

Transport for Climate-Resilient Cities

Transport

Intelligent transport
system planning
mitigating climate
change risk

Extreme weather events have increased potential to cause disruptions, damage, and failure across multiple transport systems. With systems expected to last for at least 30 years, understanding how future climate might affect transport and mobility investments in the coming decades is vital. We offer expertise in every aspect of mobility management and system engineering, permitting us to anticipate climate changes impacts on transport infrastructure and how to adapt city mobility to mitigate risk.

Transport & Climate Change

Designing the architecture for **resilient and dynamic city traffic management** is a multi-faceted challenge. It involves working closely with stakeholders to understand how a living city's mobility is working/not working today as well as the **anticipation** and mitigation of limitations to that mobility potential caused by climate change events.

Typical problems caused by increased climate hazards in cities include:

- Extreme heat causing inaccessibility or malfunctions of vehicles, transport doors, roads, rail-tracks
- Extreme heat causing malfunctions in the energy supply for urban rail and metro
- Extreme cold damaging or deforming transport infrastructure or making roads inaccessible
- Heavy snowfall causing inaccessible rail or road infrastructure or damage to catenaries
- Water navigability on rivers or canals impacted by long droughts and low water levels
- Flooding of metro tunnels or rail -infrastructure due to heavy rainfall
- Instability of dykes and culverts supporting roads or rail infrastructure
- Landslides blocking transport routes.

Moving with the times

To estimate the impact of such events, our mobility experts develop and work with state-of-art simulation and predictive modelling tools to **evaluate mobility scenarios and climate impacts on multiple transport systems**. This allows us to fully investigate risk exposure and if transport systems can handle mobility behavioural changes induced by climate change, today, tomorrow and far into the future. Our studies also look at the knock-on impact of new mobility behaviours on road safety, traffic flows, environment, as well as a city's potential economical losses as a consequence of hazard events or system malfunctions.

Shared knowledge

Transport management is, by nature, a collaborative affair. We encourage constructive dialogue between all stakeholders to define scope, perimeter and elements of a network (rail, urban rail, metro, bus lines, major and smaller roads, water bound transport elements), and discuss issues, making maximum use of the existing experience. Tractebel experts contribute to **multidisciplinary risk analysis** (e.g. water flooding, heavy rainfalls, coastal erosion, drought...) on a regional/city scale, gaining inputs useful to evaluating more precise impacts on a transport

system.

Further **modelling** then allows our experts to evaluate the effectiveness of proposed solutions and arrive at information contributing to the **efficiency and cost evaluation** of the solution alternatives and adaptive pathways.

A 2 -Way approach

A two way approach to planning more resilient transportation:

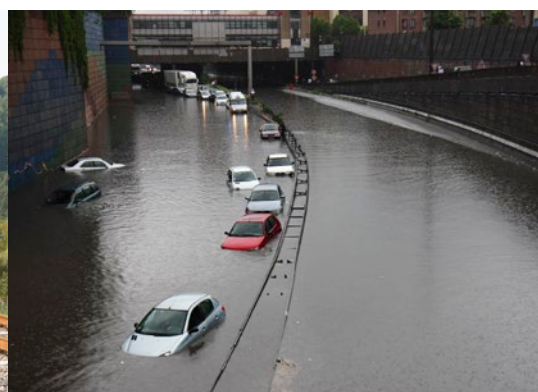
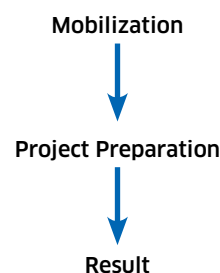
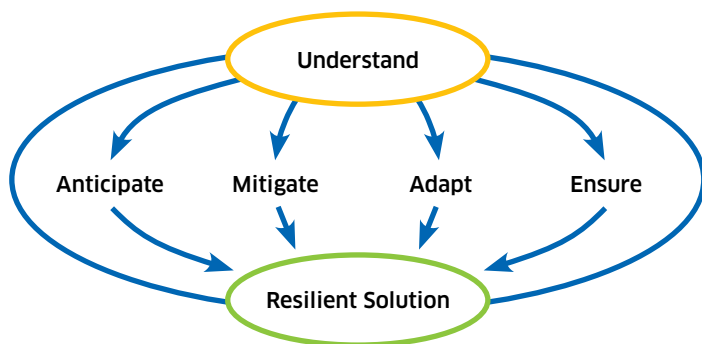
- Model based impact management based on traffic management and ITS
- Problem based solutions, limiting climate hazards impacts while minimising the impact on the transport sector at global city level.

Our Skills and Benefits

We already have many years' experience devising the philosophy and specifications for effective and resilient transport systems in major cities worldwide.

Our project team, including experts in traffic planning, modelling and advanced telematics, can produce a **pragmatic design** for a public transport system or a tailor made transport plan based on targeted analyses, experience and close interaction with local & regional authorities, transport providers & other public transport stakeholders.

Tractebel covers the full process-cycle both for sector-based and cross-sectorial analysis, planning, design and implementation of climate change adaption actions to help build the resilience of specific assets, sectors, areas or complete territories. Steps include stakeholders engagement, vulnerability and risk assessment, masterplanning and development of a resilience strategy, and finally the project preparation and implementation.



Some of our References

Urban Climate Resilience

Modernisation of a section of the Brasov-Hungarian border railway line - Romania

Objective: Assess the vulnerability of the railway modernisation project to climate change and extreme weather events, with identification of mitigation and adaptation measures.

Result: A number of adaptation options were proposed for the identified risks, and subsequently assessed. Many of the proposed options (e.g. creating walls and other constructions to prevent stones from falling on the track, use of geotextiles and geogrids for embankments, etc.) have been included in the works schedule. Another set of proposed options are subject to an evaluation of the operating costs associated with the project's operating phase.

Linking climate change to mobility and transport system functioning within Mobility Vision 2040 - Brussels

Objective: Define future evolutions of mobility and accessibility up to 2040, taking into account population evolution, displacement patterns, changing modes of transport and impacts of climate change.

Result: The study has given the city a picture of opportunities and what its inhabitants and future transport users can expect by 2040.

C-Roads Wallonia: Cooperative Intelligent Transport Systems

Objective: Pilot study for C-ITS services aiming to improve mobility and increase road safety and system functionality through direct road user information through info-on-board units in vehicles - relevant information encompassing traffic jams, road works, hazardous locations and extreme weather conditions. The system can be crucial in the extreme weather events strongly and rapidly impacting driving conditions.

Result: C-Roads Wallonia Pilot will pilot a cooperative ITS solution enabling safety-related traffic information services for mobile road users. It is based on a cloud solution to connect road users to Traffic Management Centres and test the performance of 3G-4G/LTE networks for C-ITS safety services. The pilot will be deployed along approximately 427 km of Walloon motorways.

