

Session 3.3

Climate Change Adaptation in the Transport Sector: URBAN TRANSPORT



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Overview

- **Climate change impacts for urban transport in Vietnam**
- **HCMC MRT Line 2: Adaptation measures**
- **HCMC MRT Line 2: Complimentary mitigation measures**

Climate change impacts for urban transport in Vietnam

Assessment of risks

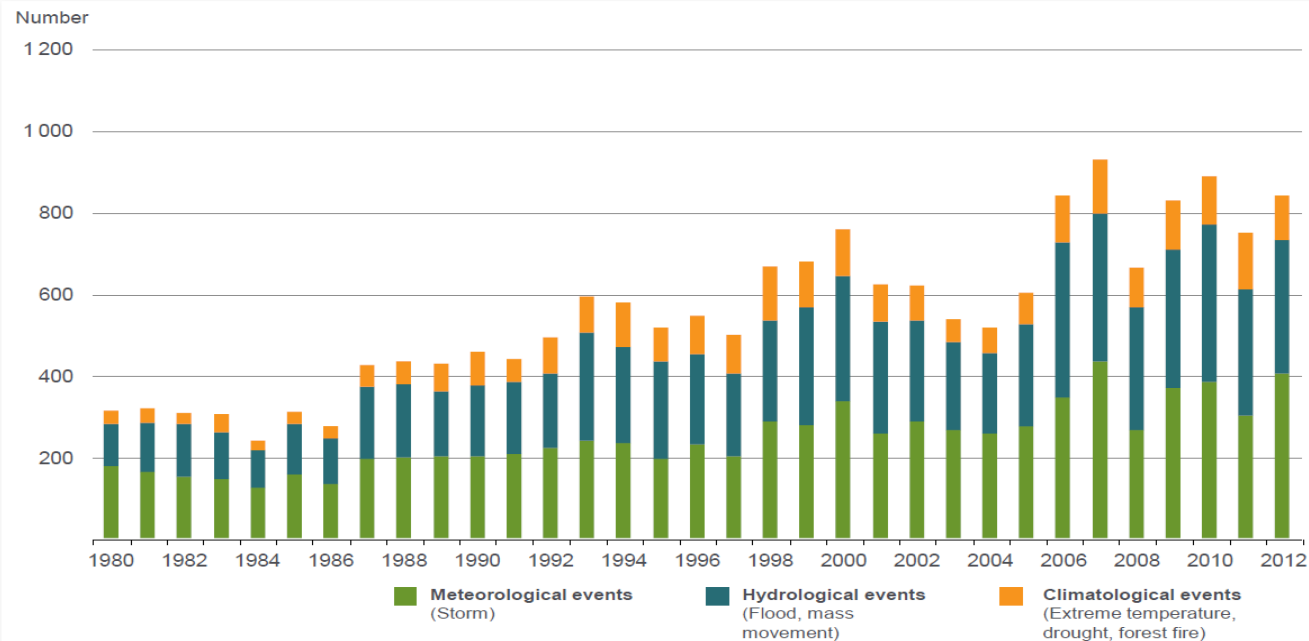
Increased trend of worldwide weather catastrophes

NatCatSERVICE

Weather catastrophes worldwide 1980 – 2012

Number of events

Munich RE



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Climate change impacts for urban transport in Vietnam

Assessment of risks

Ho Chi Minh City (HCMC) Climate and weather

Two seasons:

Wet (May to November)

High Rainfall – 1.8m (90% of year total)

Thunderstorms with heavy bursts

High humidity - >95% (October)

Dry (December to April)

Low Rainfall – 0.2m

Temperature – 28 °C (ave)

29 °C (max – April)

16 °C (min – Dec)

Humidity – never low; 52% (March)

Climate change impacts for urban transport in Vietnam

Assessment of risks

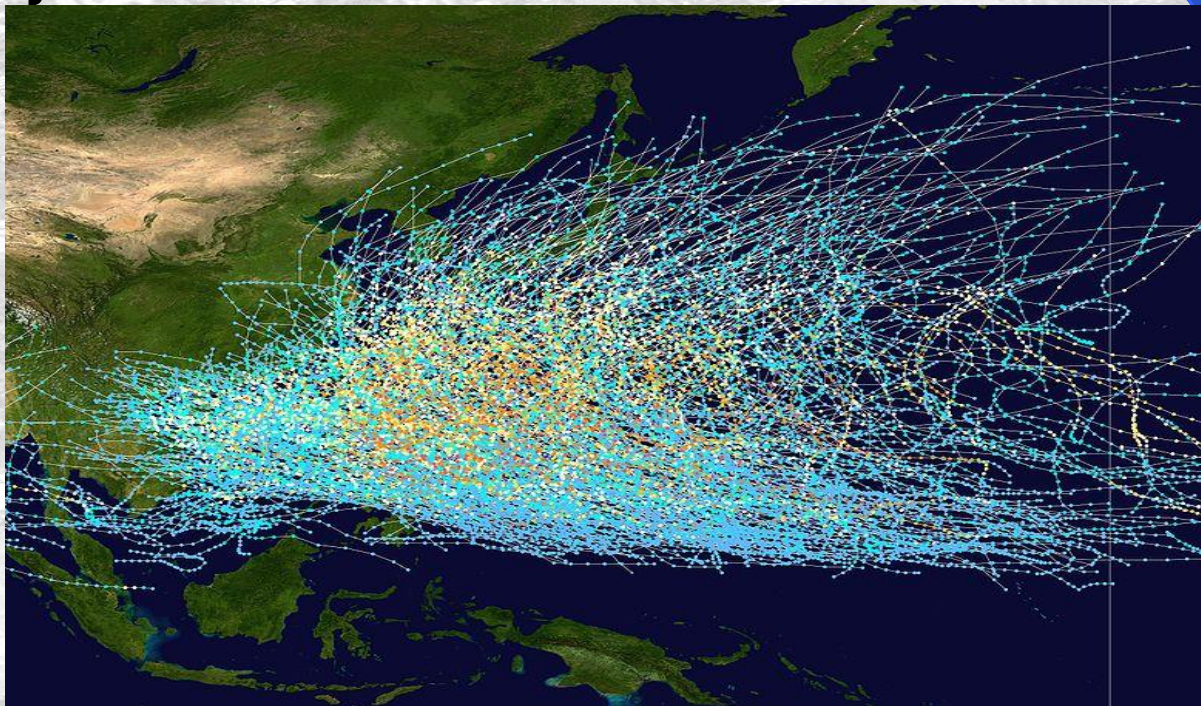
Weather systems:

Tropical

Cyclones: East Asia Monsoons

wet season: timing consistent, intensity/duration variable

dry season: from northeast/coastal



Climate change impacts for urban transport in Vietnam

Assessment of risks

Future Weather systems:

Sources of data: IMHEN, CSIRO, HUS, ADB (modelling)

Trends:

Ave temp increase 2% last 50 yrs - urban heat island effect

CC temperature forecast increase min 2%

Increase of % cyclones in HCMC area

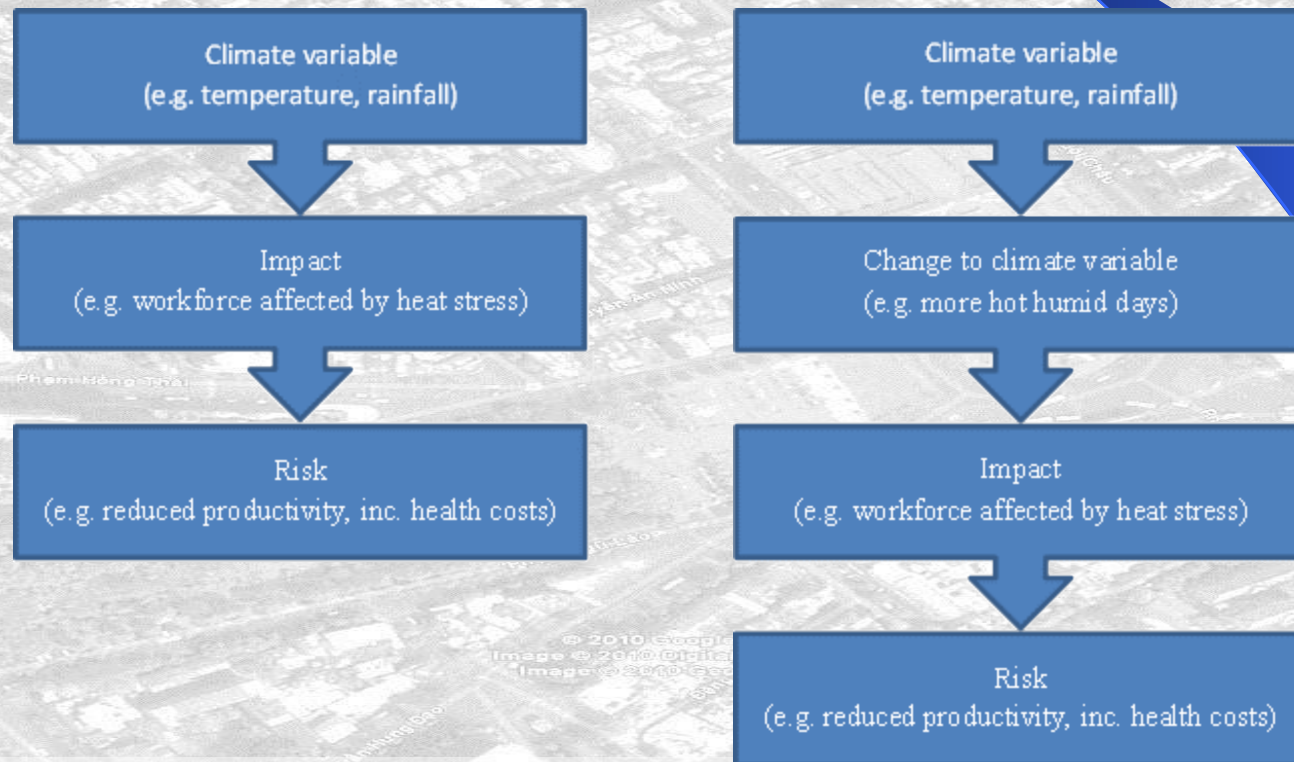
CC sea level rise of 24-26cm



Climate change impacts for urban transport in Vietnam

Assessment of risks

Link between climate and risk:



Climate change impacts for urban transport in Vietnam

Assessment of risks

Risk Assessment Process:

ISO 31000:2009 Risk Management – Principles and guidelines

Likelihood

Consequences

Likelihood	Consequences Severity of injuries, damage, financial costs, etc				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain (100%)	Moderate	High	High	Critical	Critical
Likely (10%)	Moderate	Moderate	High	High	Critical
Possible (1%)	Low	Moderate	High	High	Critical
Unlikely (0.1%)	Low	Low	Moderate	High	High
Rare (0.001%)	Low	Low	Moderate	Moderate	High

Climate change impacts for urban transport in Vietnam

Assessment of risks

Heat Stress:

Work in hot environment

diminished physical work capacity

Diminished ability for mental tasks

Increased accident risks

Heat exhaustion/stroke

Factors

air temperature, humidity, mean temperature, air flow

Assessed

Likely with minor to major consequences

Unmitigated risk is high to critical

Climate change impacts for urban transport in Vietnam

Assessment of risks

Flooding:

HCMC ranked in top 20 of 136 large coastal cities for current vulnerability to flooding

Barely above seas level: 40-45% 0-1m, 15-20% 1-2m

Large and growing population

Local development patterns affected

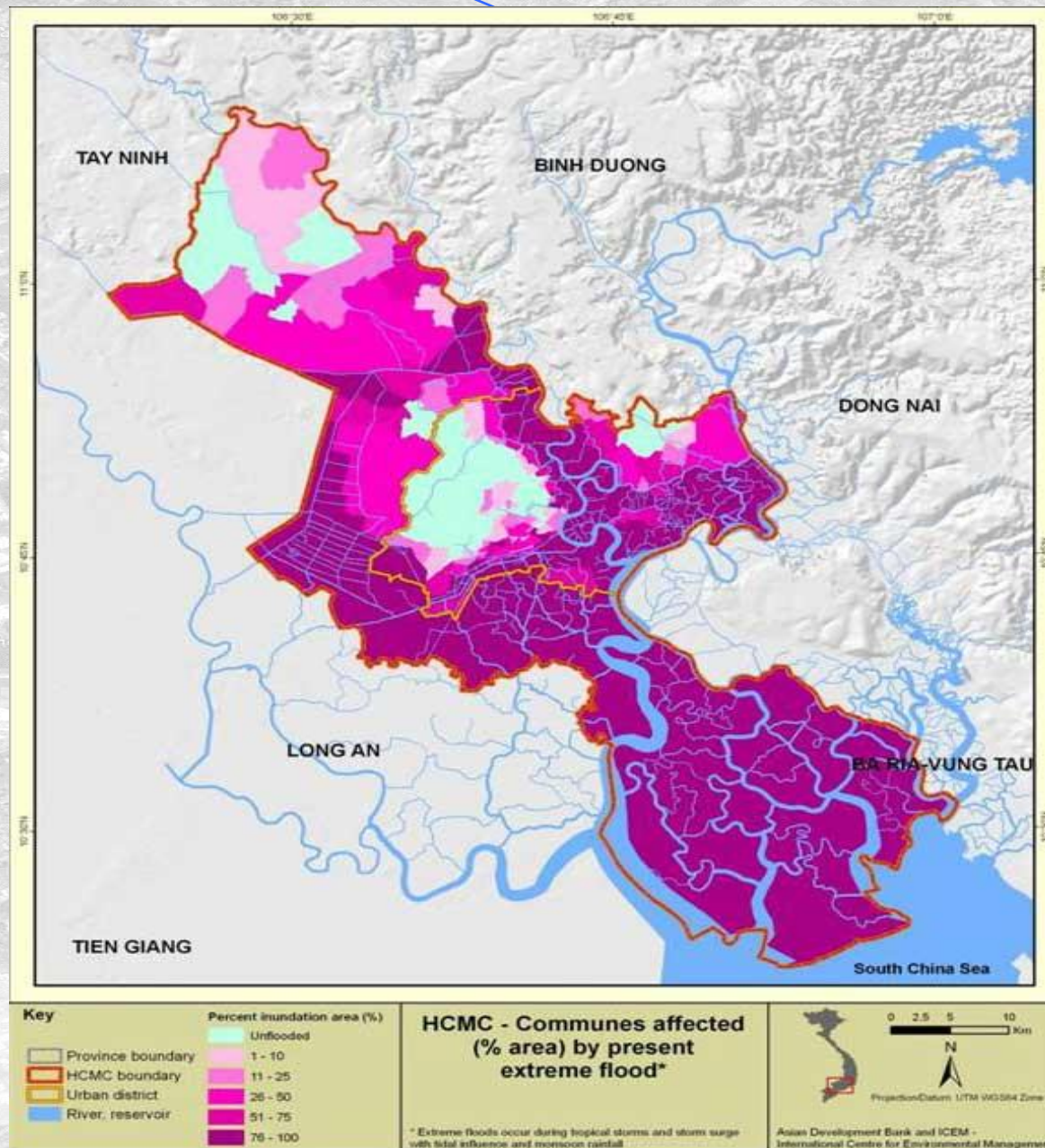
Climate and hydrodynamics are already extreme
local/upstream/Mekong rainfall catchment,
Tides and storm surges

Cannot rely on historic data only

Traditional methods can fail:

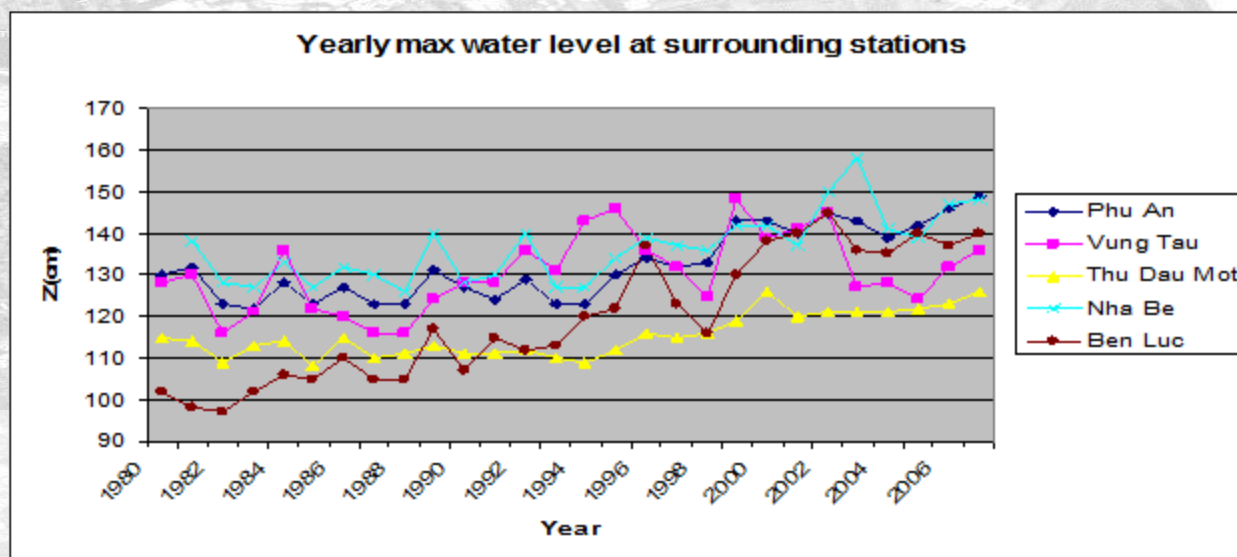
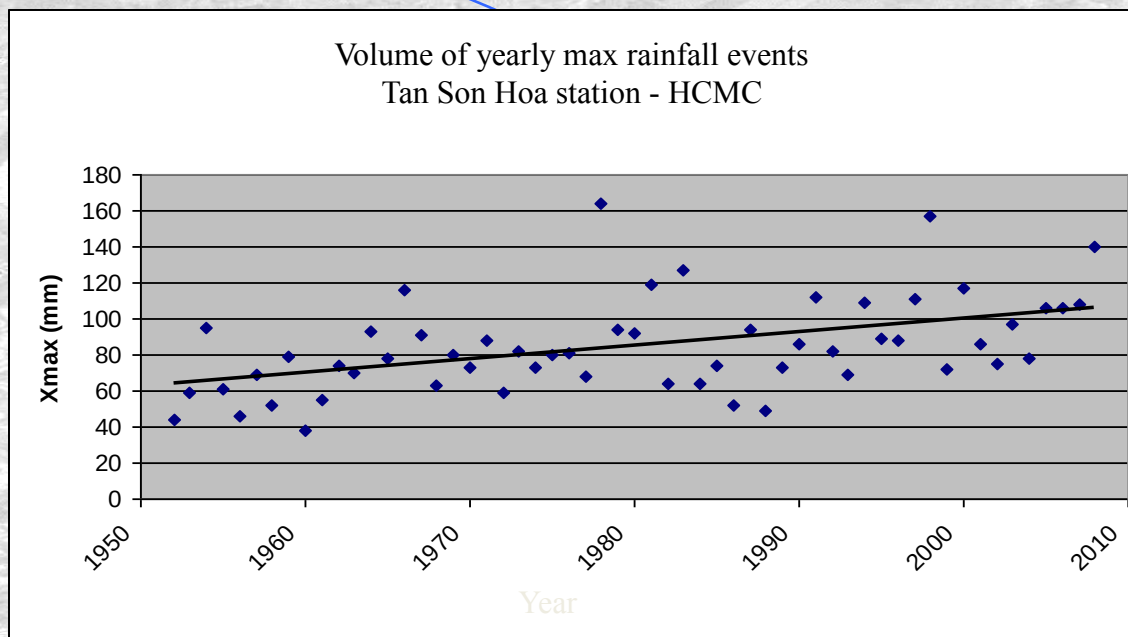
“River water gushed into 148th Street Lenox Terminal at the height of Hurricane Sandy, around 9 p.m. on Oct. 29. MTA workers stood by helplessly as flooding barriers failed and water rose to the height of the subway platform.” (source: <http://northattan.com/2012/11/01/sandy-floods-148th-st-3-train-station/>).

Flooding risk areas`:



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Higher floods:



Climate change impacts for urban transport in Vietnam

Assessment of risks

Flood Scenarios

- Robust risk assessment based on possible flood scenarios and potential infrastructure vulnerability
- Development of no-regrets or fail-safe engineering and system options

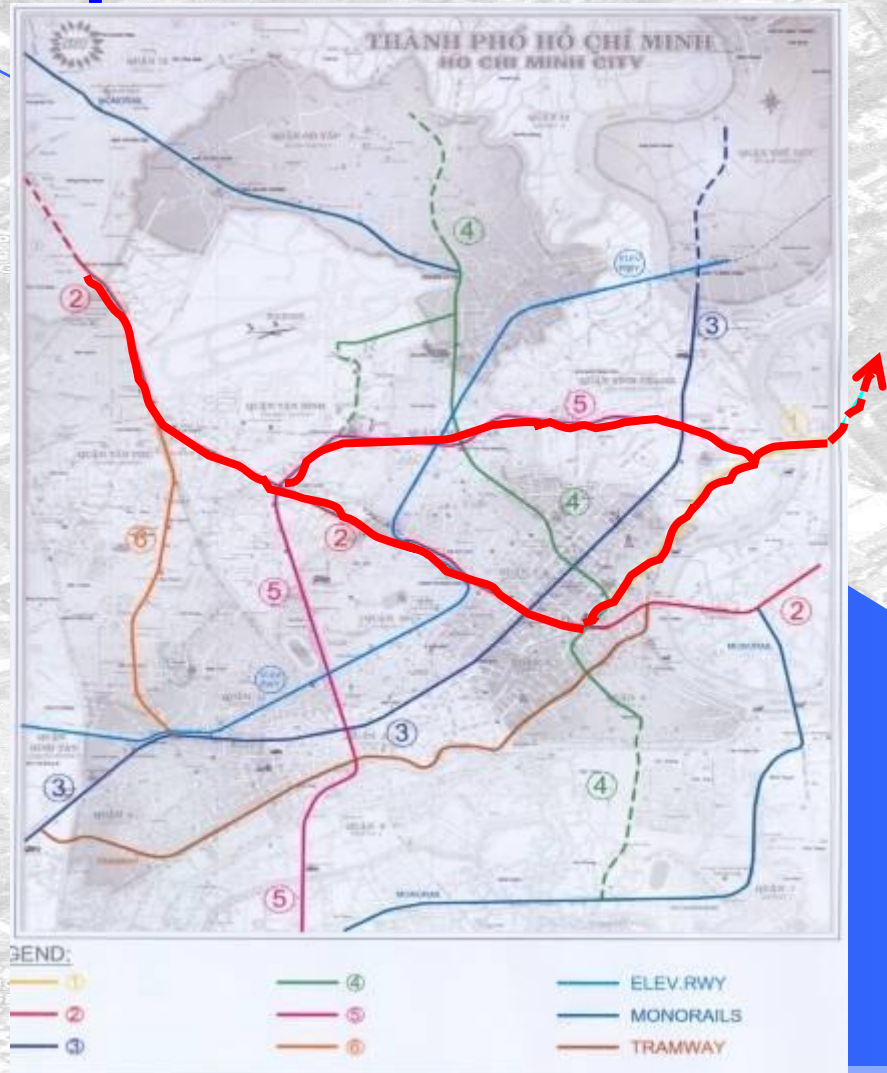
Planning that focuses solely on high probability risk events will miss the high-impact low probability events, or sequence of events, that have the greatest impact and cost the most to recover from

HCMC MRT Line 2: Adaptation measures

Project details

MRT System

- 9 lines
- Phase 1: 3 lines
- Investment \$5.2 bill (to 2020)



HCMC MRT Line 2: Adaptation measures

Project details

HCMC MRT Line 2 (Ben Thanh to Tham Luong)

- 11.5k (10km underground, 1.5km elevated)
- \$1.9 billion (\$890 million ADB)
- Implementation status: 7 contracts under bidding (all award 2014), completion of works: end of 2020

HCMC MRT Line 5 (Bay Hien to Saigon bridge)

- 9.5km (8km underground, 1.5km elevated) [\$1.5 bil]
- Feasibility study (2014), Detailed design (2015-2016), Works (2016-2021)

HCMC MRT Line 2: Adaptation measures

Flooding dynamics:

HCMC drainage improvement program:

20-30 yr durations

Line 2 will be vulnerable to normal and extreme flood events during construction and operations; and

Construction of Line 2 may detrimentally affect the flood management plans if the design is not coordinated with the Steering Centre of the HCMT Flood Control Program

HCMC MRT Line 2: Adaptation measures

Flooding dynamics:

Engineering design:

Protection

- partial retractable barriers
- alternative cost-effective barriers

Resilient Tunnel Plug

Entrances

- minimum 1 m raised surface
- under further analysis



HCMC MRT Line 2: Adaptation measures

Greenhouse Gasses Emissions adaptation:

Energy consumption during construction and power consumption

Scope 1

- process emissions (none)
- fugitive emissions (very limited)

Scope 2

- electricity use (operations)

Scope 3

- manufacture and transport building materials (80%)
- construction equipment
- processing resources
- disposal of construction waste

HCMC MRT Line 2: Adaptation measures

Construction measures for adaptation:

Scope 3

- manufacture and transport building materials
 - reduce fly ash, improve thermal efficiency, use municipal waste for fuel
 - low energy materials
- construction equipment
 - minimize travel, efficient use, regular maintenance, biofuels
- processing resources
- disposal of construction waste
 - efficient travel time (night)

HCMC MRT Line 2: Adaptation measures

Construction measures for adaptation:

Design, materials, and construction of must ensure that:

- ☐ A functioning warning system is available to initiate a flood mitigation procedures;
- ☐ Critical Electrical and Mechanical operating systems are isolated from water;
- ☐ Tunnel entrances can be quickly and easily closed in the event of rising flood waters;
- ☐ Third rail can be isolated and switched off automatically/manually;
- ☐ Emergency power is available for critical Electrical and Mechanical operating systems;
- ☐ Drainage and reinstatement of an operating rail system can proceed rapidly should catastrophic flooding occur;
- ☐ Passive cooling and dehumidification of underground;
- ☐ Least practicable maintenance costs, and recovery costs in the event of system failure, over the expected life of the project

HCMC MRT Line 2: Adaptation measures

Construction measures for adaptation:

Contractor: Ensuring Employee Health and Safety during Extreme Weather Events

- Project employees will be subject to perpetually hot and humid working conditions.
- Extreme rainfall and flood events will pose a particular risk to employees engaged in excavation and underground construction.
- to provide safe working conditions and mitigate the risks of chronic or extreme weather events to employees/sub-contractors

HCMC MRT Line 2: Adaptation measures

Construction measures for adaptation:

Contractor: Energy Efficiency and Emissions of GHG

- ☐ Model and engage in real-time optimisation of routes for material and spoil transport;
- ☐ Maintain a system for independently monitoring vehicle efficiency and vehicle and driver performance;
- ☐ Train vehicle and machinery operators in efficient operations and provide feedback on performance over time;
- ☐ Review supply chain to ensure that materials have low embodied energy where practicable and engineering standards can be met.
- ☐ Ensure that all refrigerant gasses in machinery and equipment for air conditioning are non-ozone depleting.

HCMC MRT Line 2: Complimentary Mitigation measures

Major investment not viable and sustainable unless MRT integrated with public transport and policy support:

The proposed additional project aims to support integrated urban transport measures related to MRT Line 2 development.

Components will include:

- 1. Improve accessibility at Metro/MRT stations**
- 2. Integration with public transport network and development of bus network**
- 3. Sustainable urban transport policy support**

Impact: Integrated sustainable transport system in MRT districts.

Outcome: Improved public transport accessibility and services along MRT corridors

HCMC MRT Line 2: Complimentary Mitigation measures

Component 1: Improved accessibility at MRT stations

- Access points improvements to suit integration with bus or other public transport modes
- Improved pedestrian access: (within 500m of stations) footpaths, parking restrictions, greening
- Provision of bus stops or direct connections: scaled to suit demand, from intermodal hub to simple bus stops

Component 2: Integration of public transport with MRT

- All stations should connect with bus network
- Vehicle and taxi drop off and pick up facilities
- Park & ride to allow vehicle connection at outer stations
- Re-aligned or new bus feeder routes to serve MRT
- Integrated ticketing with MRT
- Introduce/pilot new technologies or low carbon fuels for buses

HCMC MRT Line 2: Complimentary Mitigation measures

Component 3: Sustainable Transport Policy

Measures to restrict private vehicle use and encourage public transport usage

- Parking and public space strategy
- Restrict private vehicle access and parking
- Traffic and parking enforcement
- Traffic management measures (bus prioritization, signal systems, pilot ITS initiatives)
- Common ticketing and fare policy strategy
- Road user charging and / or parking charges

HCMC MRT Line 2: Complimentary Mitigation measures

Project financing source – Global Climate Change funds:

Funded under Climate Investment Fund (CIF) through Clean Technology Fund (CTF) to address climate change mitigation:

- has to be linked to ADB funded project
- support low carbon transport (through innovative and transformative measures)
- result in decrease in greenhouse gas emissions

Definitions of
“innovative” and
“transformational”
flexible

HCMC MRT Line 2: Complimentary Mitigation measures

Meeting CTF Criteria:

Potential for GHG Emissions Savings Net avoided emissions are estimated at 586,500 tCO₂e over the project lifetime. Replication and scale up to other MRT lines in the city would result in avoided emissions of 3.8 million tCO₂e.

Cost-effectiveness CTF\$50 million / 586,500 tCO₂e = CTF\$85 / tCO₂e, with replication and scale-up cost-effectiveness is CTF\$13 / tCO₂e .

Demonstration Potential at Scale: Transformation potential is estimated to be more than 6 with replication and scale up in HCMC only, and higher if replication and scale up is achieved in other urban areas

Development Impact: The Project will accelerate growth of the sustainable urban transport investment by demonstrating the effectiveness of integrated urban transport systems.

Impacts with respect to environmental, public health, and energy security benefits are consistent with the CIP. Impacts on employment are significant in the short-term given the large-scale construction workforce required. In the long-term, direct employment will be created in operations and maintenance and indirect employment benefits will accrue from improved access to mobility services.



THANK YOU