INTERATING SCIENTIFIC KNOWLEDGE INTO POLICY IN ASIAN CITIES: A CASE OF BANGKOK, THAILAND

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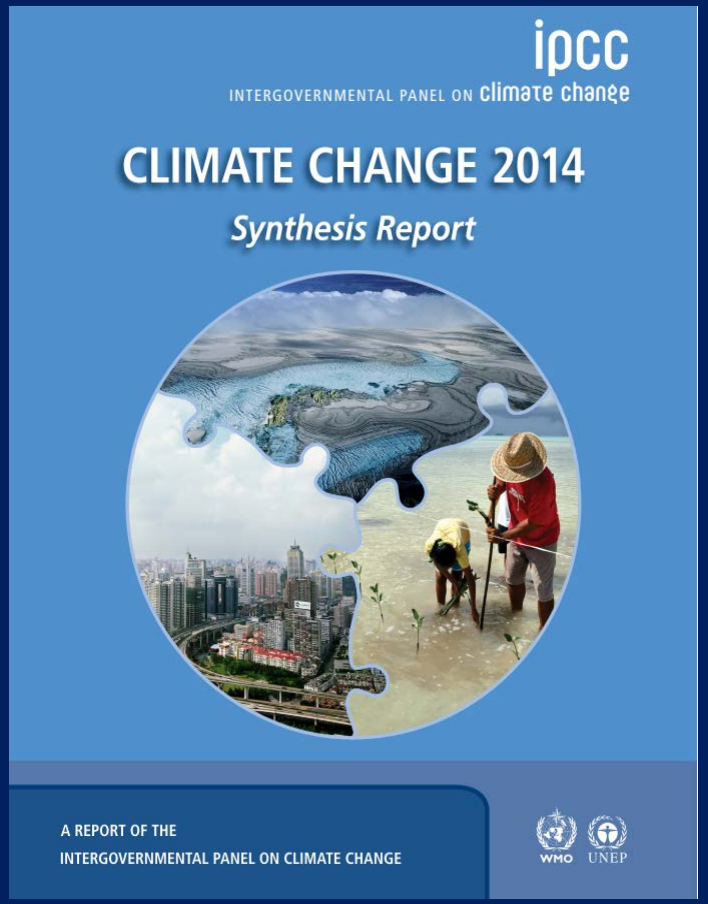
Climate change is one of the largest challenges to the current and future development of human society

IPCC Fifth Assessment Report

- Warning of the climate system is unequivocal since the 1950's.
- Many of the observed changes are unprecedented over decades to millennium.
- Atmosphere and ocean have warned.
- Amounts of snow and ice have diminished.
- Sea level has risen
- Greenhouse gases (GHGs) have increased.



Bangkok and Climate Change

- For Bangkok, climate change is a big challenge and were hit by a large scale flooding and historically economic and social damages were recorded.
- Bangkok is vulnerable to such extreme events that might be induced by climate change.

A future vision towards establishment of a low carbon and climate change resilient city

- 5 keys to future vision of Bangkok

1. BMA in partnership with the national government ministries and agencies, takes a major responsibility to mitigate and adapt to climate change.

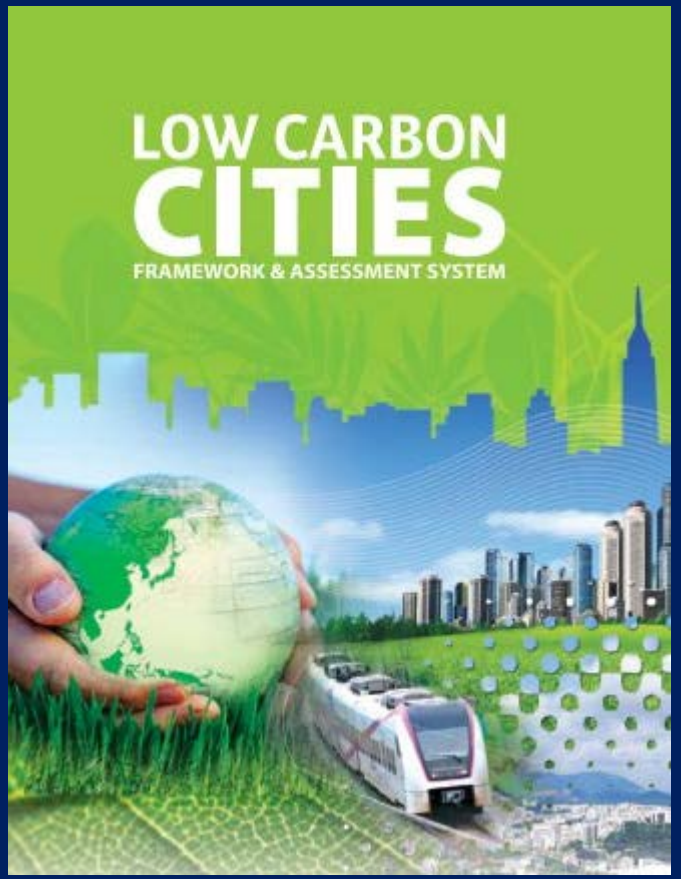
2. BMA endeavors to establish well balanced action to harness economic and social development and climate change concerns.

A future vision towards establishment of a low carbon and climate change resilient city

- 5 keys to future vision of Bangkok (Cont.)

3. BMA takes comprehensive approach to the low carbon and climate change-resilient urban development and action- oriented approach to the implementation of the Master Plan, as a vehicle in an evolving nature

4. BMA, as a leading city of Southeast Asia and the world, takes proactive measures to mitigate and adapt to climate change in short, mid and long terms.



A future vision towards establishment of a low carbon and climate change resilient city

- 5 keys to future vision of Bangkok (Cont.)

5. BMA promotes actions by citizens, the private sector, academia,

   - Key players to mitigate and adapt to climate change, which should involve a multi-channel communication platform, innovative ways of promotional schemes

   - Low carbon technology leapfrogging.

UC Climate Solutions CHANNEL

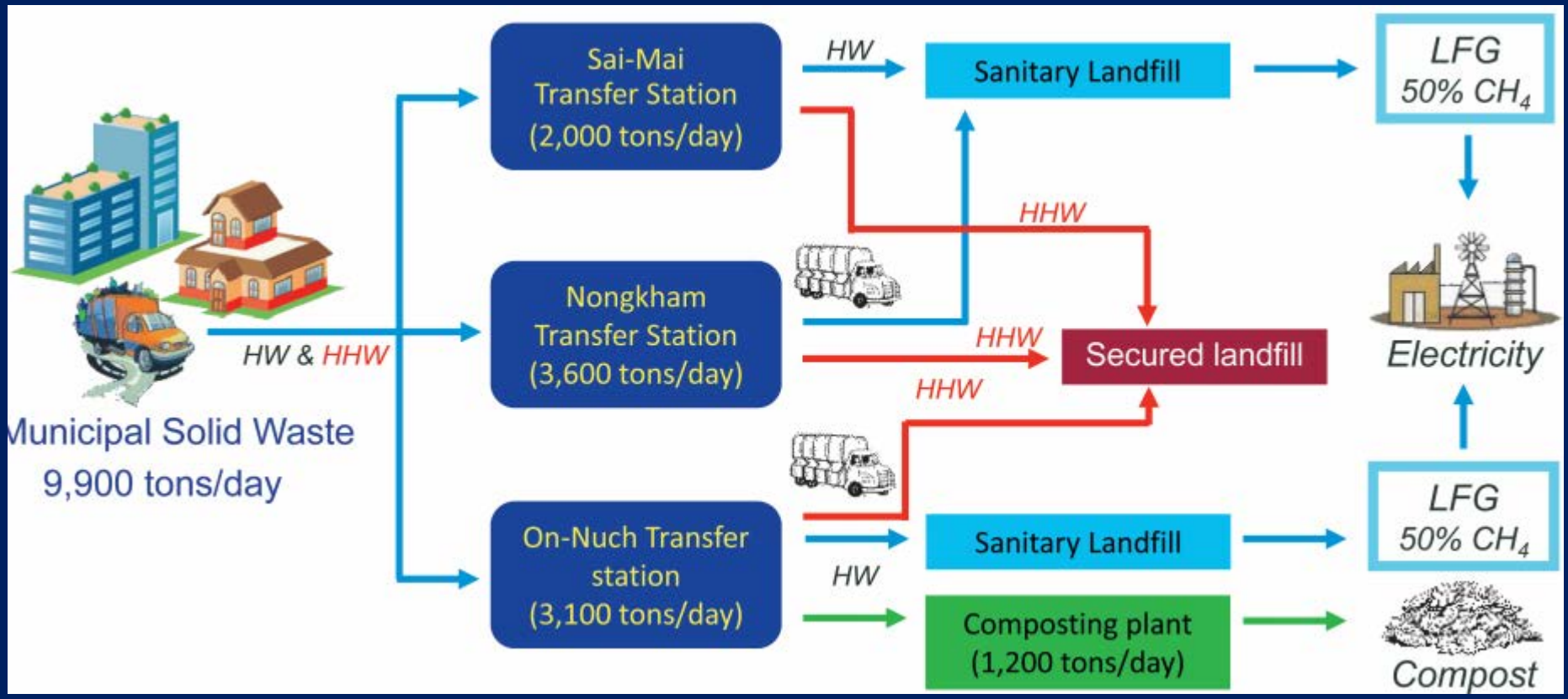
Scope of the Master Plan Bangkok Master Plan on Climate Change 2013-2023

(1) Environmentally sustainable transport;

(2) Energy efficiency and alternative energy;

Scope of the Master Plan Bangkok Master Plan on Climate Change 2013-2023

(3) Efficient solid waste management and wastewater treatment;



Scope of the Master Plan Bangkok Master Plan on Climate Change 2013-2023

(4) Green urban planning;

Comparison of GHG emission in future in different scenarios in 2020 in the green urban planning sector

Unit million t-CO_2 e

Sector	Year 2013	Year 2020		
	GHG emission	Future GHG emission in BAU Scenario	Future GHG emission with Bangkok Master Plan Implementation	Expected reduction/ absorption amount (reduction rate against BAU)
Green urban planning	-0.045	-0.045	-0.049	0.004 (+8.89%)

Scope of the Master Plan Bangkok Master Plan on Climate Change 2013-2023

(5) Adaptation planning;

Master Plan includes

- Assessment of the current and future situations
- Prioritizing possible interventions
- Proposing concrete implementation plans of feasible measures

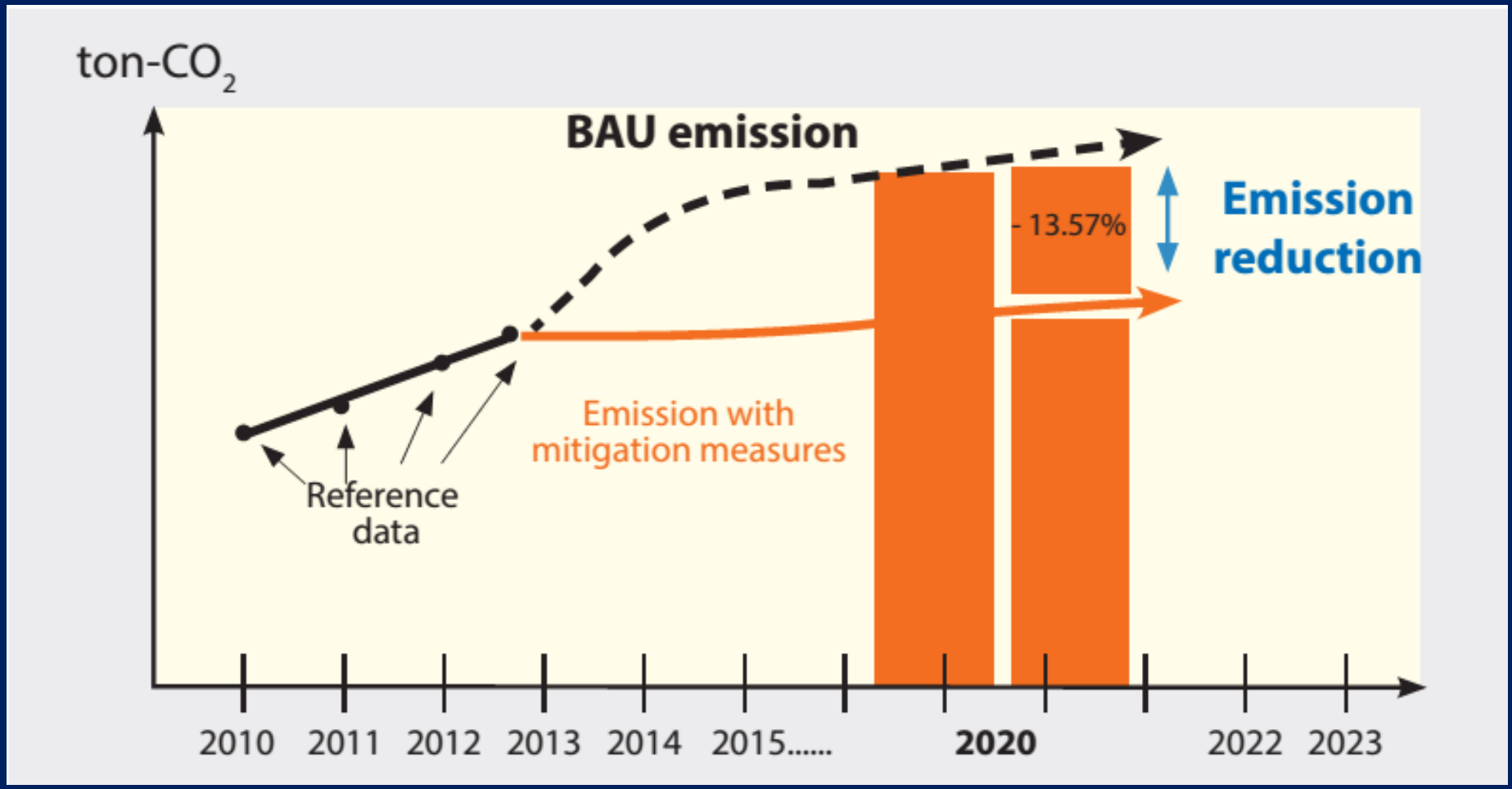


Master Plan contains

- Package of Business as Usual (BAU) setting, target setting and actual mitigation and adaptation measures.

- Monitoring and evaluation (M&E) as well as the Measurement, Reporting and Verification (MRV) mechanisms

GHGs emission prospects and mitigation targets under the Bangkok Master Plan on Climate Change 2013-2023

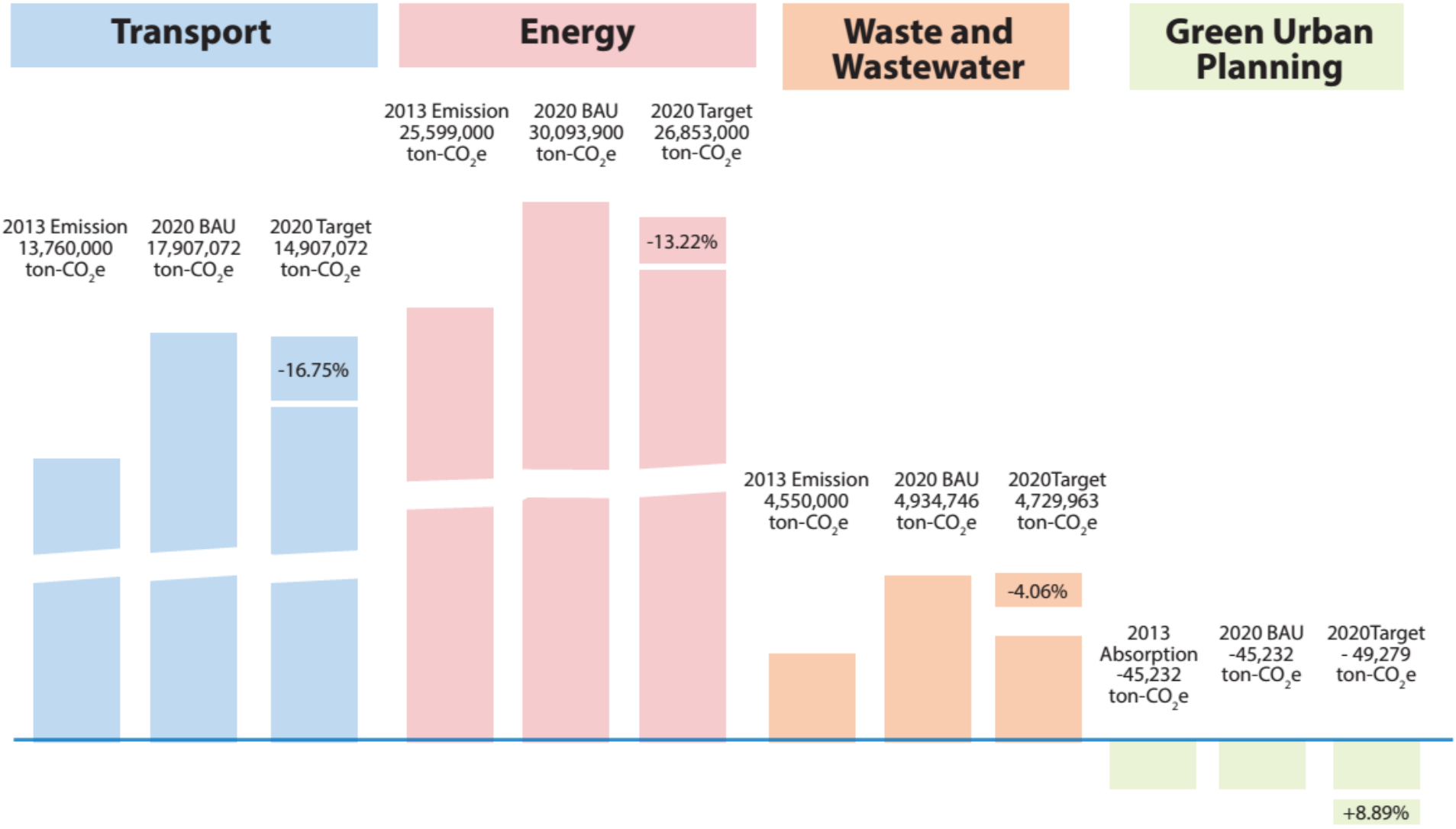


Comparison of GHGs emission in future in different scenarios in 2020

Unit million t-CO_2e

Sector	Year 2013	Year 2020		
	GHG emission	Future GHG emission in BAU Scenario	Future GHG emission with Bangkok Master Plan Implementation	Expected reduction/ absorption amount (reduction rate against BAU)
Transport	13.76	17.91	14.91	3.00 (-16.75%)
Energy	25.60	30.94	26.85	4.09 (-13.22%)
Waste and wastewater	4.55	4.93	4.73	0.20 (-4.06%)
Green urban planning	-0.045	-0.045	-0.049	-0.004 (+8.89%)
Total	43.87	53.74	46.44	7.29 (13.57%)

GHG emission in 2013 and BAU emission and mitigation targets in 2020 (by sector)



Mitigation measures in the transport sector

- Development of environmentally sustainable transportation infrastructures and promotion of model shifts as well as public awareness – raising.

Comparison of GHG emission in future in different scenarios in 2020 in the transport sector

Unit million t-CO_2 e

	Year 2013		Year 2020	
Sector	**GHG emission**	**Future GHG emission in BAU Scenario**	**Future GHG emission with Bangkok Master Plan Implementation**	**Expected reduction/ absorption amount (reduction rate against BAU)**
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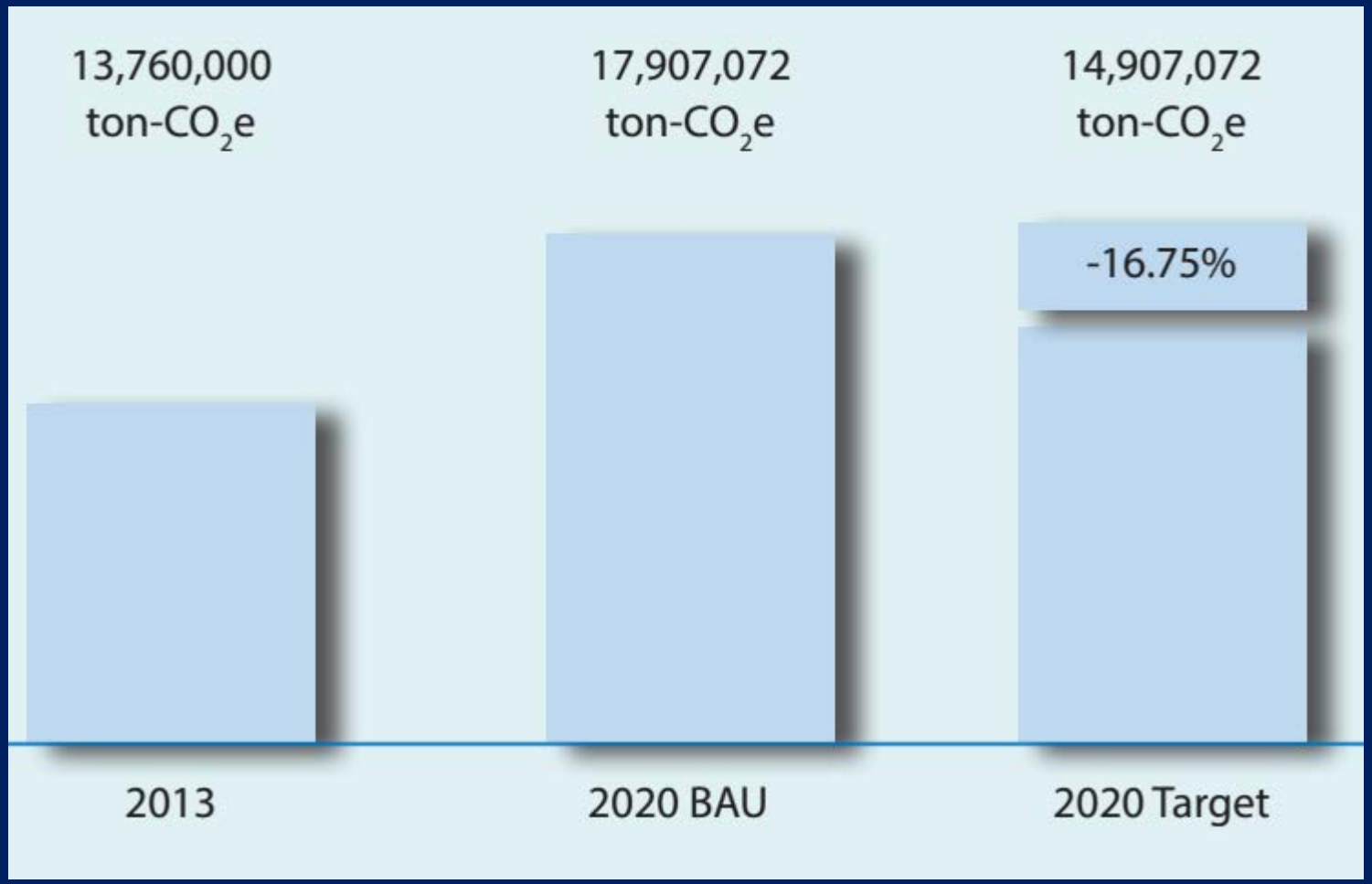
GHG emissions in 2013 and BAU emission and mitigation targets in 2020 in the transport sector



GHG emissions in 2013

Emission in BMA = emission from road, railways, waterways

- Each sub-sector emission is calculated multiplying activity data and emission factors of fuel or electricity.
- Activity data
  - : Fuel consumption from road sub-sector in Bangkok by fuel types.
  - Electricity consumption of MRT and Sky train in Bangkok.
  - Fuel consumption of waterways in 2013.

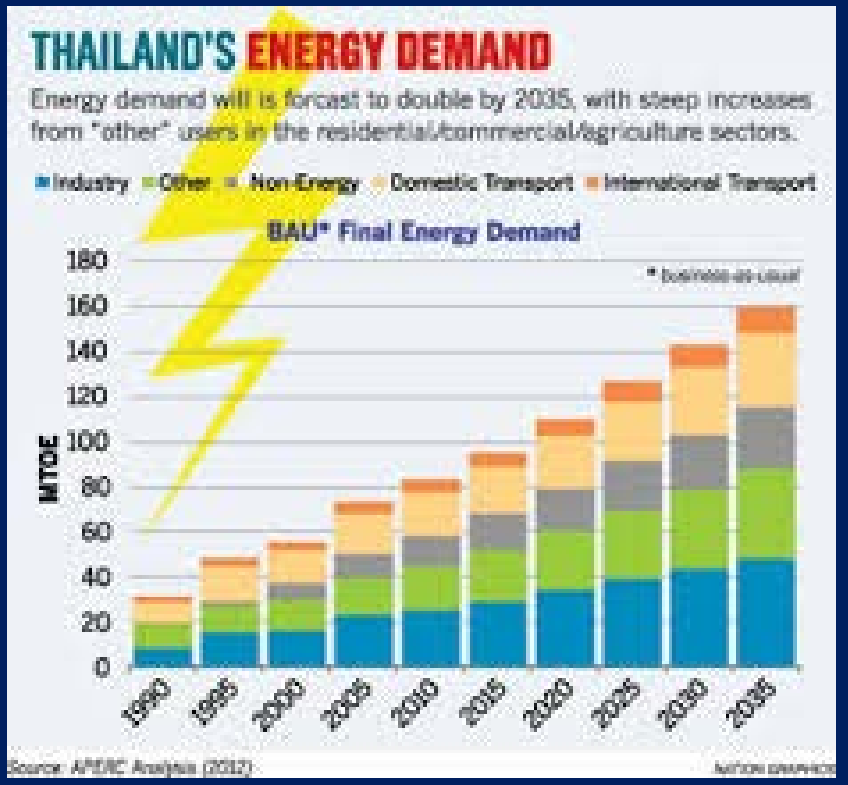
Business as Usual (BAU) emission in 2020

- Future (BAU) CO2 emissions associated with transportation activities (road) within BMA administration area are estimated by multiplying.

- “Current emission (year 2013)” by “Increase rate of BAU emission”

Business as Usual (BAU) emission in 2020

- *Increase rate of BAU energy consumption in transport sector* **provided in Thailand 20 year Energy Efficiency Development Plan (2011-2030), Ministry of Energy.**



Measures for Implementation

Category	Measure
1. Public transportation (Infrastructure)	1.1 Development of Monorail and Light rail Transit System 1.2 Extension of BTS 1.3 Development of MRT 1.4 Development of BRT 1.5 Development/improvement of water transportation

Measures for Implementation

Category	Measure
2. Public transportation (Supporting measures)	2.1 Improvement of connectivity of public transportation 2.2 Improvement of bus service 2.3 Development of passenger shelter at bus station 2.4 Development/expansion of Park & Ride 2.5 Introduction of common ticket system

Measures for Implementation

Category	Measure
3. Measures on motor vehicles	3.1 Introduction of low emission vehicles (LEV) to BMA vehicles 3.2 Introduction of natural gas vehicle NGV to BMTA buses 3.3 Promotion of Eco-driving

Measures for Implementation

Category	Measure
4. Non-motorized transport (NMT)	4.1 Development/expansion of bikeway 4.2 Expansion of “Bike-for-Rent” 4.3 Development/expansion of pedestrian

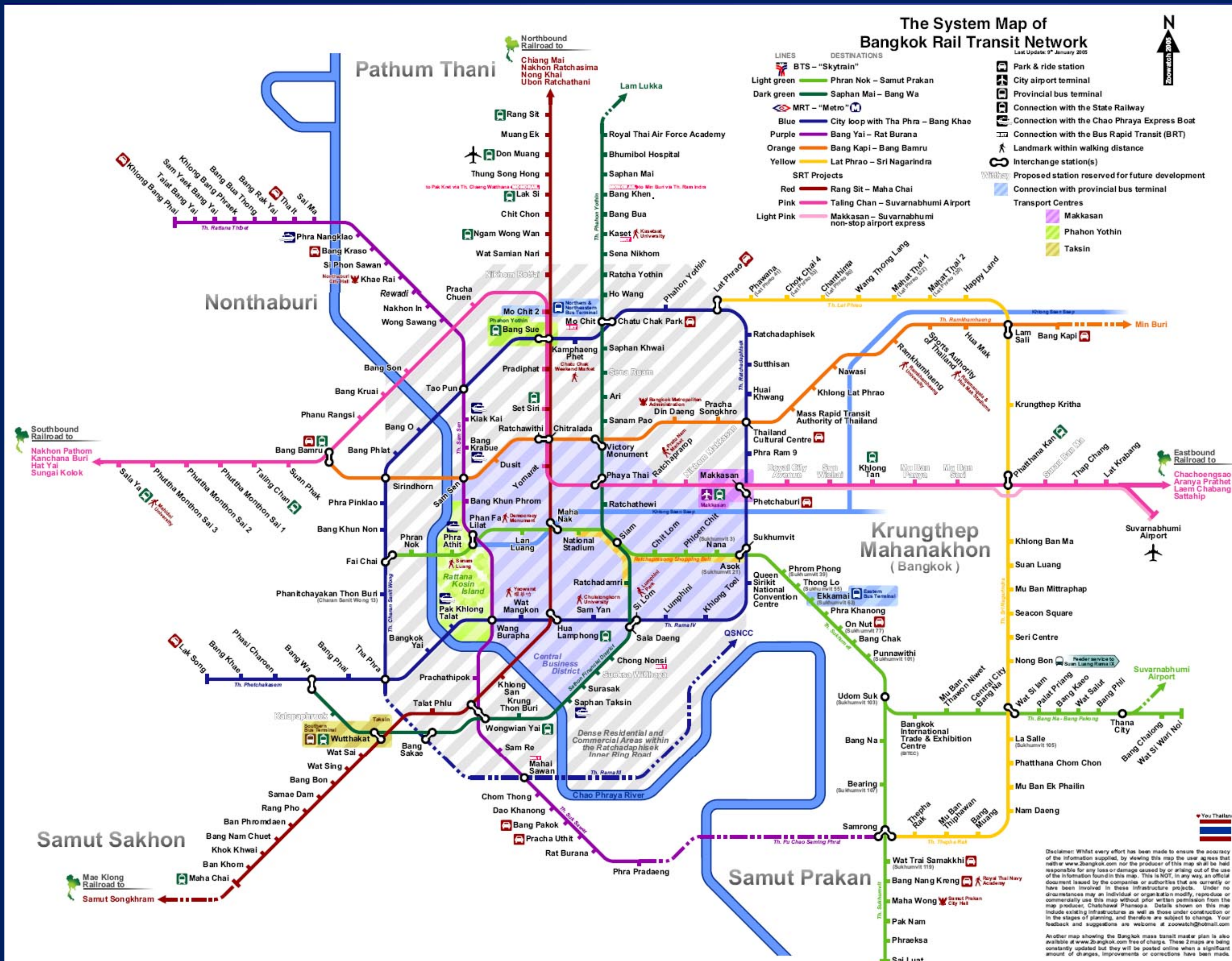
Measures for Implementation

Category	Measure
5. Traffic volume/flow control	5.1 Development/improvement of road, bridge, tunnel 5.2 Improvement of signal system 5.3 On-street parking control

Measures for Implementation

Category	Measure
6. Public awareness rising	6.1 Promotion of public transportation 6.2 Classes for school to learn about environment/transport 6.3 Organizing workshops and seminars

Network of Sky Train in BMA

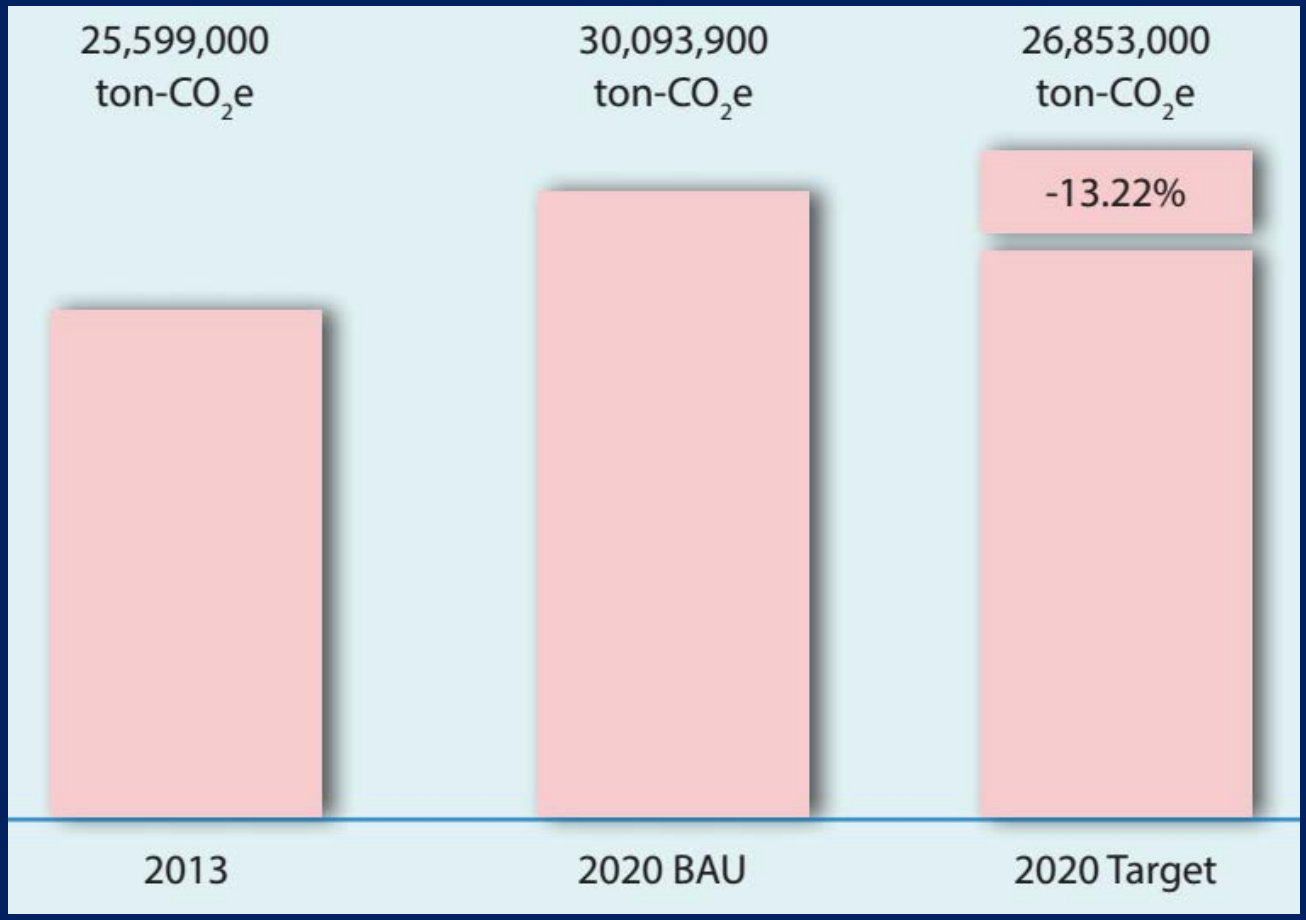


Network of Sky Train in BMA

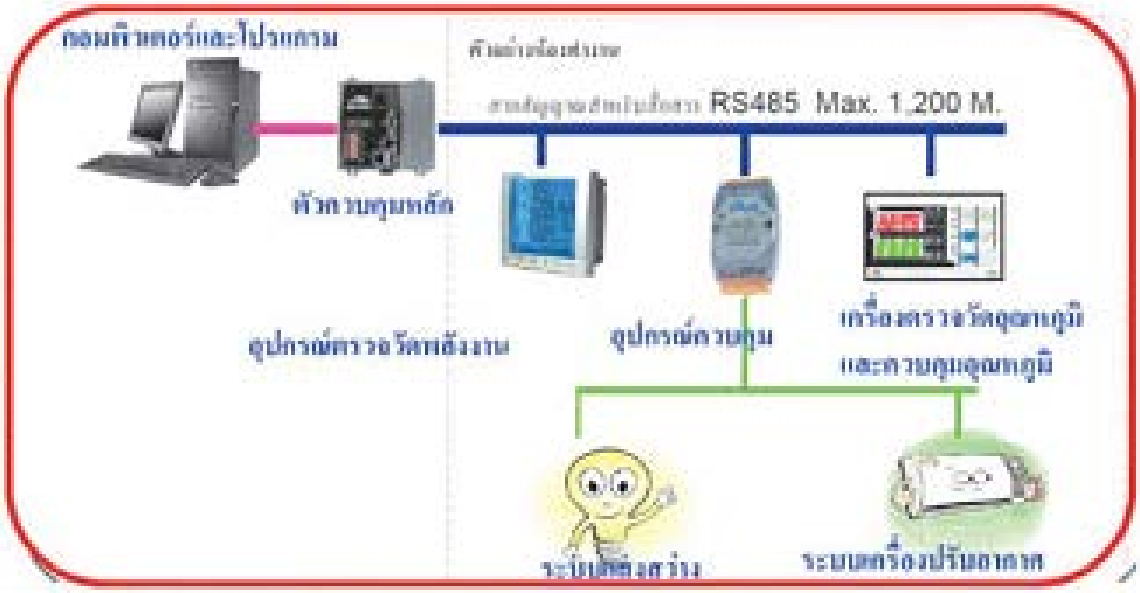
Mitigation measures in energy sector

- Energy efficiency
- Renewable energy

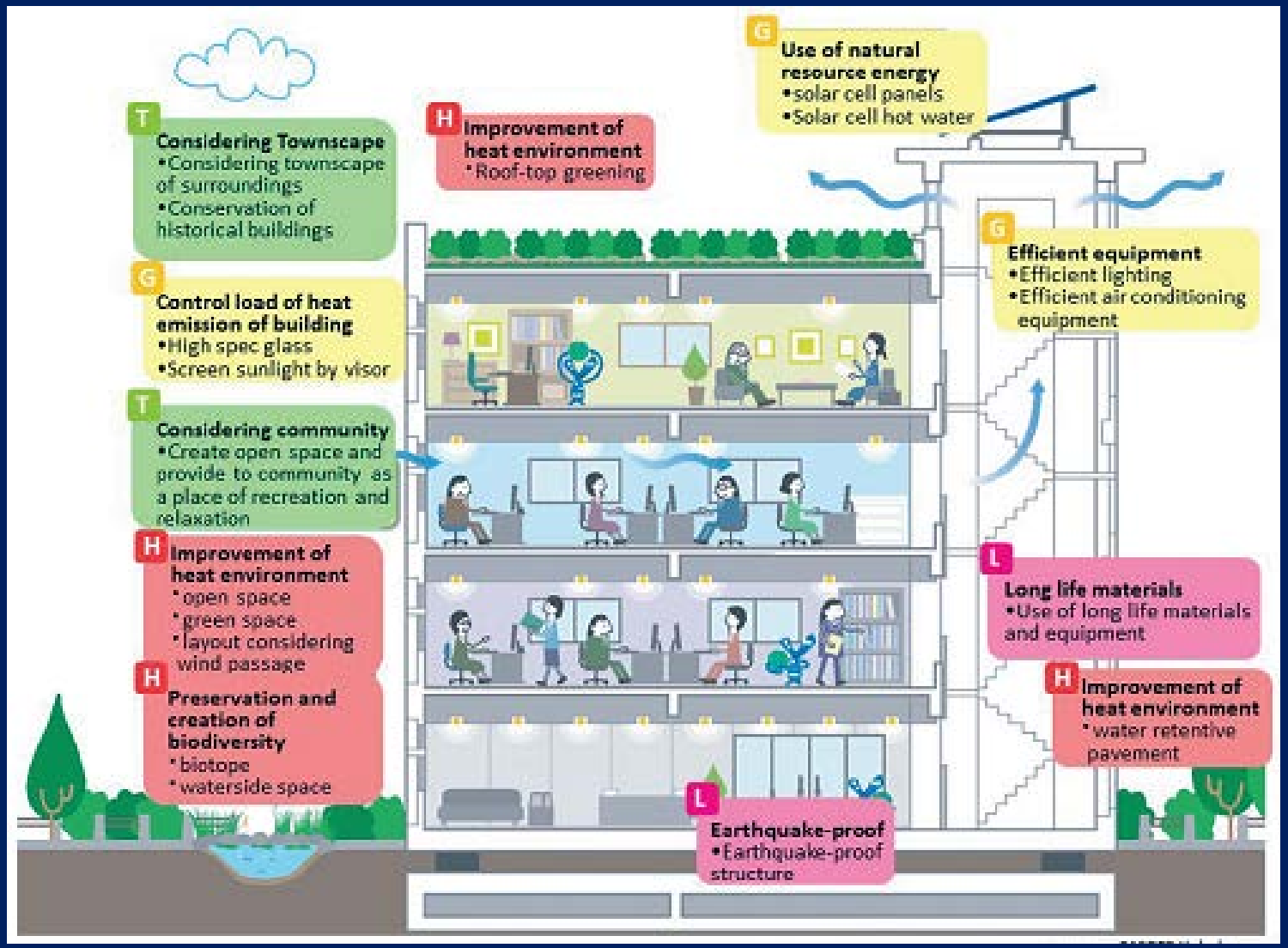
GHG emission in 2013 and BAU emission and mitigation targets in 2020 in the energy sector.



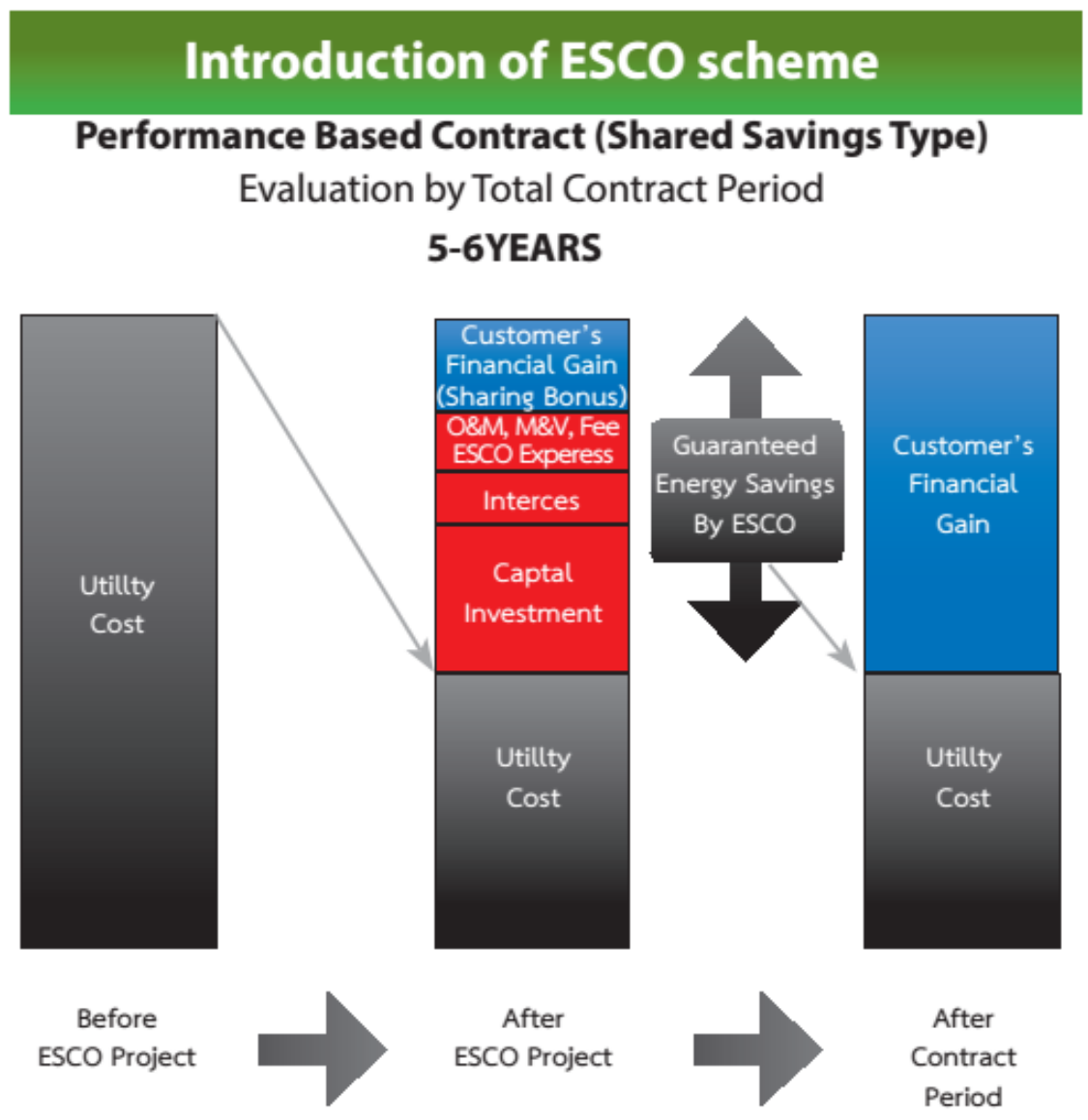
Energy Management System (BMA owned building)



Energy Management System (Private Sector)



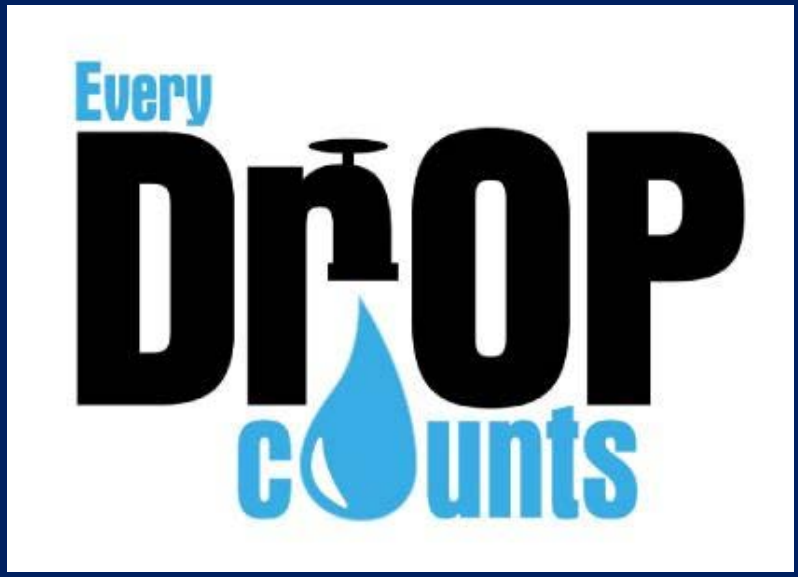
Introduction of Energy Service Company (ESCO)



Category			Possible mitigation measures (countermeasures)	
1. BMA government buildings & facilities	1.1 Energy saving renovation/ repair work for existing facilities	1.1.1 General tasks	1)	Developing systematic schedules of retrofitting BMA's existing building for appropriate management of energy
			2)	Systematic implementation of energy saving retrofitting works of BMA's existing building
			3)	Selection of model project for energy saving renovation work Intensive adoption of top-runner appliances
			4)	Energy saving requirements for retrofitting works of BMA facilities and setting of high-level of energy efficiency Acquisition of certification for energy saving renovation work (CASBEE or LEED etc.)
			5)	Consideration of renovation work, extension work, conversion at the time of facilities update (maximum utilization of existing stocks)
			6)	Efficient retrofitting/renovation work for energy saving by introducing private capital know-how

Category			Possible mitigation measures (countermeasures)	
		1.1.2 Improving insulation performance (renovation technique)	1)	Introduction of thermal barrier roof coatings
			2)	Improving external insulation and waterproofing
			3)	Introduction of roof greening
			4)	Improving heat insulating window (high heat insulating glass such as low-e pair glass)
			5)	Improving heat insulating window (thermal barrier film)
			6)	Controlling solar radiation heat by installing louver or eaves
		1.1.3 Cutting down air conditioning/ ventilation load (retrofitting technique)	1)	Replacing existing air-conditioning equipment by high-efficiency one
			2)	Introduction of variable flow controller
			3)	Introduction of task ambient air conditioning system - controlled by motion/temperature sensor, timer etc.
			4)	Introduction of high-efficiency fan (total heat exchanger)
			5)	Introduction of cogeneration system
		1.1.4 Cutting down lighting load (retrofitting technique)	1)	Introduction LED lighting or hf fluorescent lamp
			2)	Introduction of task ambient lighting
			3)	Installing motion sensor lighting to bathroom, corridor or staircase
			4)	Daytime energy reduction by daylight sensor

Category			Possible mitigation measures (countermeasures)	
		1.1.5 Energy reduction by water-saving	1)	Upgrading water saving sanitary appliances
			2)	Introduction of rainwater recycling system
			3)	Introduction of waste water recycling system (reuse as toilet bowl flushing water)
		1.1.6 Others	1)	Introduction of Solar power generation systems
			2)	Introduction of BEMS, building energy management systems
			3)	Replacing street lighting to LED



Category			Possible mitigation measures (countermeasures)	
1. BMA government buildings & facilities	1.2 Energy saving for new construction	1.2.1 General tasks	1)	Constructing high energy efficiency building
			2)	Introducing requirements of certificate for new construction of BMA facilities (Energy standard such as CASBEE or LEED etc.)
	1.3 Information campaign	1.3.1 Conducting campaign to citizens	1)	Promoting environmental education at school
			2)	Support to exhibition of energy saving merchandise for BMA facility
			3)	Visualization of energy saving of BMA facility Notify saving energy activities by panel or monitor
			4)	Promoting "Green Curtain" installation at school to reduce air conditioning load
			5)	Holding workshop on energy saving repair work for public participation (schools, public facilities)
		1.3.2 Conducting campaign to the officials	1)	Raising preset cooling temperature
			2)	Award for saving energy activity
			3)	Turning off lightings during lunch break
			4)	Thorough power saving setting on PC or OA equipment

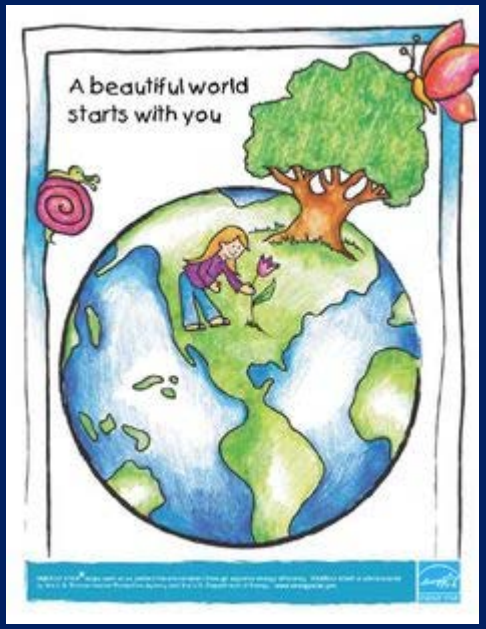
Category			Possible mitigation measures (countermeasures)	
	1.4 Promotion of low carbon city	1.4.1 Model areas		Setting up low-carbon model area, each fields top runner measure, intensive equipment investment
2. Civil Categories (Residential/ Commercial/ Industries)	2.1 Residential part	2.1.1 Promotion of energy saving house	1)	Promotion of low-carbon/energy saving detached house (Publicity of cost benefit from the viewpoint of low carbon community , backup exhibition, provide advertising spaces at BMA facilities
			2)	Facility equipment introduction promotion of energy saving house (LED lights, energy-saving air conditioning system or hot-water apparatus etc.)
		2.1.2 Promotion of energy saving repair work	1)	Publicity of cost benefit by repair work for energy saving
			2)	Promotion of repair work for energy saving: insulation upgrade by double glazing, heat barrier film, renew air conditioning device (subsidy system etc.)
		2.1.3 Promotion of energy saving home appliances		Purchase promotion of energy saving home electric appliances (air conditioning, fridge, TV etc.)

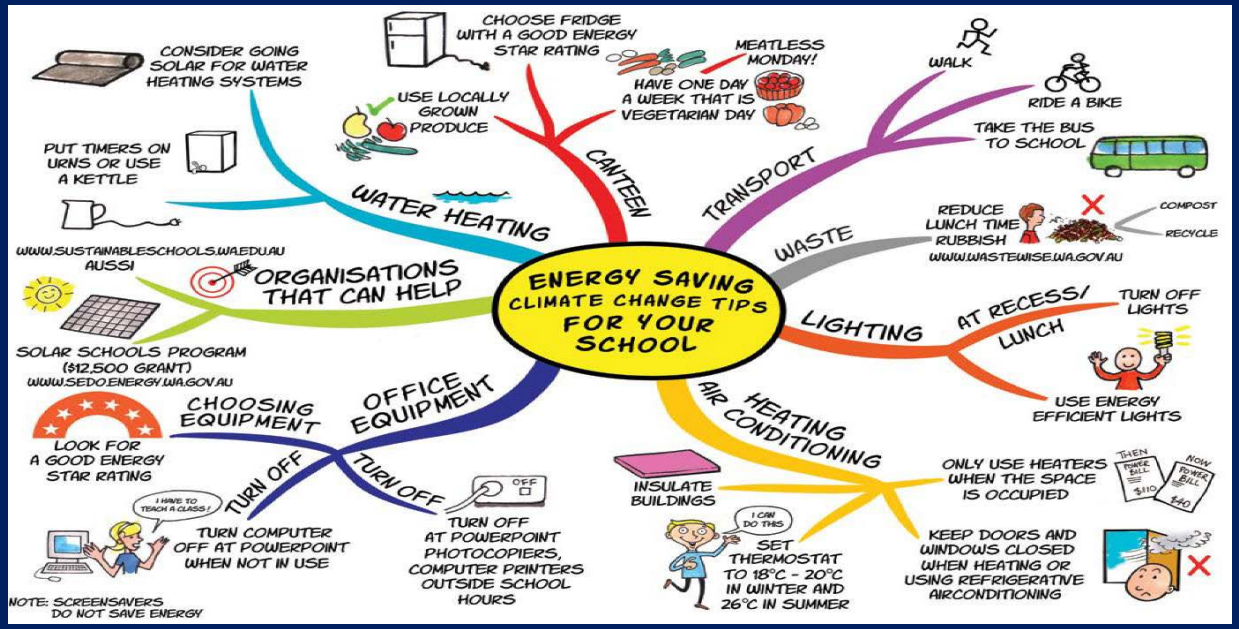
Category				Possible mitigation measures (countermeasures)
		2.1.4 Promotion of energy saving measure		Promote better understanding of air conditioner maintenance (conduct free cleaning)
		2.1.5 Others		Promotion of solar panel installation subsidy system or mediating installable roof

Category			Possible mitigation measures (countermeasures)	
2. Civil Categories (Residential/ Commercial/ Industries)	2.2 Commercial/ Business part	2.2.1 Promotion of energy saving building		Incentive for constructing/repairing saving energy factory (tax reduction, subsidy, zero-interest finance etc.)
		2.2.2 Promotion of energy saving repair work for existing building	1)	Conducting energy saving inspection of public buildings
			2)	Promotion of ESCO business for existing buildings (Explaining ESCO business, advertisement promotion support, subsidy system for energy saving diagnostic)
			3)	Promotion of repair work for energy saving: insulation upgrade by double glazing, heat barrier film, renew air conditioning device (subsidy system etc.)
			4)	Publicity of cost benefit by Electricity Peak-Cut Introduction support for automatic control facility of Electricity Peak-Cut

Category				Possible mitigation measures (countermeasures)
		2.2.3 Promotion of energy saving measure	1)	Promotion of saving energy activity (publicity of cost benefit etc)
			2)	Raising preset cooling temperature at public buildings Turn off lightings during lunch break
			3)	Thorough power saving setting on PC or OA equipment
			4)	Award for saving energy activity
		2.2.4 Others		Promotion of solar panel installation subsidy system or mediating installable roof
	2.3 Industrial part	2.3.1 Promotion of energy saving factory		Incentive for constructing/retrofitting saving energy factory (tax reduction, subsidy, zero-interest finance etc.)
		2.3.2 Promotion of energy saving repair work for existing factory	1)	Conducting energy saving inspection of factories
			2)	Promotion of repair work for energy saving (subsidy system etc.)
			3)	Publicity of cost benefit by Electricity Peak-Cut Introduction support for automatic control facility of Electricity Peak-Cut

Category			Possible mitigation measures (countermeasures)	
		2.3.3 Promotion of energy saving measure	1)	Promotion activity for factory's energy saving technique (for SMEs)
			2)	Commendation for saving energy activity
		2.3.4 Others	1)	Promotion of Solar Energy subsidy system or mediating installable roof
			2)	Promotion of beneficial use of factory exhaust heat



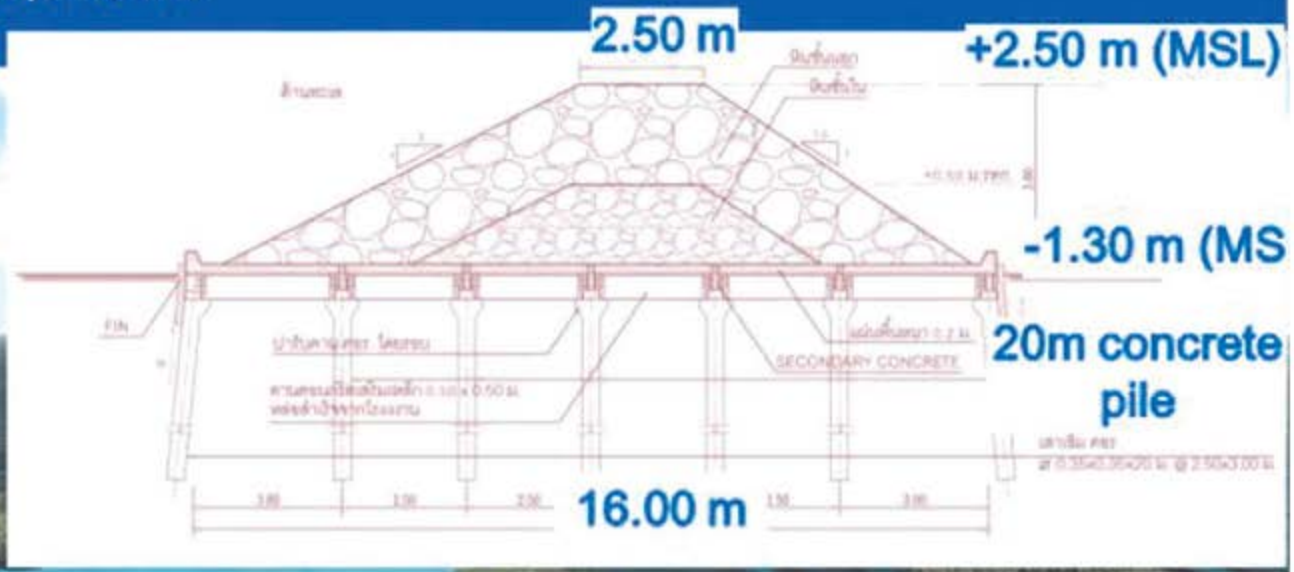


ADAPTATION MEASURES

- Bangkok Problems
  - Land subsidence.
  - Flood and drought.
  - Sea level rise.

Bang Khun Thian Coastal Erosion Protection Project

- No. of T-Groins: 10 units.
- Total structure length: 5,975 m.



10 T-Structures length 40-100 m.
Interval between structures : 500 m.

20-supplemental parallel structures length 50 m.

T-Gronis length 200 m.

Measures for Implementation in Adaptation Area

1	Flooding	
Time scale of impact	Adaptation level	Adaptation measure
Short term 1-3 years	Level 1 Prevention	1. Strengthening measures for retention areas e.g., construct and improve temporary retention basins (BMA et al., 2009)
		2. Dredging of drainage channels
		3. Installing drainage pumps
		4. Improving small scale irrigation facilities e.g., gates, weirs and etc. (NESDB et al., 2013)
		5. Constructing flood protection system (e.g., pumping station, water gate, flood dyke, tunnel) with proper supporting system such as alternative power sources and transmission lines
	Level 2 Minimizing impacts	1.Providing catchment area to store water and reduce volume of flood water flow rate
		2.Ensuring feed for livestock (NESDB et al., 2013)
		3.Designating evacuation areas (MOEJ, 2010) with appropriate facilities/equipment
		4.Developing disaster evacuation plan and revise the plan as necessary

Measures for Implementation in Adaptation Area

1	Flooding	
Time scale of impact	Adaptation level	Adaptation measure
		5.Developing emergency preparedness plan
		6.Strengthening emergency communications (BMA et al., 2009)
		7.Promoting people's participation to maintain community canal
		8.Educating/informing citizens on flood related issues e.g., risk of residing in flood prone area, health care during flood, situation of flood
		9.Establishing "Flood Aid Units" which are ready to help promptly and thoroughly
		10.Compensating for damaged farmland and properties
	Level 3 Chang and Reconstruction	1.Coordinating with government/related organizations/neighboring provinces to develop agreement on flood water management
		2.Formulating business continuity plans (MOEJ, 2010)
		3.Providing financial support during inundation period (NESDB et al., 2013)

Measures for Implementation in Adaptation Area

1	Flooding	
Time scale of impact	Adaptation level	Adaptation measure
Midterm 3-5 years	Level 1 Prevention	1.Continuing the implementation according to the plan
		2.Constructing community-based small scale retention pond
		3.Maintaining canals/rivers and increase drainage capacity (NESDB et al., 2013) e.g. maintenance of levees and river bank dredging
		4.Developing Ayutthaya bypass channel regulation
		5.Operating existing dams effectively and revise dam water management plan as appropriate
		6.Constructing and elevate outer ring road as alternative for transportation during flood
		7.Providing alternative power source and power transmission lines of drainage system
		8.Constructing flood proof buildings (BMA et al., 2009)
		9.Effectively utilizing existing flood protection facilities and extending their lifetime via regular maintenance (MOEJ, 2008)

Measures for Implementation in Adaptation Area

1	Flooding	
Time scale of impact	Adaptation level	Adaptation measure
	Level 2 Minimizing impacts	1.Establishing flood hazard maps
		2.Improving accuracy of weather forecast and upgrade monitoring and warning systems (MOEJ, 2008)
		3.Developing flood management information system with link to other sectors e.g., planting schedule
		4.Establishing guidelines for flood control facilities operation
		5.Enforcing law on land use and adopt integrated land use planning e.g., prohibit construction in flood prone area
		6.Implementing intervention measure in agricultural sector when appropriate (NESDB et al., 2013)
		7.Developing emergency preparedness plans (BMA et al., 2009)
		8.Providing more catchment areas
		9.Relocating housing in flood prone areas
	Level 3 Change and Reconstruction	1.Utilizing urban planning measures
		2.Conducting research and develop countermeasures technologies (MOEJ, 2010)

Measures for Implementation in Adaptation Area

1	Flooding	
Time scale of impact	Adaptation level	Adaptation measure
Long term 5-10 years	Level 1 Prevention	Continuing the implementation of Flood Prevention Plans
	Level 2 Minimizing impacts	1. Continuing the implementation of Flood Prevention Plans
		2.Ensuring operational guidelines for flood control facilities
		3.Enforcing law on land use and integrated land use planning (BMA et al., 2009)
		4.Improving flood management information system (NESDB et al., 2013)
Long term 5-10 years		5.Upgrading monitoring and warning systems (MOEJ, 2008)
	Level 3 Change and Reconstruction	1.Continuing the implementation of plans
		2.Providing government sponsored flood insurance (for areas outside of flood protection facilities) (BMA et al., 2009)
		3.Establishing funds and subsidies for post disaster restoration (MOEJ, 2008)
		4.Conducting research and develop countermeasures technologies (MOEJ, 2010)

Measures for Implementation in Adaptation Area

2	Coastal erosion	
Time scale of impact	Adaptation level	Adaptation measure
Short term 1-3 years	Level 1 Prevention	1.Constructing temporary coastal area protection fence (Bamboo)
		2.Improvement of dike system (BMA et al., 2009)
	Level 2 Minimizing impacts	1.Promoting people's knowledge on benefits of mangrove forest and its conservation
		2.Promoting mangrove forest plantation
		3.Developing emergency preparedness plans (BMA, et al., 2009)
		4.Public information campaigns and training exercises (World Bank, 2010)
	Level 3 Change and Reconstruction	1.Setting clear goal for coastal area protection measures and develop action plan accordingly
		2.Setting up joint committee of stakeholders to develop the coastal area management master plan by adopting integrated coastal zone management approach (MOEJ, 2008)

Capacity building and outreach

Cooperation with ASEAN cities

Society level (citizens and the private sector)

(1) Acquire and strengthen interest in and understanding about climate change, triggered by the Master Plan
(2) Acquire and strengthen willingness to participate in implementation of the Master Plan within its activities and become aware of such means
(3) Become aware of the necessity of data provision and MRV from GHG emission in Bangkok

Institutional level (BMA as a whole and respective departments)

(1) Establish and strengthen institutional arrangement to design and implement the Master Plan
(2) Strengthen the capacity of the Secretariat for (1)
(3) Elaborate a process of monitoring the implementation of the Master Plan
(4) Prepare procedure and documents for MRV (with a focus on R), among from (3) above
(5) Strengthen capacity to build and maintain good network with external organizations (government, private sector, citizens etc.)

Individual level (BMA officials)

(1) Acquire and strengthen capacity to overview climate change in general and specific sectors, and to plan countermeasures
(2) Understand technical aspects of GHG quantification and adaptation and able to guide consultants
(3) Able to collect and process activity data within BMA
(4) Able to communicate with stakeholders regarding technical matters of climate change in a appropriate way
(5) Able to lead other officials in BMA

Thai National government ministries

Collaborative work on low carbon and climate resilient society development with BMA

Participate in SC, and provide policy and technical advices

- Guide on ways ansdmeasns of how to renew knowledge of GHG quantification and adaptation
- Strengthen capacity for communication
- Provide training methods thru TOT

Other partners
(other cities and development partners)

- Support Master Plan development and PDCA Cycle development
- Strengthen implementation arrangement through SC
- Elaborate GLs and other documentation
- Share useful experiences from Japan and others

Local consultants

Approaches by outreach activities (newsletter, seminars etc)


IUE
China-Thailand Joint Workshop on
Watershed Sustainable Development in the Context
of the "Future Earth" Program
February 7 – 11, 2015, Xiamen, China

THANK YOU