


Public Transport in National Adaptation Plans

Strengthening resilience of infrastructure & human settlements to climate change impacts



Public transport remains an important yet underrepresented component of global adaptation efforts and National Adaptation Plans (NAPs). NAPs should establish a long-term vision for climate-resilient public transport, because building the resilience of public transport, infrastructure, and human settlements is critical for adapting to the impacts of climate change, particularly in vulnerable urban contexts, and for advancing the Sustainable Development Goal (SDG) 11 on resilient, sustainable cities and communities. And estimates show that every \$1 invested in adaptation and resilience generates more than \$10 in benefits over ten years.



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Introduction

Building the resilience of public transport, infrastructure, and human settlements is critical for adapting to the impacts of climate change, particularly in vulnerable urban contexts, and for advancing the Sustainable Development Goal (SDG) 11 on resilient, sustainable cities and communities.

Climate-related hazards cause around [USD 15 billion in damage to transport systems each year](#), with over USD 8 billion occurring in low and middle income countries, where the economic impact is most severe. Without stronger policies, the transport sector could face up to 97.8% infrastructure loss by 2050, the highest of any sector. In addition to the physical damage, transport disruptions have severe impacts on communities and economies.

The [UN-Habitat World Cities Report 2024](#) estimates that cities require USD 4.5 trillion to 5.4 trillion annually to maintain resilient urban systems, while only about USD 831 billion is available. Yet, [every \\$1 invested in adaptation and resilience generates more than \\$10 in benefits over ten years](#).

What is a National Adaptation Plan (NAP)?

The Global Goal on Adaptation urges Parties to increase the resilience of infrastructure and human settlements to ensure basic and continuous essential services while minimising climate-related impacts. Adaptation and mitigation efforts are mutually reinforcing. Adaptation helps to cope with the unavoidable effects and creates the resilient foundation for mitigation action and sustainable development.

A NAP is not time-bound, so can act as a government's official medium and long-term roadmap for how it will prepare for and manage the impacts of climate change such as floods, extreme heat, storms, sea-level rise, and landslides across key sectors of the economy. Like Nationally Determined Contributions (NDCs), NAPs are developed under the UNFCCC process and are designed to:

- a) Reduce vulnerability to the impacts of climate change, by building adaptive capacity and resilience;
- b) Facilitate the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programmes and activities, in particular development planning processes and strategies, within all relevant sectors and at different levels, as appropriate.

As of June 2026, a total of 89 NAPs have been submitted to the UNFCCC: [77 submitted NAPs from developing country Parties](#) and [12 from developed country Parties](#). A number of [Sectoral NAPs and other Outputs \(Developing Country Parties\)](#) have also been produced.

No dedicated guidance is available on transport and infrastructure within NAPs. Yet public transport authorities, operators, manufacturers and wider stakeholders in [the public transport sector are increasingly facing a series of impacts induced by climate change](#), such as: physical impacts on infrastructure and assets (e.g. damaged infrastructure following extreme weather events); impacts on services and people, especially from heat, flooding and severe wind/storms; impact on changing demand for public transport assets and products under emerging climate conditions (e.g. impacts of extreme heat on the uptake of public transport or active travel options).

Avoid-Shift-Improve-Adapt Approach

The “Avoid–Shift–Improve–Adapt” approach, adopted by some countries to assess transport measures in NAPs, provides a structured framework for integrating climate mitigation with long-term resilience planning in the transport sector. It builds on the well-established “Avoid–Shift–Improve” model by explicitly incorporating adaptation to climate impacts.

The first component, **avoid**, focuses on reducing unnecessary polluting travel and preventing exposure to climate risks. This can include avoiding the construction of transport infrastructure in flood or landslide-prone areas, as well as promoting compact and mixed-use urban development to shorten travel distances by integrating transport and land-use planning. Compact urban design can also contribute to adaptation by reducing urban heat island effects and easing pressure on transport systems.

The second component, **shift**, aims to encourage a transition toward more sustainable and resilient transport modes by reducing dependence on private car use and increasing the use of public transport, walking, and cycling. This includes policies and investments such as expanding and modernising public transport systems, improving service reliability, quality and accessibility, developing safe pedestrian pathways and cycling infrastructure or even shifting travel patterns to avoid hottest times of the day during heatwaves.

Shifting toward sustainable transport modes can support both mitigation and adaptation objectives. In addition to reducing emissions and air pollution, diversified and multimodal sustainable transport systems make cities more resilient to climate disruptions because they reduce dependence on a single mode of private transport and provide alternative mobility options during extreme weather events or when there are direct damages to transport systems.

The **improve** component focuses on enhancing the efficiency, reliability, and resilience of existing transport systems and infrastructure. This can involve upgrading rail tracks to withstand extreme heat, improving drainage systems to reduce flood disruptions, retrofitting stations and depots for climate resilience, modernising vehicle fleets with more energy-efficient or zero emissions vehicles, and deploying smart transport technologies that improve operational management during extreme weather events. Passenger-focused measures, such as air conditioning and real-time information services during disruptions, can also improve comfort and reliability under changing climate conditions.

Argentina

The transportation sector is a fundamental pillar of climate policy, whose actors are committed to implementing measures to reduce GHG emissions generated by the activity and to adapt its infrastructure and operation. Promoting sustainable mobility requires a systemic and detailed analysis, which takes into account the particularities of the management and planning of mobility and transport subsystems (distinguishing types of demand and scale of flows) and promotes an introspective review of each, as well as dialogue between them. These criteria are based on the "avoid-change-improve-adapt" approach.

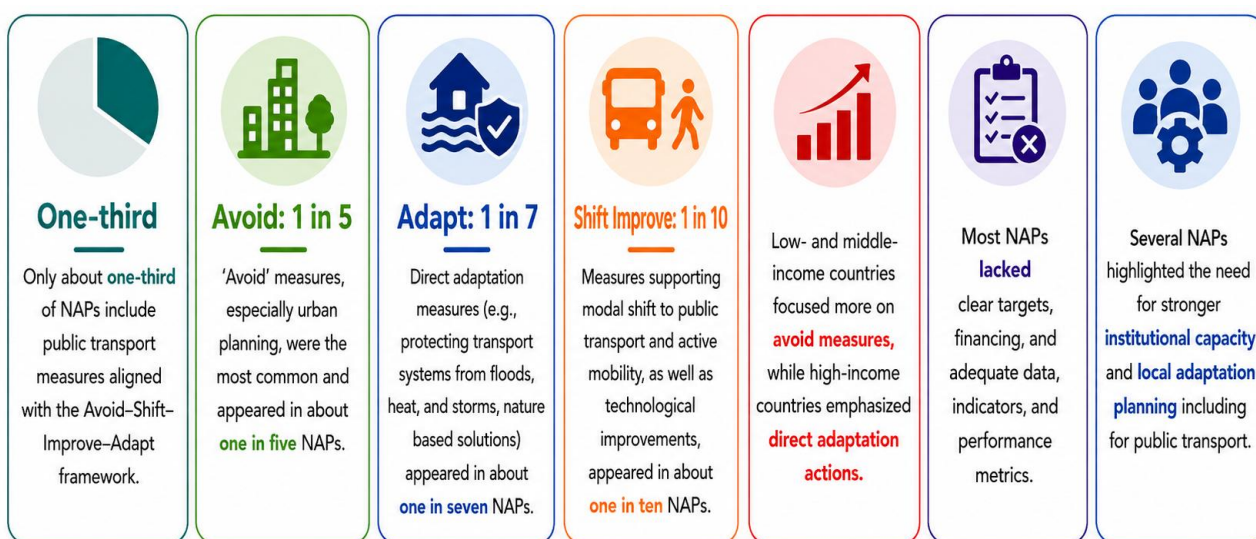
Finally, **adapt** addresses the management of unavoidable climate impacts through targeted resilience measures. These include constructing flood defences in and around public transport, implementing early warning and emergency response systems, applying climate-resilient design standards for public transport infrastructure, and strengthening maintenance and recovery plans after extreme events. Nature-based solutions are also increasingly used as adaptation measures, such as planting trees to provide shade at stations and along streets, restoring wetlands for flood protection,

and incorporating green tram tracks and permeable surfaces to reduce heat and manage stormwater runoff.

Together, these four components provide a comprehensive framework that helps governments prioritise actions across prevention, behavioural change, system improvement, and climate resilience. By linking mitigation and adaptation objectives, the Avoid–Shift–Improve–Adapt approach supports a more proactive, integrated, and cost-effective transport and climate policy approach.

Public Transport in NAPs

Public transport remains an important yet underrepresented component of global adaptation efforts and NAPs, with only around one-third of overall plans including public transport related measures aligned with the Avoid–Shift–Improve–Adapt framework. While around two-thirds of developed countries incorporated interventions based on this approach (noting the smaller sample size), only about one-quarter of developing countries did so.



Urban planning (“avoid” measures) was the most frequently cited, appearing in approximately one in five of NAPs. Direct adaptation measures aimed at hardening public transport assets against floods, heat, and storms, as well as nature-based solutions, were less common, each appearing in around one in seven NAPs. About one in ten NAPs included measures promoting shifts to public transport and active mobility, while a similar share featured technological improvements.

Austria

The mobility transition requires, among other things, increased use of public transport and active mobility. To ensure that these are also attractive in the summer months, it is essential to improve thermal comfort in public transport, transport stations and company buildings and to provide shade for cycling and walking infrastructure. Cleverly combined mitigation and adaptation strategies (e.g. shading with photovoltaic systems, tree planting after demolition/parking space reduction, shaded cycle paths instead of parking lanes, shaded pavements and ground floor arcades, etc.) must be increasingly used, considered and communicated in traffic and open space planning.

When focusing on NAPs that identified public transport related interventions, developing countries were more likely to include avoid measures focused on urban planning, which appeared in around three-quarters of their public transport related NAPs, whereas developed countries placed a much stronger emphasis on direct adaptation measures, featured in about nine out of ten of their NAPs.

Beyond this distinction, the two groups showed broadly similar patterns: around one-third of NAPs that included public transport interventions in both developed and developing countries incorporated shift-oriented objectives, while around one-quarter include technological improvements.

Lebanon

Integrate energy and water-efficient building design and mass transit infrastructure into urban planning frameworks to reduce urban heat island effects, enhance climate resilience, and promote low-emission, pedestrian-friendly environments.

Targets are largely absent, although several NAPs emphasise the need to strengthen institutional capacity and support the development of local adaptation plans that include the public transport sector.

Lao People's Democratic Republic

Promote the development of multimodal transportation systems, infrastructure, urban design that is resistant to climate change and disasters.

Invest in low-carbon public transport, such as electric buses and trains as well as in renewable energy sources and energy-efficient technologies as it helped reduce the dependency and enhance transport resilience.

New Zealand

Action 8.6: Invest in public transport and active transport.

Current Investment in multi-modal infrastructure can increase the resilience of the transport system and help manage the vulnerability of existing assets. More use of public transport and active modes will help reduce reliance on private vehicles. It will increase system redundancy, improve equity and support sustainable growth. Safe and attractive alternatives to driving create a more resilient transport system, support sustainable growth and reduce emissions.

Action 8.7: Embed nature-based solutions as part of the response to reducing transport emissions and improving climate adaptation and biodiversity outcomes.

At a local, regional and national scale these measures can reduce transport emissions and improve climate adaptation as well as biodiversity.

Even when the resilience needs of public transport systems are well recognised, financing is often lacking, insufficient, uncertain, or heavily reliant on external support. In addition, many NAPs lacked information on the data, indicators, and performance metrics needed to assess the climate resilience of public transport networks. This limits the ability to identify priority actions and investment gaps, monitor progress, and support evidence-based adaptation planning.

Measuring access to public transport – as targeted under SDG 11.2 on inclusive, safe, resilient, and sustainable cities – as well as the frequency of climate-related public transport service disruptions offers a practical measure of how well transport systems

are resilient and adapting to climate change, in the context of infrastructure and human settlements.

Brazil

By 2035, reduce, by at least 30%, operational interruptions in federal transportation infrastructure caused by climate events.

Tracking delays, shutdowns, or rerouting from storms, floods, or heatwaves reveals the real-world impacts of climate stress on public transport systems and the economy, guides targeted investment, and safeguards communities' reliable access to public transport services.

Lessons Learned

Strengthening NAPs requires making urban mobility and public transport a central pillar of climate resilience rather than a peripheral sector in NAPs.

This means explicitly embedding public transport and urban mobility

within national adaptation priorities and applying a clearer Avoid–Shift–Improve–Adapt approach. Doing so can help align NAPs with NDCs, strengthening synergies between climate resilience objectives and broader global climate goals.

NAPs should establish a long-term vision for climate-resilient public transport, support local transport authorities and public transport operators in integrating adaptation into planning and operations, and strengthen the evidence base for decision-making through resilience standards, guidance, research, and data improvements. Greater emphasis is also needed on resilient infrastructure investment, nature-based solutions, and stronger coordination between local public transport organisations, urban planning, and climate ministries, as fragmented governance often weakens implementation.

Finally, monitoring and financing mechanisms should be more explicit, including indicators such as climate-related service disruptions and access to public transport,

Strengthening NAPs requires positioning urban mobility and public transport as central pillars of climate adaptation and resilience planning.

alongside dedicated climate finance to prevent urban mobility and public transport adaptation from being underfunded relative to other sectors.

The Adaptation Fund under the Paris Agreement can support adaptation projects and programmes aligned with priorities identified through the NAP process. Strengthening the links between NDCs and NAPs can improve access to climate finance for national and local governments, while enhancing coordination across ministries and levels of government to accelerate the implementation of integrated adaptation and mitigation measures in priority sectors, including public transport.



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