents play equipment from heating, allows children to play without exposure to extreme heat and sun and prevents contact burns
9. Passively reflects solar radiation and prevents materials from warping, cracking, or retaining heat

Recommendations

These sector-specific recommendations must be considered alongside the foundational actions outlined on **Pages 36 - 38**, as their combined application is essential to achieving inclusive and resilient outcomes.

Involve people with disabilities in resilient placemaking

Ensure that public spaces cater to diverse user needs by involving people with disabilities in the design process. For playground design, actively engage children with disabilities and caregivers to shape play environments that support different physical, sensory, and cognitive impairments. These can include adaptive swings that provide full-body support, wheelchair-accessible slides, or musical chimes. Use creative and engaging methods in participatory design workshops, such as drawing, collaging, and games like LEGO and Minecraft, to get input from community members.

Strengthen resilience through environmental design

Develop cooler microclimates through shaded areas, green corridors, and natural ventilation pathways that reduce urban heat and improve thermal comfort. Protect mature trees, increase canopy cover, and incorporate blue-green infrastructure, such as rain gardens and permeable paved surfaces, to manage stormwater and support biodiversity. Involve people with disabilities in community gardening activities to promote a connection with nature and community, and contribute to food resilience.

Enable access to all public-use areas in parks

Ensure that all public-use areas in parks are accessible for people with disabilities by incorporating step-free access and even-surfaced pathways. In large parks, provide diverse seating, accessible toilets, and drinking water points at multiple, well-distributed locations. Park design should enable people with disabilities of all ages to experience nature, recreation, and social interaction equitably, rather than limiting access to few designated areas only.

Ensure safety in blue-infrastructure spaces

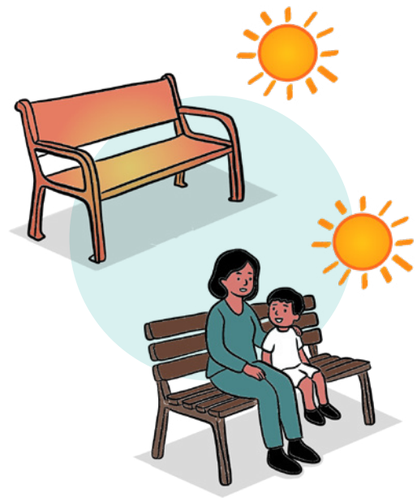
Blue infrastructure is essential for climate resilience and serves multiple purposes simultaneously, such as managing stormwater runoff, improving biodiversity, and supporting social interaction. Features like rain gardens, retention ponds, and restored floodplains can temporarily store large volumes of water during heavy rains or cloudburst events. Hence, these spaces should be planned and designed with safety considerations for all visitors. To prevent any drowning risks, these areas should have gentle slopes, clear caution or warning signage, and be cordoned off with railings or hedges, while still allowing for visual connection.

Reduce exposure to heat and harsh sun with shade and water features

Where possible, public spaces must also serve as refuge from heat stress. Incorporate rest areas within shaded structures like gazebos and pavilions, plant trees with large canopies, and install cooling features such as mists, sprinklers, and water fountains. In play areas, prioritise equipment with built-in shade structures or provide shade sails during summer months.

Incorporate flexible and multifunctional design

Public spaces should be designed to serve multiple uses at a time. For example, combining a community centre with an accessible laundry facility and an inclusive park can allow caregivers to supervise children at play while completing daily tasks. Public spaces must also be designed for temporary or seasonal uses under changing climate conditions. Parks, playgrounds, and community centres can act as recreation spaces on normal days, while also functioning as temporary flood retention areas, cooling centres, emergency gathering spaces, or venues for seasonal community activities during periods of climate stress or changing community needs. Such flexibility enhances community resilience and maximises the value of limited urban land.



Balance durability, resilience, and sensory comfort

Select materials and design features that are durable, climate-resilient, and provide sensory comfort. Material choice should not create additional risks or discomfort during extreme weather conditions. For example, exposed uncoated metal parts of play equipment can become dangerously hot during heat waves and may cause burns upon prolonged contact. Similarly, while metal mesh panels improve ventilation, high-contrast and overly bright colours, intricately repetitive patterns, and reflective surfaces can overstimulate users with sensory needs or trigger people with photosensitive epilepsy.

Improve wayfinding signage and evacuation information

Public spaces should include clear, multi-format communication systems that support people with diverse sensory and cognitive needs in both everyday use and emergencies. Use tactile maps and wayfinding, colour-coded navigation, and accessible signage with routes and spatial layouts to help visitors independently navigate parks, playgrounds, and community centres and easily locate amenities. These systems should also support orientation and evacuation during climate-related disruptions. Emergency refuge areas and evacuation routes must remain fully accessible and clearly identifiable during climate events.

08 Way Forward

GDI Hub's research at the intersection of urban infrastructure, disability inclusion, AT, and climate resilience has recurrently reinforced the need for and significance of transdisciplinary thinking and cross-sectoral coordinated action to ensure people with disabilities are part of shaping resilient futures. For example, during heavy flooding, an accessible housing unit works best when nearby parks manage stormwater effectively, and an AT user can choose low-emission public transport to get to work. Ultimately, the most inclusive and resilient solutions do not sit in siloes, but within inclusive urban ecosystems, where infrastructure, services, culture, and governance work together to ensure city residents can participate fully in urban life in the context of a changing climate.

This Playbook serves as a starting point, where inclusive climate infrastructure design has been discussed from the view of three key sectors: housing, transport, and public spaces. However, inclusive climate infrastructure design as a spatial and functional concept applies to all urban sectors and their interconnected systems. This includes energy, water, sanitation, and hygiene (WASH), food, and healthcare. Adopting a systems-thinking approach is crucial to understand various urban scenarios as experienced by people with diverse disabilities and foster place-based inclusive innovation. From this background, GDI Hub will continue to demonstrate how inclusion and resilience are both essential for co-designing urban built environments where AT users can thrive, through testing unit-level solutions and catalysing systems-level change.

To strengthen the evidence base and continue meaningful knowledge exchange, GDI Hub invites researchers, practitioners, and organisations working across urban climate infrastructure sectors to share insights, case studies, and practical recommendations. We seek to highlight what works in embedding disability inclusion and advancing inclusive design, not only as a set of projects but also as a guiding mindset and methodology shaping equitable urban climate futures. Please scan the QR code to share your input.

Scan QR code to share your input

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