UITP ADVANCING PUBLIC TRANSPORT

POLICY BRIEF

ADAPTING PUBLIC TRANSPORT TO CLIMATE CHANGE: THE KEY FOR RESILIENT CITIES

JULY | 2024

INTRODUCTION

As a more energy efficient, inclusive and cost-efficient mode of transportation in cities and territories, public transportation is supporting the implementation of the Paris agreement's objectives of reducing carbon emissions with the aim of mitigating climate change.

However, climate change impacts generate real risks to public transportation systems' availability and reliability, and is forecast to get worse as the climate crisis deepens. It is already affecting weather and leading to more frequent extreme climate events in every region across the globe, causing widespread adverse impacts to nature and society.

A lack of drainage led to the flooding of the Tyne and Wear Metro in May 2017, forcing a 10 minute journey to take 1 hour.

This Policy Brief is intended to provide insights on the importance for the entire public transport sector to increase and accelerate their efforts to adapt to climate change. These steps are vital to improve the quality of service and safety of public transport users, operational and financial resiliency and make sure that public transport remains the backbone of sustainable mobility. If adaptation is done well, it also creates great opportunities to create more attractive, nature-rich, livable cities, with strong communities and vibrate local economies.

As part of a greater sustainability approach, a more comprehensive and practical document proposed by UITP supports this Policy Brief, and presents an accessible framework describing initial steps for UITP members to step into an adaptation journey. Examples from different stakeholders involved in public transport worldwide are presented. This Climate Change Adaptation Framework is available on MyLibrary.

WHY WE NEED TO ADAPT PUBLIC TRANSPORT TO CLIMATE CHANGE

Beyond the mitigation of climate impacts on transport and mobility, **climate change adaptation contributes to the robustness of the public transport sector and organisations.** In an uncertain, volatile, fast changing and sometime chaotic context, climate adaptation at its simplest is ensuring long-term business viability.

Adaptation is key to cost-efficiency. Climate change adaptation is inherently linked with **key organisational concerns,** such as **good asset management, risk management** and **health and safety**. Therefore, if integrated effectively and proactively, adaptation has a high return on investment. A 2019 analysis of potential infrastructure scenarios estimates that US $1 of investment in strengthening infrastructure in low- and middle-income countries results in a median of US $2 in benefits, which increases to US $4 when climate change is considered[vii].

Ensuring continuity of transport services

- Supports operational continuity of public transport and limits impacts on people's access to mobility.
- Fosters sustained levels of ridership through provision of a comfortable, reliable service.

Strenghening organisations

- Better asset management and risk management.
- Contributes to health and safety of staff.

Optimising cost

- Helps to manage costs associated with maintenance and asset upgrades.
- Has the potential to reduce costs of response to climate impacts, suspended activities, reconstruction and recovery, and insurance that are escalating due to more recurring extreme weather events.

Fostering community resilience

- Contributes to preserving safe and resilient communities.
- Contributes to health and safety.
- Protects population against psychological impacts of severe climate events.
- Has the potential to support an increase of greenery in urban environments.

Figure 1: examples of the benefits of climate change adaptation measures

CLIMATE CHANGE IMPACTS ON THE PUBLIC TRANSPORT SECTOR: ALREADY A REALITY

The impacts of climate change – including on public transport – can already be noticed around the world today.

According to the Intergovernmental Panel on Climate Change (IPCC), even if we mitigate our emissions and achieve the goal of the Paris Agreement to limit the increase of temperature to 1.5°C by 2050, effects of climate change are expected to intensify, with vulnerable communities being disproportionately affected[i].

Societies will experience, on one hand, more recurring, extreme weather events such as storms, flooding or heat waves and, on the other hand chronic impacts such as coastal erosion or higher average temperatures. It is expected that it will have major impacts on our societies and human settlements.

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 mass transit or active travel options).

A bus stop surrounded by bush fires. According to UNEP, Wildfires are set to rise by 50% by 2100.

CLIMATE HAZARDS	EXAMPLES OF IMPACTS ON PUBLIC TRANSPORT
Hydrological risks such as extreme flooding	2021, Henan Province (China): flooding of rail tunnels. 500 people had to be rescued and 12 people died. The flooding also caused widespread damage to roads and 200,000 evacuations. Dams and reservoirs breached warning levels and flights and trains were suspended[ii].
Geophysical risks, such as coastal erosion	2022 to 2023, California (USA): Amtrak and commuter operator Metrolink (Southern California) suspended operations due to safety concerns over erosion of shoreline below the railway following heavy rains. Coastal erosion is projected to worsen due to climate change with the west coast of the US projected to face up to 8 inches of sea level rise just the next 25 years[iii].
Climatological, such as extreme heat	2022, London (United Kingdom): the UK experienced record-breaking temperatures exceeding 40 degrees Celsius for the first time. This led to widespread disruption for Transport for London including cancelled services, temporary speed restrictions, asset failures, and trackside fires and impacts on passenger experience. £8 million was lost in revenue due to 5 million fewer passengers on the London Underground. A strong correlation between asset failure and higher temperatures in tunnels has also been identified.

Table 1: Examples of impacts of climate change on public transport

Impacts of climate change generate risks for public transport on safety of staff and passengers, operational continuity, on reputation of the organisation and/or network, and on finances. As a provider of vital community links, disrupted public transport services can also lead to a series of indirect socio-economic impacts such as loss of access to food, education, jobs, recreation, health and social and government services. The continuity of public transport is essential and measures should be implemented to support the resilience of the sustainable mobility ecosystem and human settlements.

HOW TO REACT FOR A CLIMATE RESILIENT PUBLIC TRANSPORT SECTOR?

KEY CONCEPT DEFINITIONS

When addressing climate change in relation to the transport sector, 4 pillars are essential to consider: mitigation of emissions, **adaptation** to climate impacts, **resilience** to climate change and **adaptive capacity** of human systems. For this document, we consider the concepts as follows (in accordance with definitions from the IPCC):

RESILIENCE

The capacity of interconnected social, economic, and ecological systems to cope with a hazardous event, trend, or disturbance, responding or reorganising in ways that maintain their essential function, identity, and structure.

- For example, a resilient rail operator may use a weather forecasting system to inform speed restrictions, allowing them to keep services running in a safe manner.

ADAPTATION

Adaptation reduces the need to rely on resilience. The process of adjustment to actual or expected climate and its effects, to moderate harm or exploit beneficial opportunities. For example:

- Investing in flood resistant infrastructure to ensure continued service during an extreme rainfall event.
- Operational maintenance processes and practices to adjust, evolve or respond effectively to changing climatic conditions.

MITIGATION

These include the human interventions to reduce emissions or enhance the sinks of greenhouse gases.

- For example, investing in electric buses to reduce greenhouse gases.

ADAPTIVE CAPACITY

The ability of a (human) system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences[i].

- For example, an organisation with an existing emergency response plan may have greater adaptive capacity.

Table 2: Key concepts definitions

CLIMATE RISKS MANAGEMENT IN PUBLIC TRANSPORT TODAY

Public transport is increasingly vulnerable to climate change and the probability of more significant and widespread impacts over the value chain is increasing. **Some organisations are undertaking work to integrate adaptation into their planning and risk management to limit the impacts of climate change, however there is still much more work to do.** According to a survey conducted by UITP in 2022[iv], a majority of organisations did not integrate climate change adaptation in their strategies and operations. In addition, even if there are best practices, there is a gap in the way different stakeholders consider adaptation as a key policy priority. This lack of awareness, anticipation and measures taken to face the consequences of extreme weather events sadly often results in dramatic effects. Through inaction, organisations are also unprepared for the effects of chronic climate change.

As an asset-heavy, high technology industry and interacting strongly with the built environment and socio-economic system, adaptation of public transport to climate change will lead to greater resiliency of human settlements. A climate resilient public transport system can anticipate climate risks on networks and services, adapt existing assets to future climate conditions and resist and recover from impacts.

With the support of public authorities and governing bodies, all public transport stakeholders have a role to play in the resilience and adaptation journey. It is indeed essential that adaptation measures are implemented at all levels in the sector to secure the provision of safe, affordable, inclusive and sustainable mobility options to citizens around the world.

Figure 2: Adapting the mobility ecosystem for more climate resilient communities.

A PROCESS TO ADAPT THE SECTOR TO CLIMATE CHANGE

Undertaking a climate change adaptation journey is a consequent and iterative process for organisations. To guide public transport in understanding climate risks and identifying and implementing effective adaptation interventions, UITP with the support of ARUP and Transport for London have developed a **Climate Change Adaptation Framework**[v].

The Framework is process-driven, providing 7 stages that can be undertaken to support all organisations from the public transport sector in considering climate risks, impacts and practical adaptation measures to climate change:

1. **Evaluate the maturity** of the organisation in terms of climate change adaptation
2. **Prepare the ground** for climate change adaptation
3. **Assess climate risks** to the organisation
4. **Identify adaptation measures** that address climate risks
5. **Assess adaptation measures** to select those that will be implemented
6. **Implement measures** that help achieve climate change adaptation
7. **Monitor and evaluate** the effectiveness of implemented climate change adaptation measures

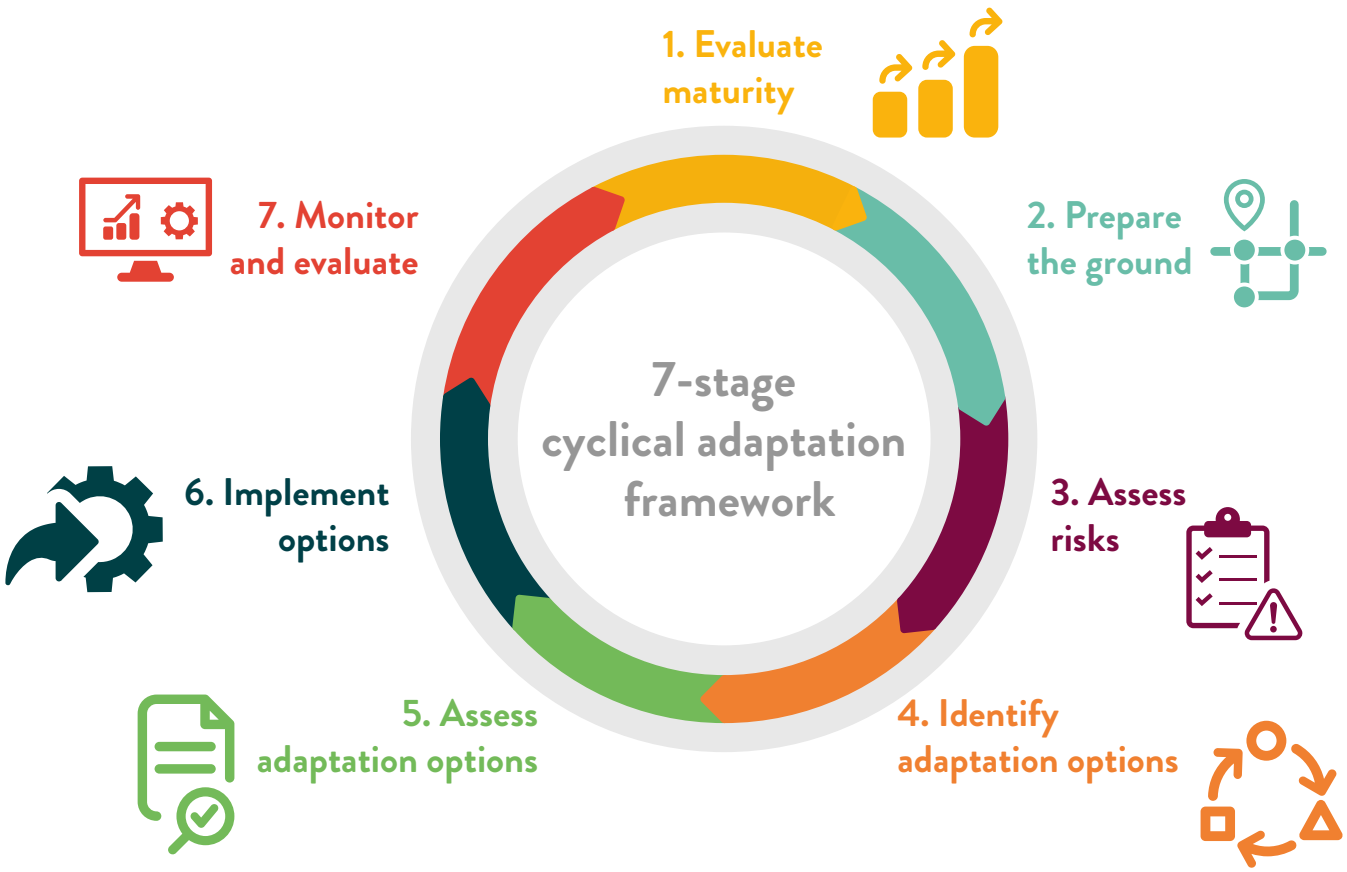


Figure 3: Seven-stage climate change adaptation framework

The process can be applied to a full range of contexts within the sector, regardless of an organisation's:

- **Type:** authorities, operators, manufacturers and other organisations supporting the provision of public transport services
- **Scale** of application of climate change adaptation (see examples in table 3).
- **Size**
- **Geography and policy landscape**
- **Maturity of climate change adaptation journey**
- **Activity:** at any stage of public transport services from transport planning/strategy; project design; construction of new or retrofit of existing services; operation of services and maintenance.

SINGLE ASSET PROJECTS	ASSET PORTFOLIOS	ORGANISATIONS
Climate risk assessment over the whole asset lifecycle (including design, construction, operation and maintenance, and end of life).	Larger scale of climate risk assessment to identify priority locations/assets.	Climate risk assessment focusing on impacts to staff and customers, other functions of the organisations such as procurement and supply chains.

Table 3: Illustration of project scale: climate risk assessment.

THE 7 STAGE PROCESS TO CLIMATE CHANGE ADAPTATION OF PUBLIC TRANSPORT

The full version of the UITP Climate change adaptation framework can be found online via MyLibrary.

Stage 1 - Evaluating climate change adaptation maturity

When commencing climate change adaptation work, it is important that organisations take stock of their progress to date and understand any gaps in their approach. According to the maturity and ambition of adaptation, approaches will differ for organisations.

Stage 2 – Preparing the ground for climate change adaptation

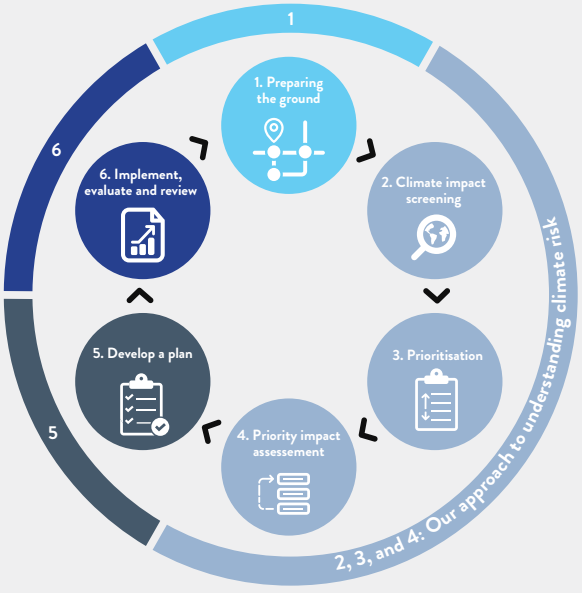
To prepare the following stages, organisations may **develop a Climate Change Adaptation Strategy**, create a programme of works, or identify where climate change adaptation fits into a wider programme. In any case, it will need to:

- Raise awareness on climate change adaptation within the organisation at all levels.
- Secure resources and build clear governance.
- Understand the context and requirements: align with policies at local, national and international levels.
- Setting the vision: what is the end goal of the organisation with climate change adaptation?
- Define scope and boundaries: what is the organisation setting out to adapt to climate change? Through a spatial, functional and stakeholder lens.

CHALLENGE: One of the barriers which can arise in implementing climate change adaptation is the lack of awareness on adaptation and coordination between different levels on the matter. Identifying and empowering staff members across the organisation is essential.

CASE STUDY: REFRESHING TRANSPORT INFRASTRUCTURE IRELAND'S (TII) CLIMATE CHANGE ADAPTATION JOURNEY

The publication of TII's Climate Adaptation Strategy in 2022 prepared the ground for the organisation-wide journey on adaptation. The Strategy sets out an ambitious six-stage approach in line with the Irish Government's Sectoral Planning Guidelines for Climate Change Adaptation[vi], which TII will follow over the next five years. It contains clear milestones and a senior leadership governance structure to deliver the approach. This includes conducting detailed climate change risk assessments for TII's staff, passengers and external stakeholders and asset portfolios: light rail, greenways and cycleways, national roads, land and buildings. The multi-scale approach is embedding climate change adaptation across the organisation's activities.



TII's climate adaptation approach

Stage 3 - Assessing climate risks

In order to take effective climate change adaptation actions, **it is essential to improve understanding of climate risks and impacts, including direct impacts on an organisation's assets or indirect impacts, such as supply-chain disruption or reduced customer confidence.** This understanding should be science and evidence-based. It is recommended to start with a preliminary climate impact screening, followed by more detailed climate change risk assessments for priority impacts.

A climate risk assessment process entails the organisation should:

- **Define the risks** to understand how climate hazards can cause adverse impacts to receptors (e.g. assets, staff, customers and the territorial context of a public transport setting) and;
- **Assess each climate risk** with the current climate and future climate, which can be derived using a combination of hazard, vulnerability and exposure.

CHALLENGE: in low-income countries, there is often a lack of transport sector specific guidance and a gap in climate data available. This can represent a barrier in developing climate risk assessments. Other stakeholders (such as universities, research centres or insurance companies) can support in collecting data or setting up climate risks assessments.

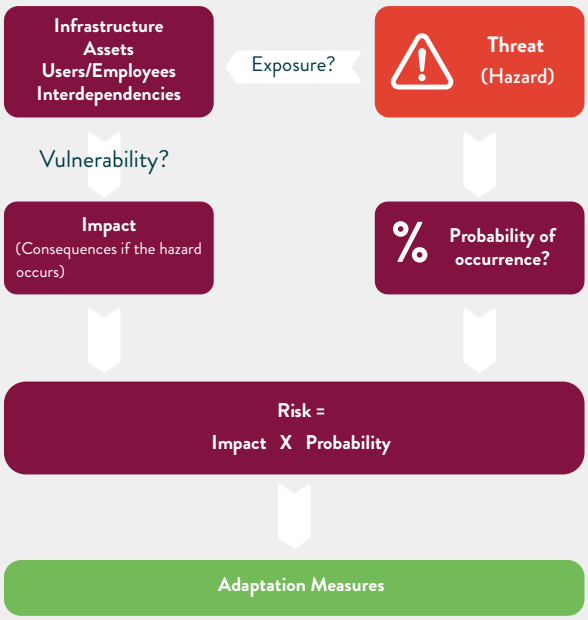
Heavy rainfall in London caused streets to flood in September 2019

CASE STUDY: CLIMATE RESILIENCE ASSESSMENT FOR THE BLUE LINE METRO EXTENSION AND ITS IMPACT ON CLIMATE CHANGE ADAPTATION PLAN OF THE SOCIÉTÉ DE TRANSPORT DE MONTRÉAL (STM)

In 2020-2021, STM completed a climate resilience assessment of the Blue Line Extension. The assessment was adjusted to the climate risk context and there were three impact criteria considered: safety, reliability, and operational resources.

The main risks identified for the Blue Metro Extension were classified in the following four areas: 1) flood risk; 2) heat waves and critical equipment; 3) loss of power supply; and 4) exposed assets. For flood risk, 2D hydraulic analysis were used to identify project vulnerabilities.

Assessing the Blue Line extension project had a significant impact on STM's climate change adaptation plan, as it provided a risk assessment methodology applicable to the network and identified the key strengths and vulnerabilities of the existing network.



Stage 4 - Identifying climate change adaptation measures

Based on climate risks previously identified, **solutions to address climate change related risks should be identified** across these different categories for instance:

- **Physical solutions:** engineered and nature-based solutions, like new flood defences, retrofitting existing infrastructures or sustainable drainage.
- **Behavioural solutions:** changing shift patterns to avoid hottest times of the day during heatwaves, Severe Weather Plans, encouraging active travel to help manage demand for public transport during peak travel times.
- **Institutional solutions:** policy changes (e.g. updating engineering standards to account for climate change), cross-organisation and cross-department coordination, business continuity planning; organisation-wide training and awareness raising (e.g. extreme weather event scenario drill)
- **Digital/technological solutions:** early warning systems, hazard mapping, forecast-informed decision-making, improved incident reporting systems with weather attribution.

Consideration of the project lifecycle can also be helpful, as different adaptation measures are applicable at different stages: planning, design, construction, operations, and maintenance.

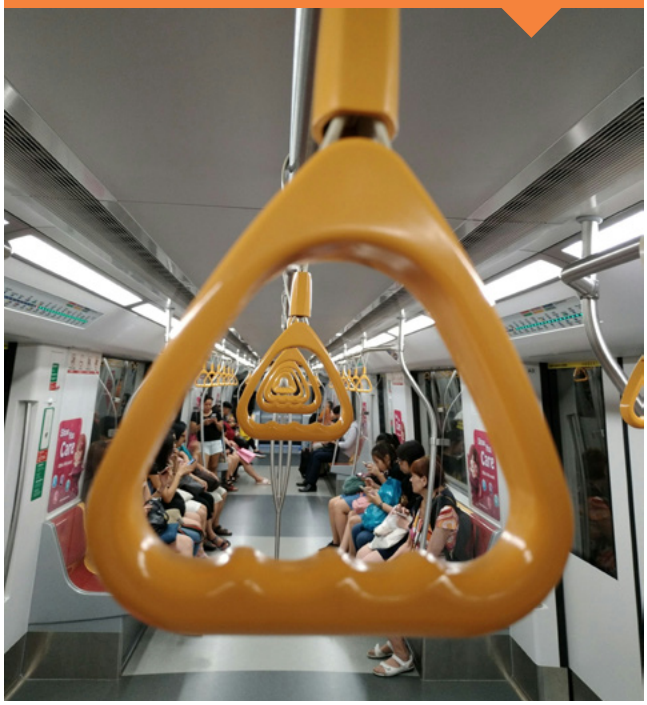
CHALLENGE 1: infrastructure systems are interlinked, so impacts on transport networks can rapidly affect other sectors and vice-versa. Interdependencies must be considered, also to reduce the ripple effects of climate hazards.

CHALLENGE 2: when evidence, strategies, and stakeholders are not properly considered, there is a possibility of maladaptation. This means that adaptation would have negative impacts and worsen the outcomes of climate related events.

CASE STUDY: THE NATIONAL APPROACH OF SINGAPORE TO IDENTIFY COORDINATED SOLUTIONS

Singapore adopts a whole-of-nation approach to address climate change due to its complex and interconnected nature. The Inter-Ministerial Committee on Climate Change (IMCCC) was established in 2007 to enhance the government's coordination on climate change policies. The Land Transport Authority (LTA) supports the Resilience Working Group. This inter-agency platform studies Singapore's vulnerability to the effects of climate change and develops long-term plans that ensure the nation's resilience to future environmental changes. Based on this platform's assessments, a set of solutions addressing climate risks were selected and implemented on the public transport network. This happened in close coordination between different government agencies and operators.

As the threats from climate change are constantly evolving, LTA works closely with both internal and external stakeholders such as other government agencies and operators to ensure the resilience of land transport infrastructure and operations.



Stage 5 – Assessing climate change adaptation measures

From the wide range of identified measures, a **final list of measures to implement** should be selected. This list should include a clear **prioritisation** and categorise measures for the short, medium and long term. Two potential approaches to prioritise measures:

- **Multi-criteria analysis:** allows the assessment to cover many factors (not just financial cost), like urgency, scale of the risk, wider benefits, 'no/low regrets';
- **Quantitative cost-benefit analysis**: remains an emerging area of research.

CHALLENGE 1: While there is general consensus that proactively investing in climate change adaptation outweighs the cost of inaction in the medium to longer term, many organisations see challenges in demonstrating and communicating these benefits. This forms an obstacle to implementing effective climate change adaptation measures. Assessments of measures and justification of their benefits are key in implementing them, noting that attributing the cost of a measure integrated as part of wider projects and investment programmes can be difficult.

CHALLENGE 2: To unlock the necessary funding for adaptation, it may be beneficial to align funding and actions into wider investment plans to ensure investments in transport climate change adaptation are consistent with other activities. Additionally, given the positive impact these actions have on creating a climate-resilient future, funding may be available to support adaptation efforts from governments or development banks.

CASE STUDY: A COST-BENEFIT ANALYSIS TO PRIORITISE MEASURES TO DEPLOY IN THE METROPOLITAN MOBILITY SYSTEM OF BARCELONA

L'Autoritat del Transport Metropolità de l'Àrea de Barcelona (ATM) identified climate risks and proposed actions divided into short and long term for roads, rail infrastructure, ports and airports. A cost-benefit analysis was compared to the cost of investing in adaptation by factoring in infrastructure replacement costs. Costs of inaction were broken down into direct and indirect costs (externalities). The results allowed for the prioritisation of measures with a good cost/benefit ratio. The main priorities identified were to improve drainage capacity with technical and maintenance solutions and flood management capacity of underground stations.

Stage 6 – Implementing climate change adaptation measures

Deployment and implementation of measures can be supported by an **action plan**. For each action, it is important to identify timelines for implementation, the appropriate owner of the action across the organisation, and the feasibility assessments or technical analysis required to fully scope the project.

CHALLENGE 1: Developing a long-term plan to roll out adaptation measures may help secure funding in the short-term for initial action. However, uncertainty in climate projections, paired with the long design life of many assets can also make it difficult to form and communicate the business case for some adaptation interventions. The 'Adaptation Pathways' approach, which allows decisions-makers to take actions under uncertainty can be a useful way to develop a long-term plan.

CHALLENGE 2: In recent years, resistance towards climate change science is seen in societies around the world. The deployment of some measures to mitigate or adapt to climate change may be accompanied with a resistance to change. Public engagement and communication should be taken into account in all stages of deploying measures.

Stage 7 – Monitoring, evaluation, and learning

Finally, the organisation should measure the progress of climate change adaptation actions against the implementation plan, evaluate the uptake and effectiveness of the measures and draw lessons learnt to improve future actions.

A continuous application of the 7-stage approach ensures strategies, knowledge, action plans, and stakeholder cooperation remain up to date, ensuring the best adaptation journey.

CASE STUDY: CLIMATE CHANGE ADAPTATION BY THE METROPOLITAN TRANSPORT AUTHORITY OF NEW YORK CITY (MTA)

In 2012 Hurricane Sandy inundated the public transport network of New York City: subways were flooded, tracks were washed out and crucial infrastructure was damaged by corrosive salt water. Following the event, the MTA embarked on a $7.8billion USD plan to repair and increase resilience of their assets for the future including accounting for projected long term climate impacts.

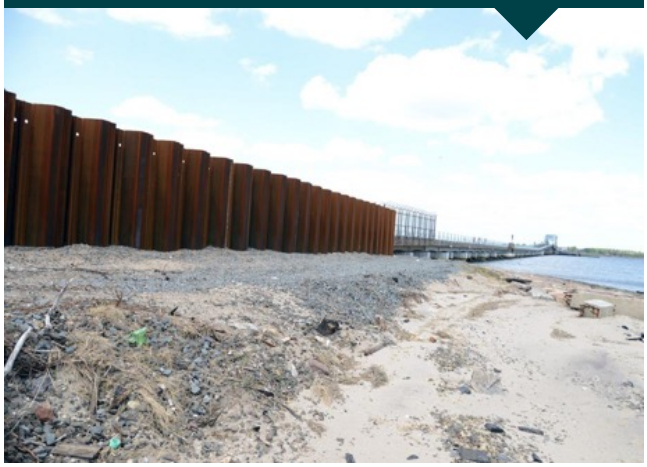
Some of the initiatives implemented as part of this plan include:

Keeping water out of tunnels – flood mitigation devices were installed at vulnerable stations, underwater tunnels were restored, and pumping and electrical systems were strengthened.

Improving supporting infrastructure – train yards and maintenance facilities were rebuilt to be more resilient including improved power and signal systems.

Flood mitigation – numerous interventions were rolled out across the network to increase resilience to future flooding.

Hurricane Sandy spurred a greater focus for the MTA on climate change adaptation, resilience, and sustainability.



THE CO-BENEFITS OF ADAPTATION AND COLLABORATION WITH OTHER STAKE-HOLDERS

Climate change adaptation is one of many sustainability concerns that all stakeholders dealing with the mobility system ought to manage. Adaptation interventions must work in conjunction with other sustainability related issues, such as biodiversity crises, poor air quality, increasing carbon emissions and social issues such as equity and inclusion.

For instance, when considered together with climate change mitigation, effective adaptation measures implemented proactively to protect critical assets can reduce the impacts of extreme weather events and consequently decrease the needs to use carbon intense solutions for clean-up and remediation. Conversely, the embedded carbon and resources required to implement climate change adaptation measures should be considered and where possible minimised.

Similarly, a modal shift from private vehicles to public transport is key in achieving global decarbonisation targets. However, climate change may impact public transport services' safety, reliability, comfort and affordability, which are core components to encourage that modal shift.

Adaptation measures will support this objective by:

- Reducing the potential difficulties a network may face coping with climate effects on services, preventing a decline of customer trust in the system;
- Avoiding a shift of resources from making public transport environmentally sustainable, more accessible, reliable and safe to instead dealing with climate effects, such as asset damage and service disruptions.

Given the interdependencies between public transport networks and the many stakeholders they are serving (city, business, healthcare, leisure…), greater collaboration is required to build resilience. According to the context, there are strong co-dependencies and dependencies between different services to take into account to ensure continuity and recovery of societies after extreme weather events. These links exist, for example, with emergency services, energy suppliers and communications providers.

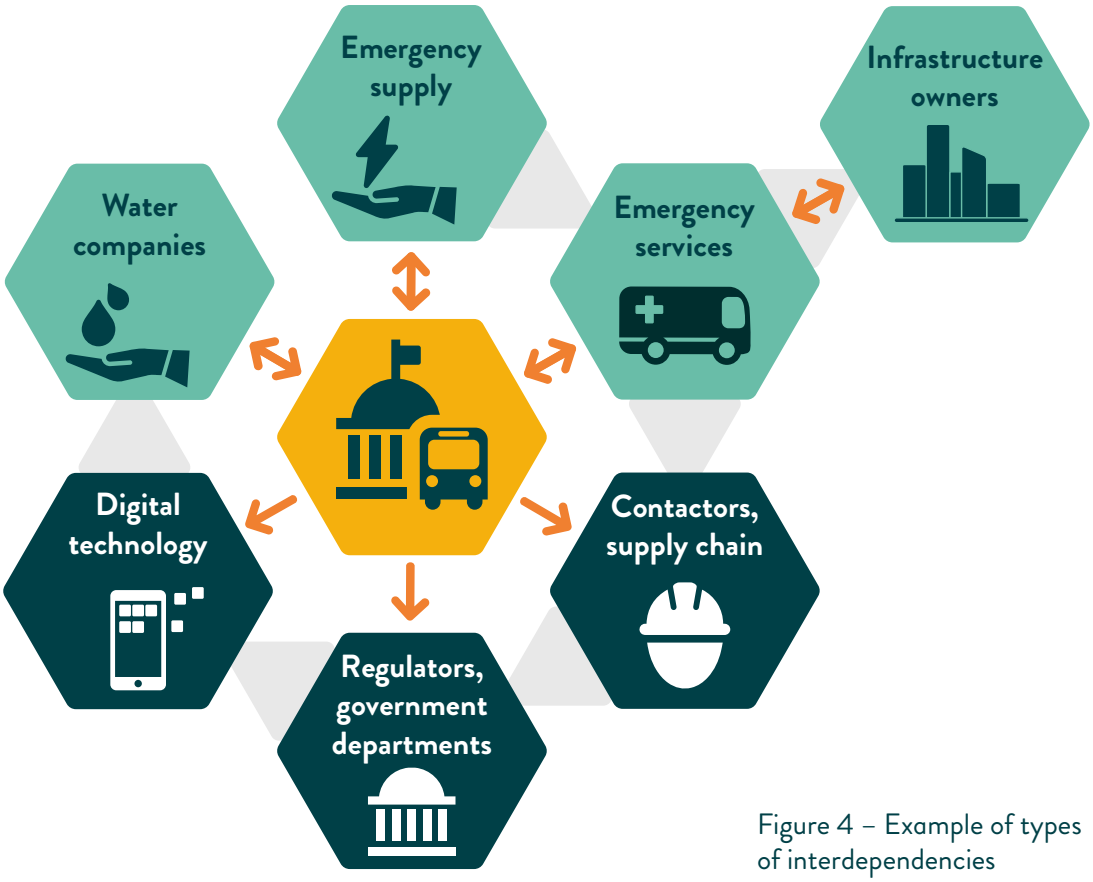


Figure 4 – Example of types of interdependencies

Adapting to climate change is a vital requirement for managing risk, but it is also an opportunity. If done well, adaptation to climate change can be a key driver for improving the quality of the built environment, regenerating nature, improving accessibility, inclusion and economic vitality. A world adapted to climate change is a better world for all. Actions to adapt to climate change should be a strategic priority for all organisation. It will require sustained and continual effort in all the challenges a changing climate can throw at us.

CONCLUSION

Public transport is an essential service provider of sustainable mobility and is key to decarbonising mobility to achieve global climate objectives. By its nature, the sector is energy efficient. Moreover, it is already strongly committed to mitigating its emissions through the energy transition and increased efficiencies.

Still, the sector is at risk from the impacts of climate change. Organisations are already experiencing serious impacts from extreme weather events made more severe by climate change, which is ultimately jeopardising the provision of decarbonised mobility in cities and territories around the world. Over the long term, the cost of inaction to face climate risks is far greater than implementing necessary measures.

Therefore, the sector must strengthen the adaptation leg of its resilience to an increasingly uncertain future climate. We call all UITP members, public authorities and governing bodies to play their part in dealing with this existential challenge. We encourage them to follow the 7 steps of the UITP Climate Change Adaptation Framework to start the adaptation journey of the sector and help public transport networks become more resilient.

This goal requires overcoming some obstacles: such as, the low awareness of adaptation, the need for continual learning and sharing of evidence, and the need to handle the complex relationships among sectors, organisations, and stakeholders.

While actions were taken to address adaptation during the 28th UN Climate Change Conferences of Parties (COP28), funding remains an essential challenge for many public transport organisations around the world. UITP is committed to support the sector and urges all stakeholders of the public transport sector, in synergy, to develop a compelling business case for climate change adaptation. We should also facilitate the implementation of necessary measures to guarantee the resilience and safety of public transport services across the world.

Flooding in the Wong Tai Sin MTR station caused by major rainfall in Hong Kong in September 2023

RECOMMENDATIONS

Recommendation 1: Any stakeholder involved in the public transport sector, from authorities and operators to industry and policy makers, should exercise a leadership role in developing a new mindset, leading to greater awareness and a strategic approach on climate adaptation across the sector and beyond.

- **Develop ambitious climate change adaptation strategies over all organisations of the sector** which should:
  1. Cover **different stages**, from planning, project design, construction and retrofitting, to operations and maintenance processes;
  2. Consider different timeframes from short term crisis management and medium term action on priority assets, to long term continuous effort and;
  3. Integrate **assessments of climate risks and opportunities** within financial and strategic planning.
- **Work across silos in a multistakeholder system** in order to:
  1. Identify **interdependencies** to adapt to climate change (e.g. between stakeholders) to limit compounding, cascading and aggregated risks on transport networks;
  2. Integrate adaptation measures into other **sustainability issues** (e.g. biodiversity crisis, air quality, carbon reduction, equity and inclusion); and
  3. Ensure that strategies are aligned with non-transport stakeholders' strategies that are in interaction with and benefit from public transport.
- **Participate in members networks and forums** to share best practices, caveats and update each other on a regular basis.

Recommendation 2: Any stakeholder involved in the public transport sector, from authorities and operators to industry and policy makers, should develop a holistic climate risk management plan to implement appropriate adaptation measures.

- **Adopt a holistic approach to climate risk management taking into consideration direct impacts on assets, service, people and on changing demand for public transport.** Based on risk assessment, appropriate policy measures should apply to both **assets (hard measures), processes and work practices (soft measures).** Hard measures include existing or retrofitted infrastructure, rolling stock and standards and norms for new infrastructure. Soft measures range from adaptability of the organisation to staff trainings. Adaptation action plans should also ensure they are fit for the local context and involve local communities and stakeholders.
- **Identify and unlock the co-benefits of climate change adaptation measures and synergies with other policy areas, such as zoning, housing, and natural protection.** Adaptation measures can directly benefit public transport users but also bring value to cities and the communities as a whole. More specifically, to other areas such as the improvement of the built environment, regenerating nature, improving accessibility and inclusion on networks, and economic vitality.
- **Communicate promptly on adaptation strategies and action plans** to empower **staff**, and to ensure **users** and the **general public** adopt the right behaviours in daily life in case of an extreme weather event.
- **Monitor and report regularly on the strategies and action plans** using specific **KPIs, metrics and targets.** Once evaluated, strategies should, in a retroactive manner, be regularly evaluated and adjusted.

Recommendation 3: Public authorities should support governments and public transport system managers by developing a policy toolkit dedicated to climate change adaptation

- **Support at regional, national or supranational level the creation of a legal framework that supports adaptation,** which includes technical support on adaptation (capacity, technical standards, guidelines…), legal requirements that apply to existing and new transport and non-transport infrastructures, funding schemes, as well as data collection, evaluation and reporting.
- **Apply specific governance that will foster cooperation and agile policy making** involving all government levels, operators, infrastructure managers and industry.
- **Build science-based knowledge and collect data on climate change** at a local level on risks, vulnerabilities and opportunities for cities and public transport. This should take global and local perspectives into consideration, while also looking at short and long term.

Recommendation 4: Funding organisations should dedicate appropriate funding and financing to support adaptation to climate change of public transport systems

- **Dedicate appropriate funding and financing tools to invest in infrastructure upgrades (CAPEX) and to support new work-related operational practices (OPEX).** Funding strategies should link fund allocation to adaptation strategies and actions and ensure that public procurement incorporates the adaptation necessity. Involvement of private stakeholders (private companies, fund providers and financing institutions) to complement public budgets should be considered.

Climate change adaptation supports various Sustainable Development Goals (SDGs) including Goal 1: End poverty in all its forms everywhere, Goal 8: Decent work and economic growth, Goal 9: Industry Innovation and Infrastructure, Goal 10; Reduced inequality, Goal 11: sustainable cities and communities and Goal 13: Climate action.

REFERENCES

[i] IPCC (2023) Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, pp. 1-34. Available at: https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf

[ii] BBC (2023) China floods: 12 dead in Zhengzhou train and thousands evacuated in Henan [Online] Available at: https://www.bbc.co.uk/news/world-asia-china-57861067

[iii] Koppes, S. (2022). New High-Resolution Study on California Coastal Cliff Erosion Released. [online] Scripps Institution of Oceanography. Available at: https://scripps.ucsd.edu/news/new-high-resolution-study-california-coastal-cliff-erosion-released

[iv] UITP (2022) UITP Sustainable Development Committee Survey (Module 3: Climate change adaptation of the public transport sector). Available to UITP members here: https://mylibrary.uitp.org/Record.htm?record=19354830124911720129&idlist=0

[v] UITP, ARUP, Transport for London (2024). UITP Climate Change Adaptation Framework.

[vi] Transport Infrastructure Ireland (2022) PE-ENV-01104 Climate Guidance for National Roads, Light Rail, and Rural Cycleways (Offline & Greenways). [online] TII Publications. Available at: https://www.tiipublications.ie/library/PE-ENV-01104-01.pdf

[vii] Environment, U.N. (2022). Adaptation Gap Report 2022. [online] UNEP - UN Environment Programme. Available at: https://www.unep.org/resources/adaptation-gap-report-2022

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UITP ADVANCING PUBLIC TRANSPORT

Rue Sainte-Marie 6, B-1080 Brussels, Belgium | Tel +32 (0)2 673 61 00 | Fax +32 (0)2 660 10 72 | info@uitp.org | www.uitp.org