Setting the Scene: Climate resilient urban transport – the global challenge

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Climate Resilient Urban Transport

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Global warming

Already 1.0°C warmer than pre-industrial times

→ hotter temperatures, worse storms, more intense rain and flooding, as well as higher sea levels affect transport systems
Africa most vulnerable to the impacts of climate

1400 weather related disasters affecting 460 million people over last 40 years

Africa most vulnerable to the impacts of climate

Adaptation costs could be in the region of $20 – 30 bn per annum over last decade
Outline of the problem

Challenges of climate resilient transport
Climate-related disasters increase

Floods, 43.4%, and storms, 28.2%, are the two most frequently occurring disasters.

Direct economic losses of climate-related disasters have risen 2.5 times over the past 20 years, reaching 2,245 billion US$ or 77% of total disaster-related costs (in the period 1998-2017).

Source: UN Office for Disaster Risk Reduction; https://www.unisdr.org/archive/61121
“Is not about spending more, but about spending better”.

Flood-related transport disruptions costing Tanzania over USD 100 million annually.
Urban population of 4.2 billion
+68 million/a - developing countries contribute 91% of this growth

High exposure to climate impacts due to dense transport infrastructure – often operating at or beyond capacity
New investments provide an opportunity … but investments are also at risk of climate impacts
Only 5% of assets are insured in Low Income Countries vs. 50% in High Income Countries

Photo source: The Citizen; https://www.thecitizen.co.tz/News/Tanzania-admits-BRT-project-blunder/1840340-4577630-6w1sbdz/index.html
Land slide in Bogor, Indonesia obstructs the services of the commuter line Jakarta – Bogor

All transport modes are affected
Many cities are located along the coast, making them particularly vulnerable to sea level rise and storm surges.

Harbours are also at risk...
Climate resilience must be addressed at different scales – single infrastructure versus network performance
Many good reasons to adapt urban transport to climate change…

- Ensures mobility & inter-connectivity
- Protects health and safety of urban residents
- Secures public assets with large replacement value
- Avoids cascading effects
- Enables disaster risk management
- Supports economic well-being of cities
- The longer a transport system remains disrupted during and after a shock, the more severe the economic and development losses will be
Climate impacts can affect the transport sector in three major ways

1. Impacts on transport infrastructure (planners and engineers)
2. Impacts on operations & vehicles (operators, emergency planners)
3. Impacts on mobility behaviour of people (urban residents)
3 basic approaches to adapt infrastructure to climate change impacts

- **Retreat (or avoid)**
  - Approach developed in the context of sea-level rise, but generally applicable to all climate risks

- **Protect**

- **Accommodate**
This can happen if you don’t …

Dar Es Salaam Bus Rapid Transit operators ignored an Environmental Impact Assessment:

- The main depot was built into a frequently flooded area
- It has already been flooded several times since operations began in 2016
- Operations had to be suspended several times
- Buses have been damaged
- Costs to the operator are significant

Photo source: The Citizen; https://www.thecitizen.co.tz/News/Tanzania-admits-BRT-project-blunder/1840340-4577630-6w1sbdz/index.html
“Integrating disaster risk reduction into investment decisions is the most cost-effective way to reduce (hazard) risks”

Integrate climate-resilience into existing processes

Climate-resilience needs to be integrated into all steps of transport or infrastructure planning, design and implementation.
Projected climate change
- Increase in frequency & intensity of rainfall

Rural accessibility
- Road density
- Quality of road infrastructure
- Rural access index

Infrastructure investment potential
- CPIA
- Fixed investment
- Development assistance

Historical climate related impacts
- Disaster frequency
- Affected population

Rural population exposure
- Rural population density

Quantitative Selection criteria used
Designing Climate-Resilient Roads for Long-Term Rural Access
References: RECAP Handbooks & GIZ Sourcebook
GIZ project portfolio
GIZ climate change adaptation expertise - examples

**Climate Services**
Climate services for infrastructure investments, Costa Rica: Climate data is considered when planning and investing in infrastructure.

**Adapting public investment to climate change**
Climate risk management, e.g. Peru: Making climate change adaptation measures a binding requirement for public investment projects.

**Adaptation Planning in Cities**
Cities fit for Climate Change, e.g. Chile: Climate aspects were taken into account in the upgrading of a 12 km section of a main road in Santiago.

**Digital Coastal Monitoring Using Lightweight Drones**
Drone-supported costal protection, Vietnam: Using new techniques such as the flycams (light-weight drones) for systematic monitoring of remote coastal areas, forest and coastline management and the inspection.

**Climate Resilient Urban Transport**
Training, Indonesia: Introducing the concept of climate resilience in transport and approaches to assess climate vulnerability of urban transport systems.

**Climate Insurance**
Assessment, Tanzania: Piloting of climate risk evaluation and management including risk transfer through climate risk insurance in Dar es Salaam.

**Ecosystem-based Adaptation**
Costal Protection, Vietnam: Supporting adaptation measures by building breakwaters along the Mekong Delta’s coastline to protect the hinterland and save the mangroves.

**Sectoral Adaptation Planning**
Sustainable energy supply, Caribbean: Building climate resilient energy infrastructure.

**Climate Services for Infrastructure Investments**
Costa Rica: Climate data is considered when planning and investing in infrastructure.

**Climate Change Adaptation Expertise - Examples**
- **Climate Services**: Climate services for infrastructure investments, Costa Rica. Climate data is considered when planning and investing in infrastructure.
- **Adapting Public Investment to Climate Change**: Climate risk management, e.g., Peru. Making climate change adaptation measures a binding requirement for public investment projects.
- **Adaptation Planning in Cities**: Cities fit for Climate Change, e.g., Chile. Climate aspects were taken into account in the upgrading of a 12 km section of a main road in Santiago.
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- **Climate Resilient Urban Transport**: Training, Indonesia. Introducing the concept of climate resilience in transport and approaches to assess climate vulnerability of urban transport systems.
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Focus: Resilient transport components
Pilot implementation: Greening highways in Morocco to adapt to the effects of wind erosion

**Approach**
Development Public Private Partnership

**Activities**
- Drone-based risk analysis of motorways vulnerability map
- Tested 20 different plants and hard infrastructure to combat wind erosion, tried out three and choose the most appropriate one.
- Climate change adaptation measures (erosion protection) implemented along stretches of the highway that are threatened by heavy rainfall and erosion
- Upscaling planned in DPP Phase II for longer motorway stretch

**Impacts**
- Sustainable stabilisation of 100km of motorway infrastructure (efficient, using local material, heat resistant plant)
- Employment opportunities for local youths
Pilot implementation: climate proofing a bridge in Costa Rica

Approach
Climate risk analysis + adaptation planning for existing infrastructure

Activities
• German weather service (DWD) provides meteorological data on climate impacts
• Engineers Canada assess the climate risk for the pilot bridge
• The Canadian PIEVC climate risk analysis protocol is “localized”
• Local officials are trained conduct climate proofing themselves
• Local partners (ministries of environment & planning) are advised how to improve existing climate services

Impacts
• Pilot bridge is climate proofed
• Decision makers consider climate impacts in planning processes
Building, assessing and mapping transport infrastructure in post-conflict Liberia

Approach
- Advisory of the public partners on low-cost and climate resistant technologies for road construction
- Facilitating cooperation and knowledge transfer between public and private partners

Activities
- Building climate-proof road infrastructure by using new technologies
- Assessing the state & establishing a database of bridges across the country using local capacity and graduate students
- Training of government officials and advisory on establishment of a data-based annual road & bridge maintenance plan
- Institutional support of local businesses in the road construction sector to be more competitive, to improve their services and quality of work

Impacts
- Registry of the bridge infrastructure with emphasis on climate vulnerability
- Building climate proof road sections as pilot projects
- Employment opportunities and job training for local youths
Improving the quality of urban planning for complete and green streets in Mexico

**Approach**
Consulting national and local governments to improve the sustainable planning processes in the transport sector

**Activities**
- Aid cities in promoting sustainable transport that takes climate factors (such as heavy rainfall) into account
- Organise events like the "Green Infrastructure and Climate Change Forum" to intensify the exchange of experiences between relevant stakeholders at city and federal levels.
- Identify urban areas with potential for densification, support the development of integrated plans for sustainable urban mobility, promote local public transport and active cycling and walking
- Support municipalities in integrating the social and economic value of green spaces and biodiversity in urban planning

**Impacts**
A roadmap was defined in collaboration with local authorities, civil society organisations, academia and international organisations.
Thank you for your attention!

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Training on climate resilient urban transport systems

**Approach:**
Train decision makers and transport system planners about tools that help assess climate risks and using measures to climate-proof transport infrastructure and services

**Activities**
- Introducing the concept of climate resilience in the transport sector
- Informing about approaches to assess climate vulnerability of urban transport systems

**Impact**
- Resilient urban transport systems are able to cope with impacts, without long-lasting disadvantages for its users and urban life as a whole
- Workshop participants are aware of solutions for managing the challenges of climate resilient urban transport
RECAP Handbook and supporting guideline

[Diagram showing RECAP Handbook and guidelines]

- Change Management
- Climate Risk & Vulnerability Assessment
- Engineering Adaptation
- Visual Assessment Manual