International Meeting on Building Capacity for
Urban Climate Change Adaptation in Southeast Asia

31 July – 4 August 2017

Bangkok Master Plan on Climate Change

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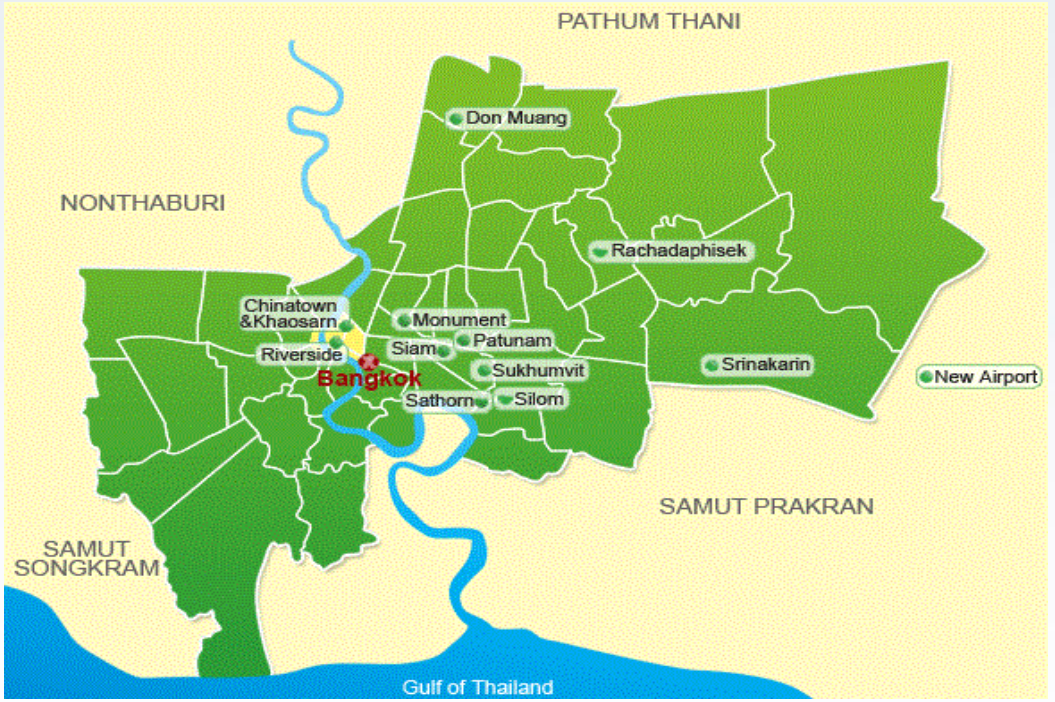
31 July 2017

About Bangkok



- **Total Area**
  1,568.737 km^2
- **Average Ground Level**
  +0.00 to +2.00 m above Mean Sea Level
- **Temperature**
  17.6 - 39.3˚C
- **Population (2016)**
  Registered 5,686,646 persons
  Non Registered ~ 4 million persons
- **District**
  50 districts



Global Climate Risk



World Map of the Global Climate Risk Index 1996–2015

Countries most affected by extreme weather events (1996–2015)	
1	Honduras
2	*Myanmar*
3	Haiti
4	Nicaragua
5	Philippines
6	Bangladesh
7	Pakistan
8	Vietnam
9	Guatemala
10	Thailand

Italics: Countries where more than 90% of the losses/deaths occurred in one year/event

Source: Germanwatch and Munich RE NatCatSERVICE

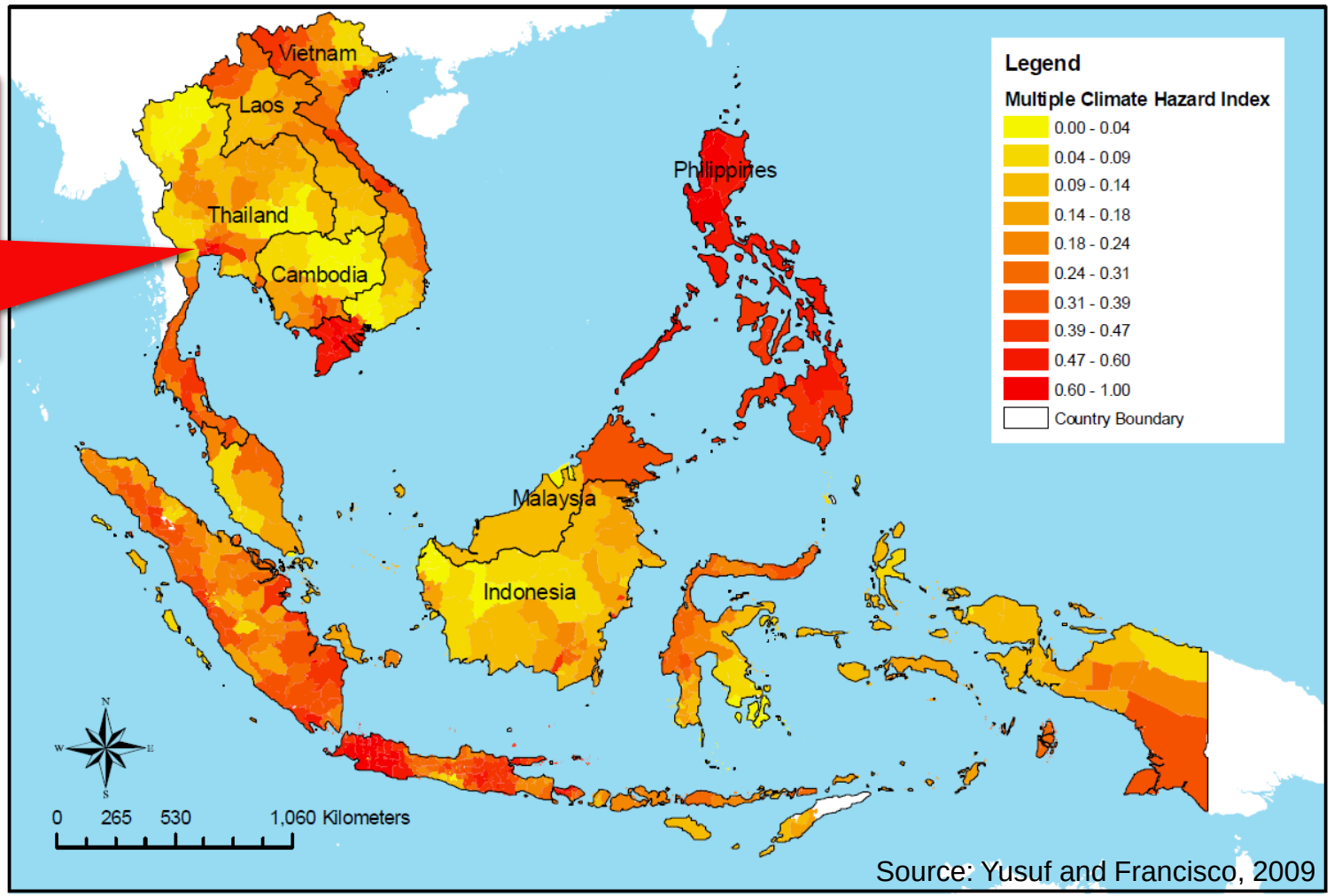
Climate Risk Index: Ranking 1996–2015 1–10 | 11–20 | 21–50 | 51–100 | >100 | No data

Climate Change in Southeast Asia



Bangkok and its surrounding area in Thailand **: Sea level rise & floods**

Multiple climate hazard map of Southeast Asia



(tropical cyclones, floods, landslides, droughts, and sea level rise)

Climate Change in Bangkok



Temperature changes

Rainfall changes
(local & upper catchment)

Sea level rise

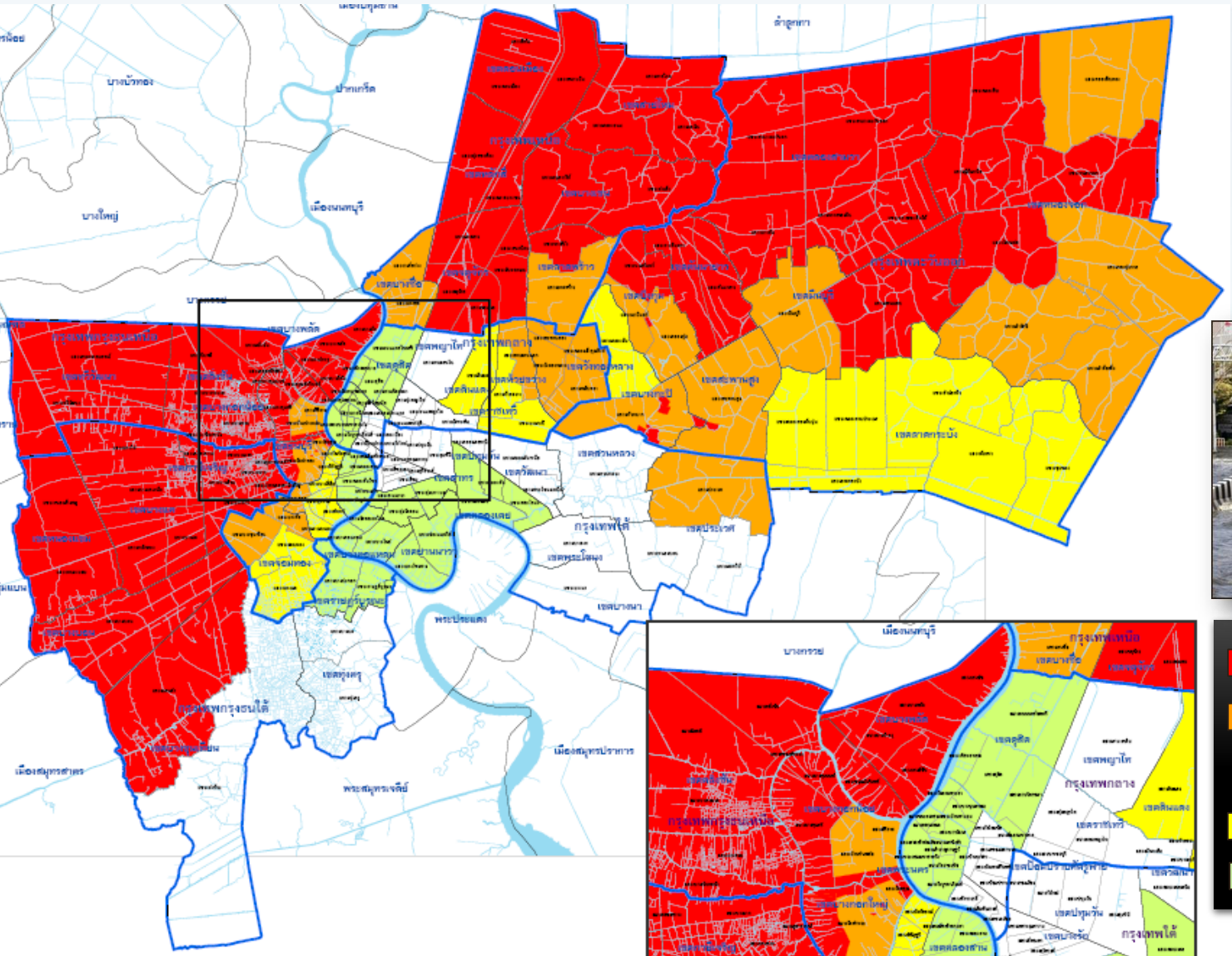
Altered frequency
of extreme events
(Storm Surge)

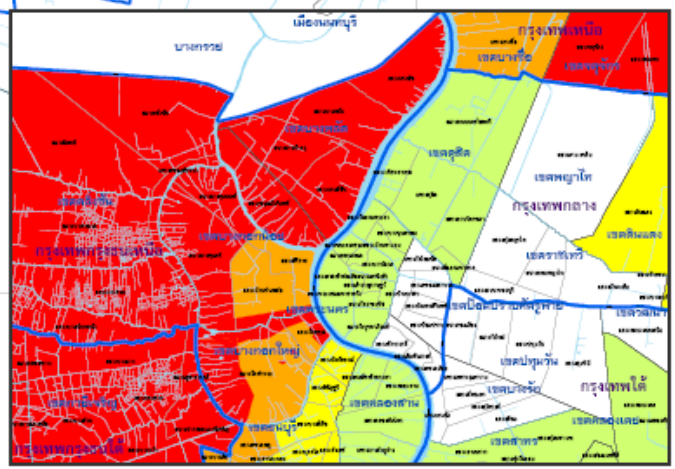
Compounding factors

- Flat topography
- Land subsidence

Flood situation map of Bangkok : 16 November 2011



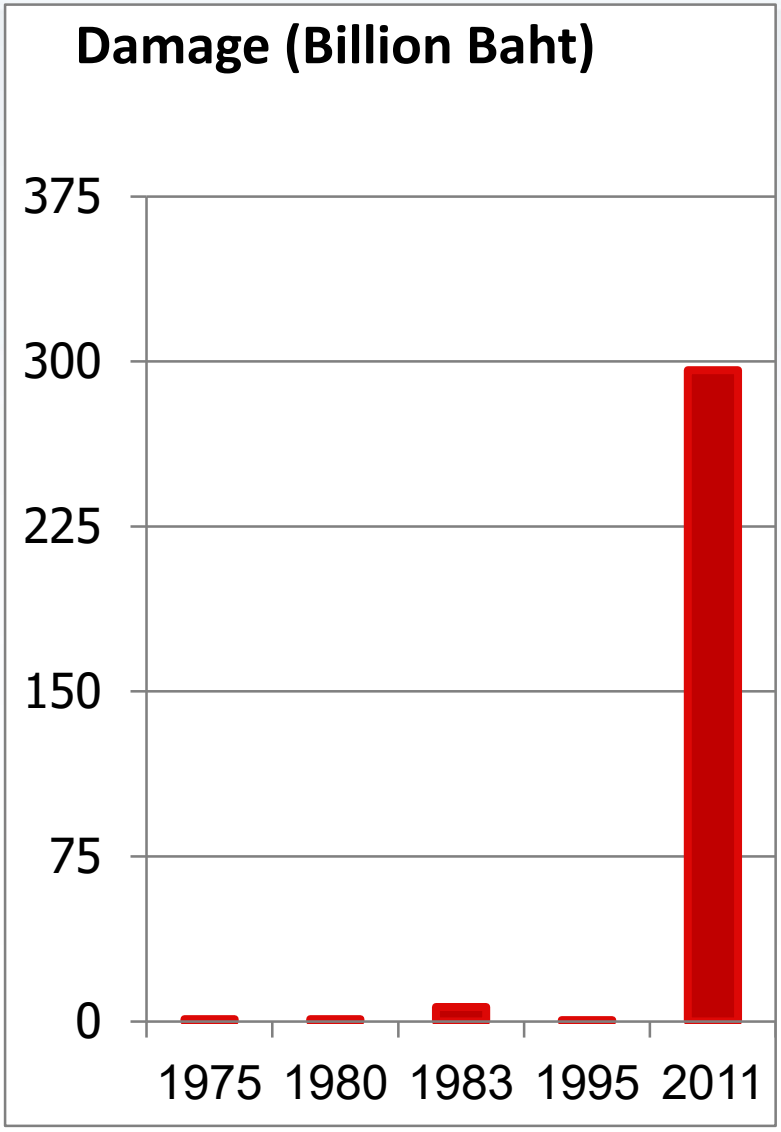




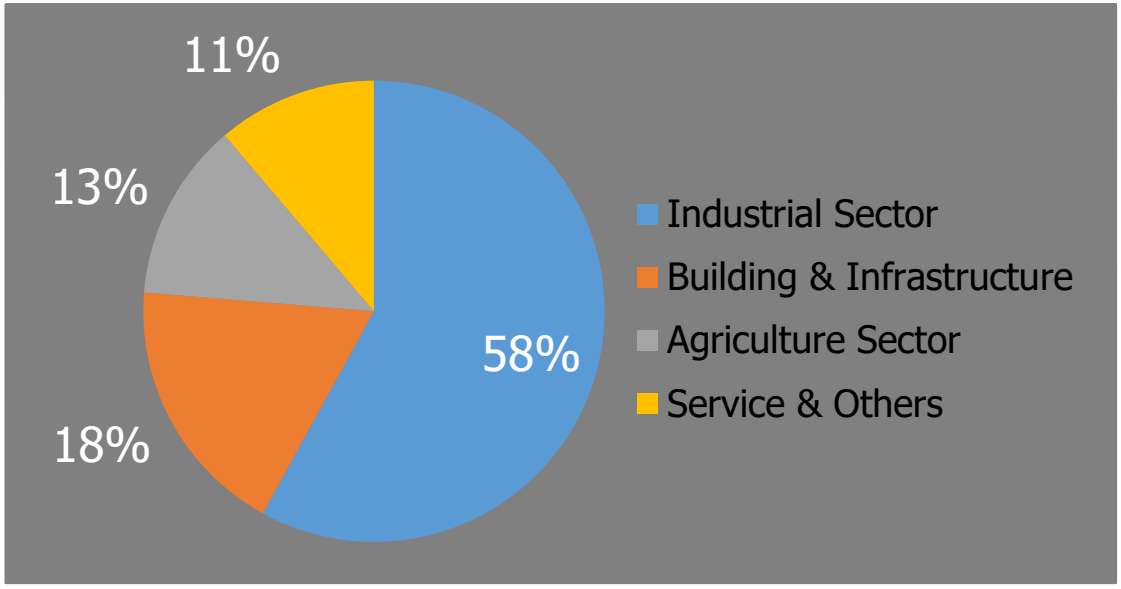
- Evacuation areas
- Intensive monitoring areas
- Monitoring areas
- Risk areas

Damages Cause by Flood of Bangkok





YEAR	DAMAGE (Billion Baht)
1975	1.000
1980	1.000
1983	6.600
1995	0.600
2011	**296.000 (59 Billion CNY)**



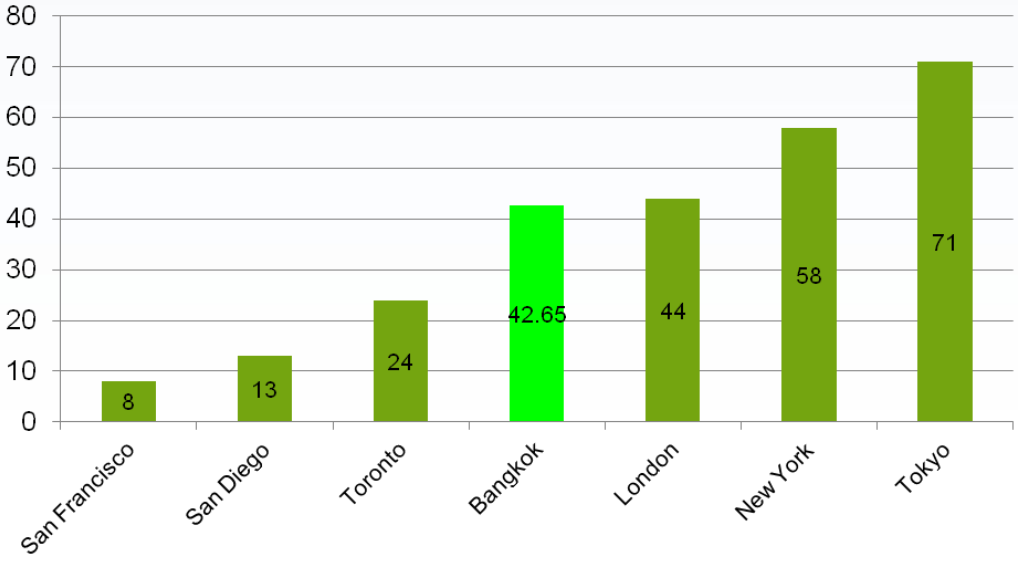
Bangkok GHG Emission



City	Estimated CO_2 Emission (million ton p.a.)	Estimated Population (million)	Estimated CO_2 Emission Per Capita (ton per capita p.a.)
San Diego[1]	13	2.9	4.5
Tokyo[2]	71	12.4	5.7
London[3]	44	7.5	5.9
Bangkok[4]	**42.65**	**6.0**	**7.1**
New York[5]	58	8.2	7.1
Toronto[6]	24	2.5	9.6
San Franscisco[7]	8	0.7	11.4

Compare with big city in the world in 2007

CO_2 Million Tons per year



GHG Emission in Bangkok by Sectors

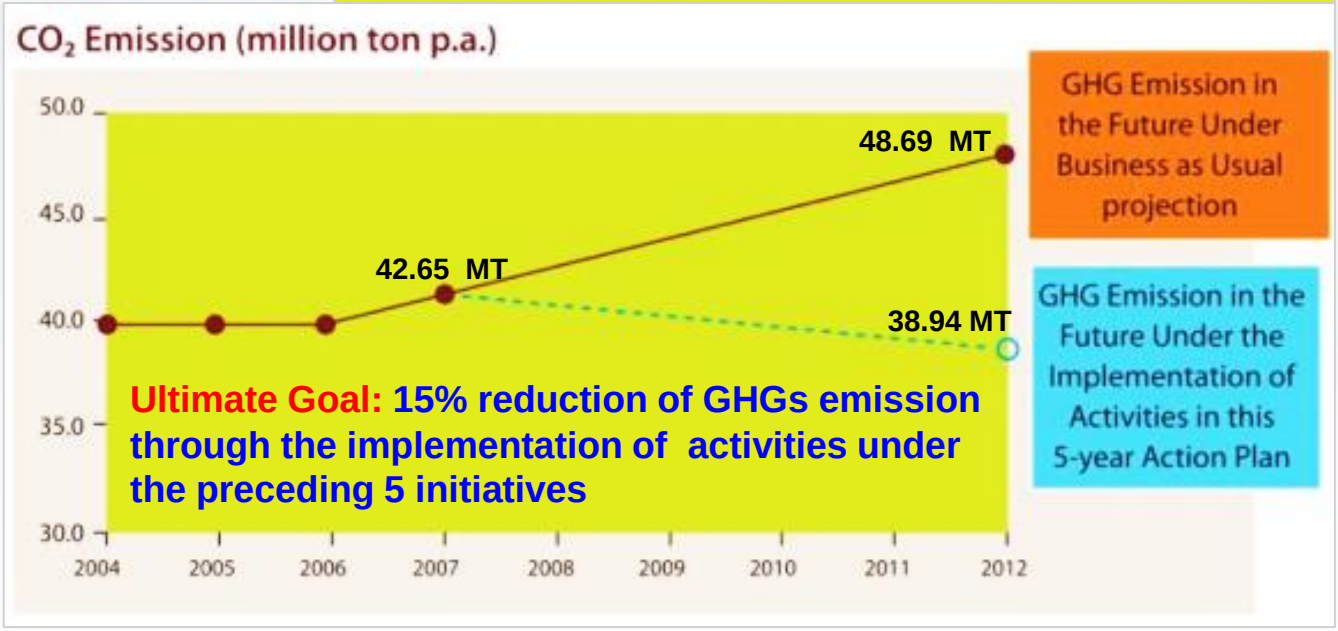
Sector	CO_2 Emission (million ton p.a.)	%
Electricity	14.86	34
Transportation	21.18	50
Waste / Wastewater	1.13	3
Other Sources	5.58	13
Total	42.75	100

BMA Action Plan on Global Warming mitigation 2007-2012



- GHG emissions **7.1 tons CO_2 equivalent / capita /year under business as usual (BAU)**
- GHG emissions in future **5.5 tons CO_2 equivalent /capita /year under the implementation of activities in 5-year Action Plan**

Reduction in Bangkok's future GHG Emission Under the 5-year Action Plan

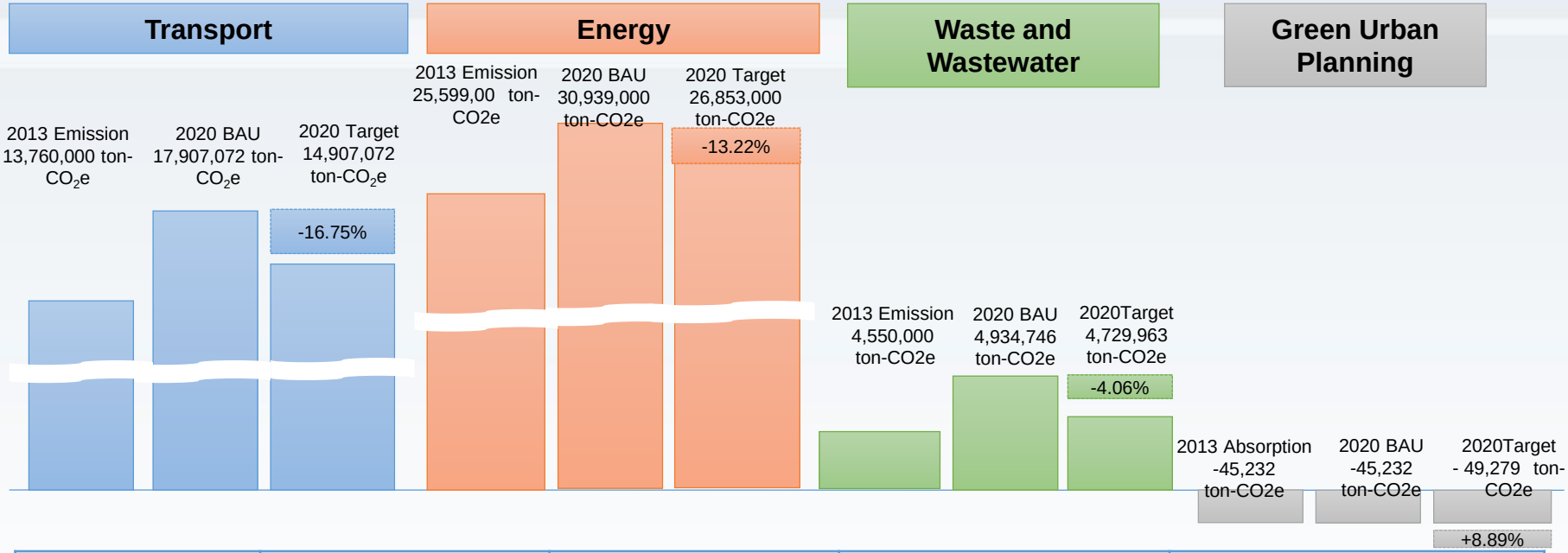


Results of Measures under BMA Action Plan on Global Warming Mitigation (2007 – 2012)

BMA Action Plan on Global Warming Mitigation (2007 – 2012)	Target Reduce CO_2 in 2012 (million-tones)	Total amount of CO_2 Reduction (million-tones)
1. Expand Mass Transit and Improve Traffic System	5.53	1.01
2. Promote the Use of Renewable Energy	0.61	0.88
3. Improve Building Electricity Consumption Efficiency	2.25	2.70
4. Improve Solid Waste Management and Wastewater Treatment Efficiency	0.46	0.70
5. Expand Park Area	0.90	1.69
Total	**9.75**	**6.98 (14%)**

GHG Emission in 2013 and BAU Emission and Mitigation Targets in 2020 (by Sector)





Sector	GHG Emission in 2013	Future GHG Emission in 2020 under BAU (million tons CO_2eq)	Future GHG Emission in 2020 under Bangkok Master Plan on Climate Change 2013-2023 Implementation (million tons CO_2eq)	Target Reduction (million tons CO_2eq)
Transport	13.76	17.91	14.91	3.00 (-16.75%)
Energy	25.60	30.94	26.85	3.24 (-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%)

Bangkok Master Plan on Climate Change 2013-2023



Building upon the efforts on the Bangkok Action Plan on Global Warming Mitigation 2007-2012,

the BMA cooperated with JICA to develop the Bangkok Master Plan on Climate Change 2013-2023.

Scope of Master Plan

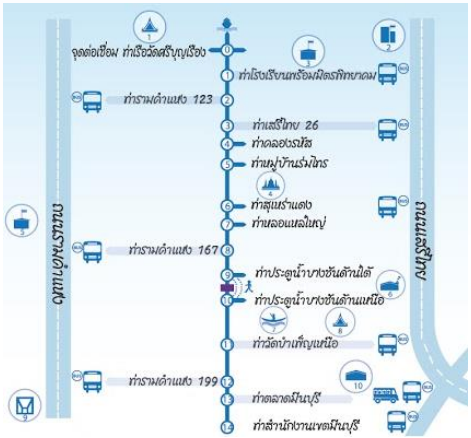
- (1) Environmentally sustainable transport
- (2) Energy efficiency and alternative energy
- (3) Efficient solid waste management and wastewater treatment
- (4) Green urban planning
- (5) Adaptation planning

Mitigation Measures



1. Environmentally Sustainable Transport

- Development of public transportation (Infrastructure)
- Development of public transportation (Supporting measures)
- Measures on motor vehicles
- Non-motorized transportation
- Traffic volume/ flow control
- Public awareness raising



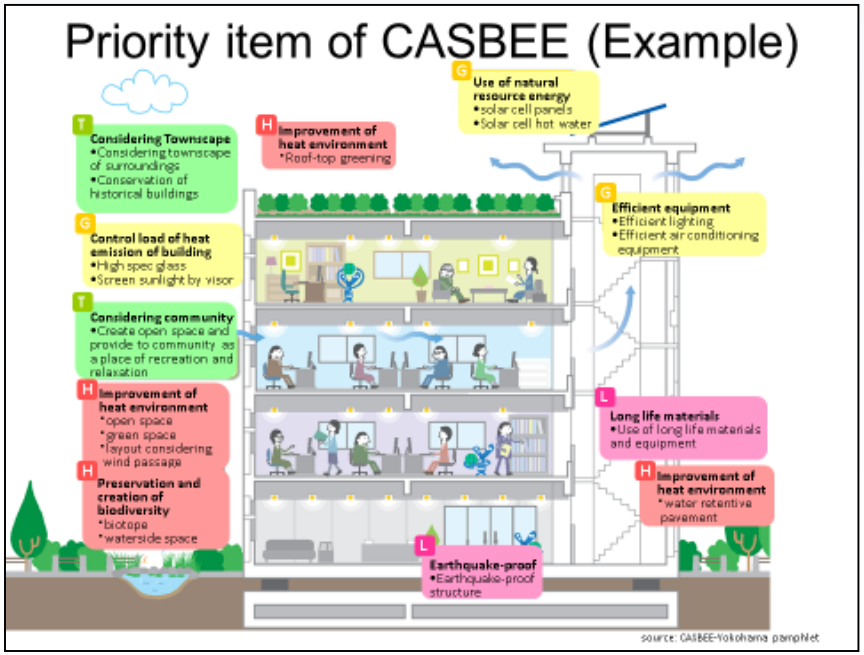
Mitigation Measures



2. Energy Efficiency and Alternative Energy

(BMA's building and facilities)

- Energy saving renovation/repair work for existing building and facilities
- Energy Saving Priority for new construction
- Information Campaign
- Promotion of low carbon city



Mitigation Measures



3. Efficient Solid Waste Management and Wastewater Treatment

Solid Waste Management

- Waste reduction and separation at source
- Improve fuel efficiency of waste collection and transportation systems
- Promote utilization of organic waste
- Construct waste-to-energy incineration facility
- Construct waste segregation plant
- Install environmentally friendly landfill system

Wastewater Management

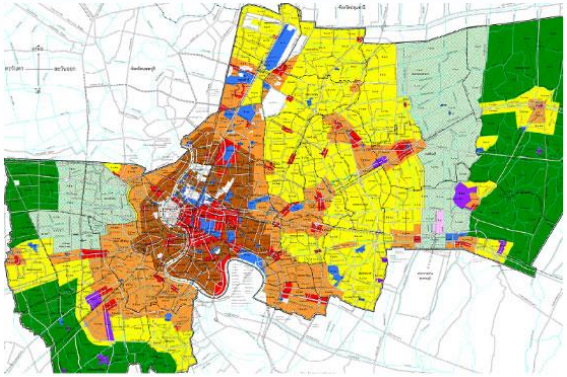
- Promote reduction of water usage at house
- Promote collection of wastewater tariff
- Feasibility study for construction of separated sewerage collection system
- Improve operation and equipment of existing WWTPs
- Promote utilization of sludge
- Promote water reuse

Mitigation Measures



4. Green Urban Development

- Increasing new green areas
- Planting new trees along roadside areas
- Increasing the Biotope Area Factor (BAF) in Private land
- Reforestation mangroves
- Well-managing & maintaining of planted trees
- Rooftop greening and wall greening
- Public awareness campaign

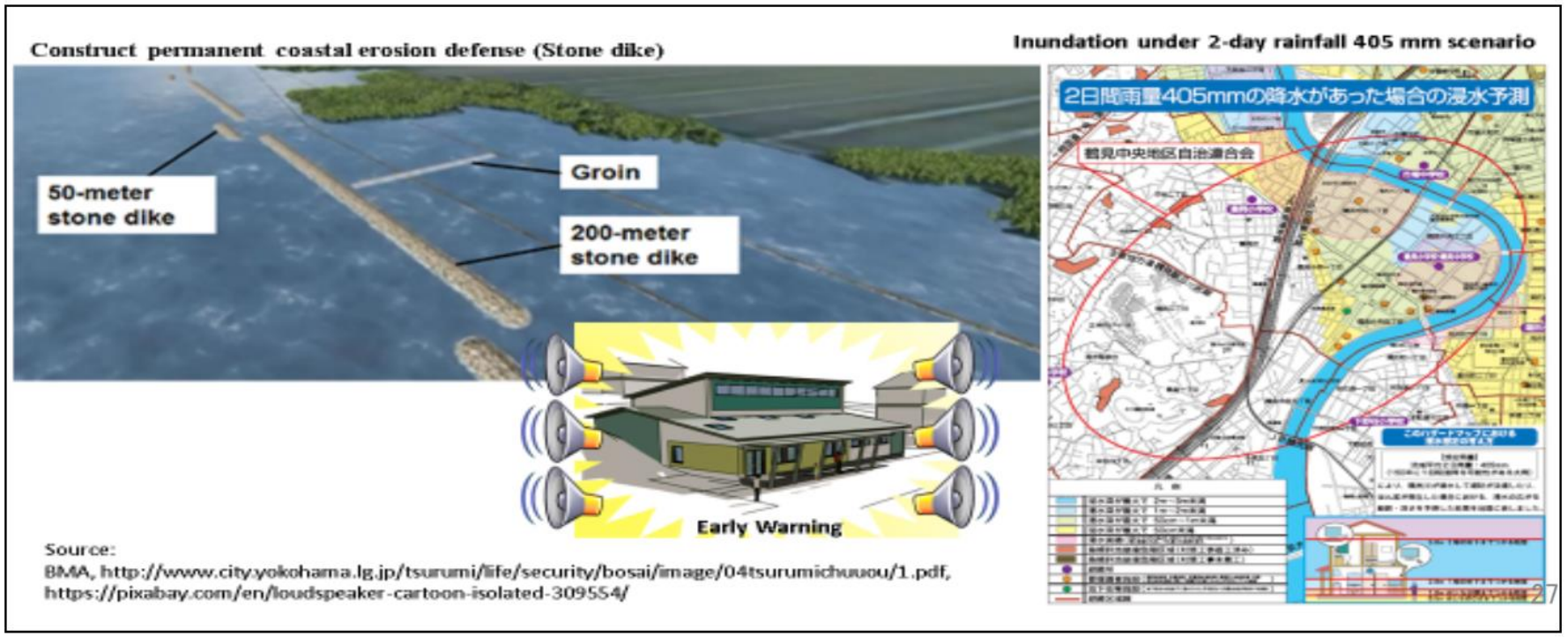


Adaptation Measures



Key Concept:

- Bangkok is extremely vulnerable to climate change negative impacts. (flooding, coastal erosion, draught and saline Intrusion)
- Bangkok will be disaster-proof city by introducing soft and hard measures. (such as hazard mapping, construction of stronger dykes, etc.)



Adaptation Measures



Bangkok has undertaken the measures for climate change adaptation by implemented structural measures

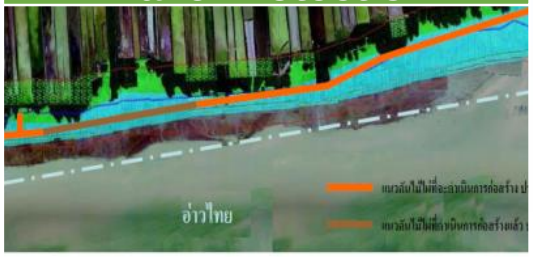
Flood Barrier

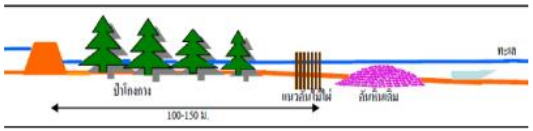
Pumping Station

Drainage Tunnels

Retention Area

Coastal Erosion and Wave Protection





Relevant Project Implementation



Joint Crediting Mechanism (JCM) Project

Public-Private Partnership Workshop on Low Carbon Urban Development in Bangkok and the Joint Crediting Mechanism (JCM) 2013

OPEN YOKOHAMA 横浜市 City of Yokohama

Focal Areas of Cooperation

(1) Energy management, public transport, waste and wastewater etc.
(2) Participation by the private sector, academia, and local communities
(3) Call for participation by the Thai and Japanese Government and international organization for their support
(4) Information sharing

Relevant Project Implementation



Joint Crediting Mechanism (JCM) Project

Overview of the Feasibility Study

Name of the Feasibility Study:
JCM projects development (energy efficiency, and waste and waste water) under the Bangkok Master Plan on Climate Change, and study on financial and other facilitation schemes for introducing low carbon technologies

Main Proposer
Overseas Environmental Cooperation Center , Japan (OECC)

Members for proposal
Yokohama City, finetech inc., InterAct Inc., JFE Engineering Corporation

Objective:
To identify and select potential projects that can reduce CO2 emission and support the implementation of the Bangkok Master Plan on Climate Change

Target sectors:
ESCO, Renewable energy, Waste management, water & sewer, Transportation, Low-carbon city

Relevant Project Implementation



60+ Earth Hour

EARTH HOUR

#CHANGE

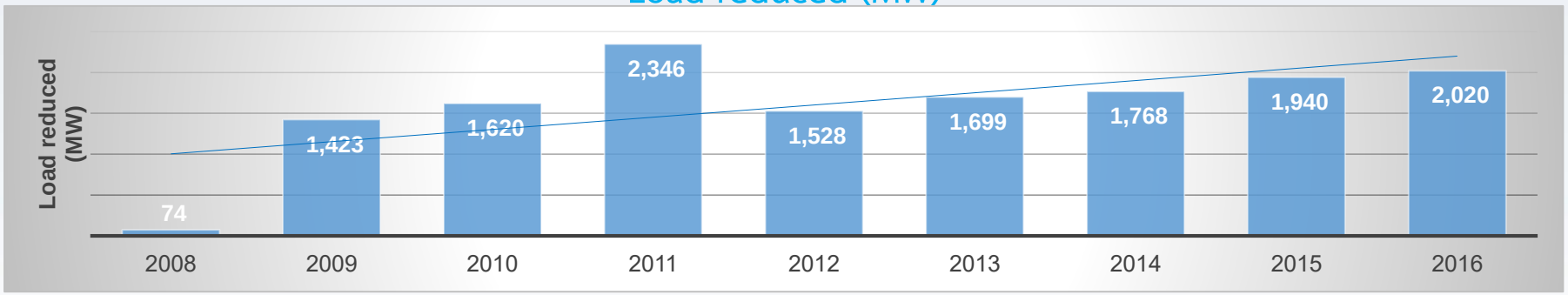
"This Earth Hour, shine a light on climate actions"

Relevant Project Implementation



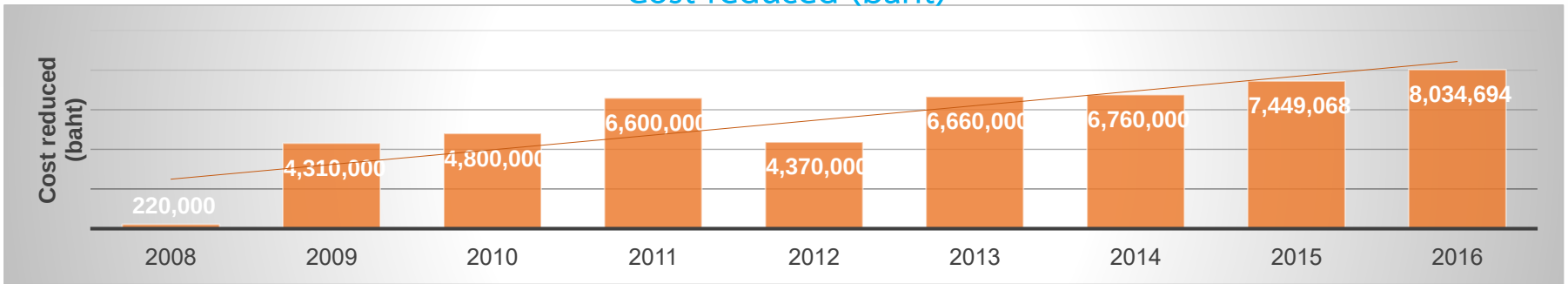
The result from 60+ Earth Hour 2008-2016

Load reduced (MW)



Carbon reduced (tons)

Cost reduced (baht)



Relevant Project Implementation



Low Carbon School Network

In 2012 , The BMA with the Foundation for Environmental Education for Sustainable Development Thailand (FEED) implemented the “Low Carbon School Network”.

Objectives :

- To create low carbon society
- To change people’s habits in schools, which would help reducing impacts to the environment.

Target group:

- Pupils from 16 BMA’s schools

goal :

- To teach educate BMA school pupils to use energy more efficiently. The network was expanded to communities.

Relevant Project Implementation



Low Carbon School Network

1. Raising awareness and educating for better understanding of climate change

2. Changing in attitude

The strategic activities

3. Developing skills

4. Participating in environmental conservation




This project can reduce 12 tCO_2 from 12 schools

Relevant Project Implementation



Bangkok Low Carbon City

Relevant Project Implementation

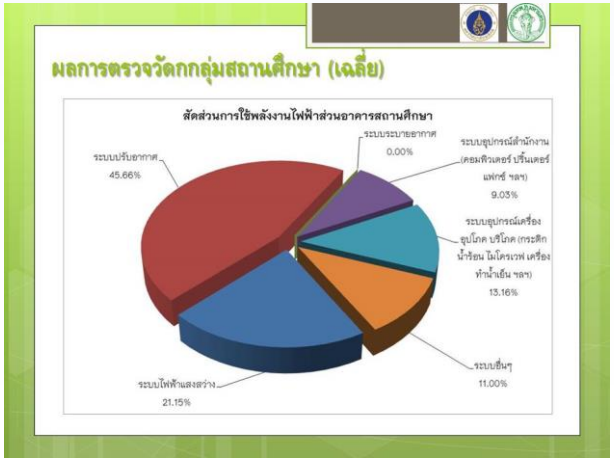


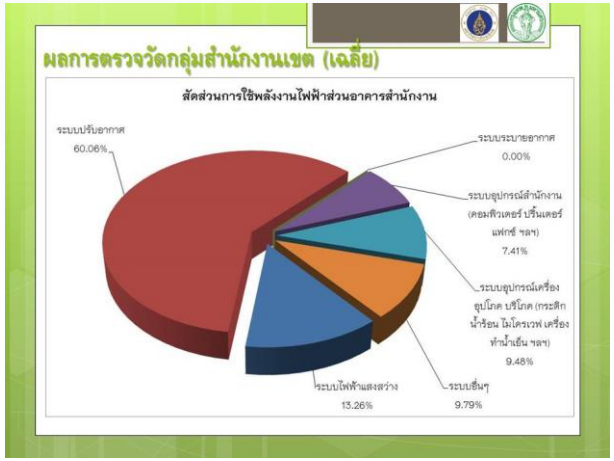
Bangkok Low Carbon City

25 BMA Schools

6 District Offices

6 Public Health Centers





Relevant Project Implementation



Bangkok Low Carbon City

https://www.facebook.com/bkklowcarboncity

Relevant Project Implementation



Bangkok Low Carbon City





Relevant Project Implementation



Community Based Solid Waste Management : CBM

- 2009 initiated 12 pilot communities
- Replication of success to another 1 communities in each district and another 5 communities in 2010 and 2011 respectively
- The project reduced the solid waste amount by 38-90 %

Relevant Project Implementation



Composting from Organic Waste

- 1,600 tons/day
- Fertilizer ~ 500 tons/day
  Mix and resize

Oversize of sieving will be transferred to landfill

Oversize of sieving will be transferred to landfill

Zone A and Zone B
swicth 20 days per Zone
(Total 40 days)

Sand, glass, stone, metal sieving

Fertilizer from composting
process (40 kg)

Relevant Project Implementation



The prototype of community in solid waste management

- Studied 2 pilot communities from 5 different groups representing flat, condominium, housing estate, urban and sub urban communities as well as slums in solid waste and environmental management
- Developed the solid waste and environmental management handbook and videos of 5 community groups ad disseminated to communities
- 50 Districts offices have facilitated the implementation of communities



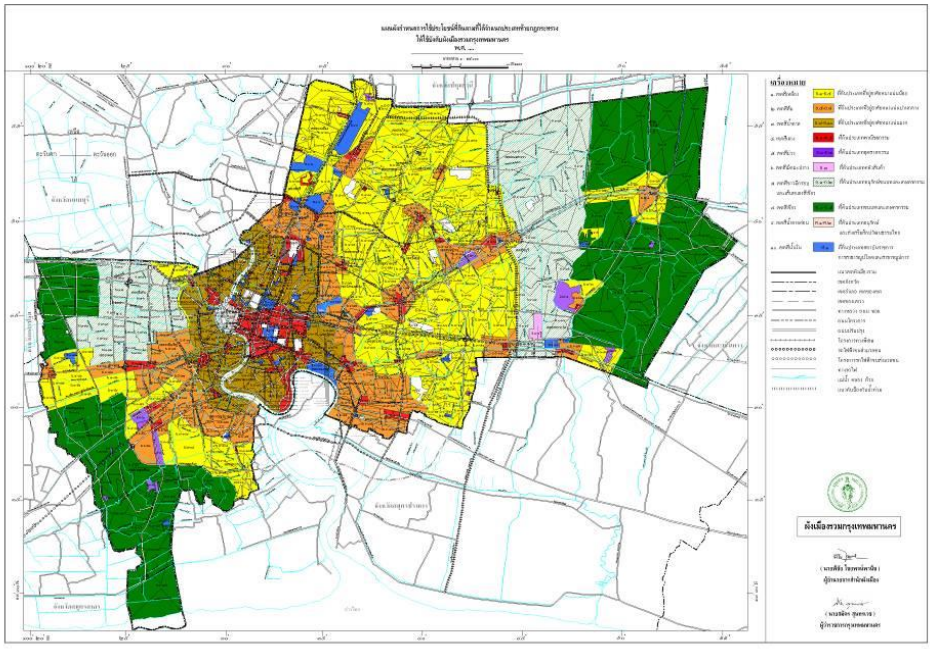
The canal side communities' participation in solid waste and waste water management project

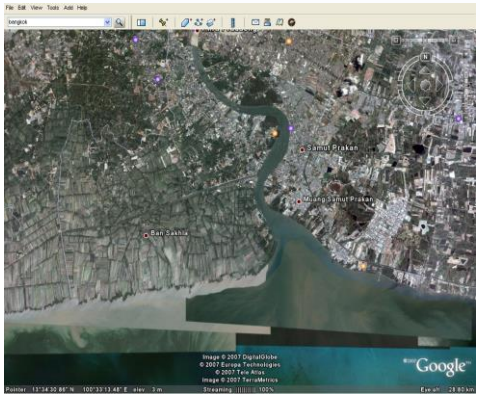
- Promote participation of canal side communities in solid waste and waste water management through 3R concept (reduce, reuse and recycle)
- Community members including houses, temples, schools, factories, commercial buildings located on 6 target canal side covering the total area of 4.94 km^2 responsible by 7 districts.

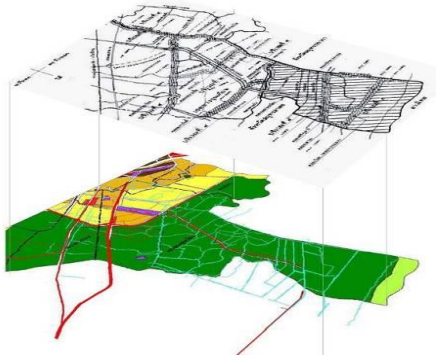
Relevant Project Implementation

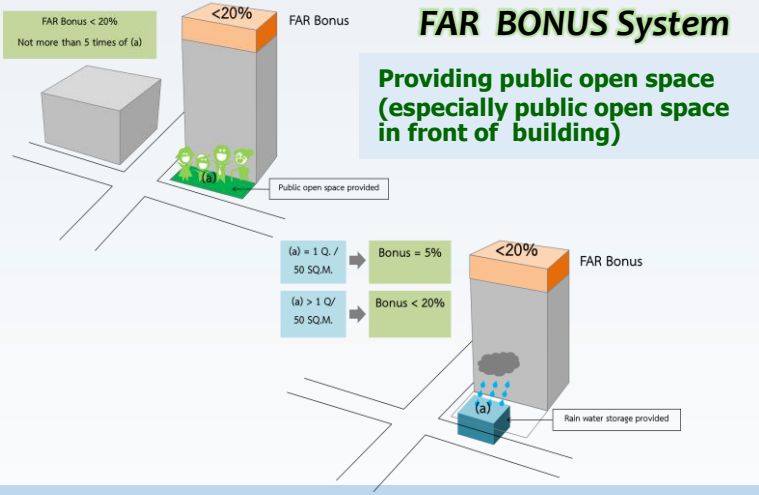


The Land Use Planning in Bangkok

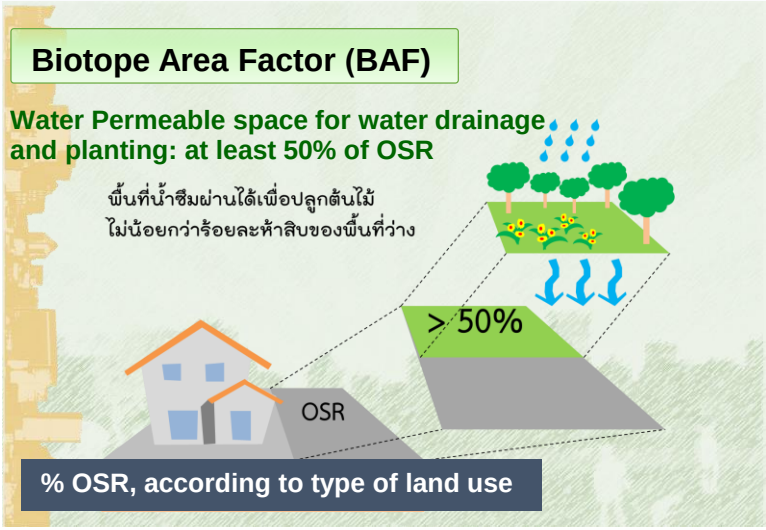








Providing rain water storage in the building or project area.



Relevant Project Implementation



Green Area

- 35 Main Public Parks
- 6.24 m^2/person

Relevant Project Implementation

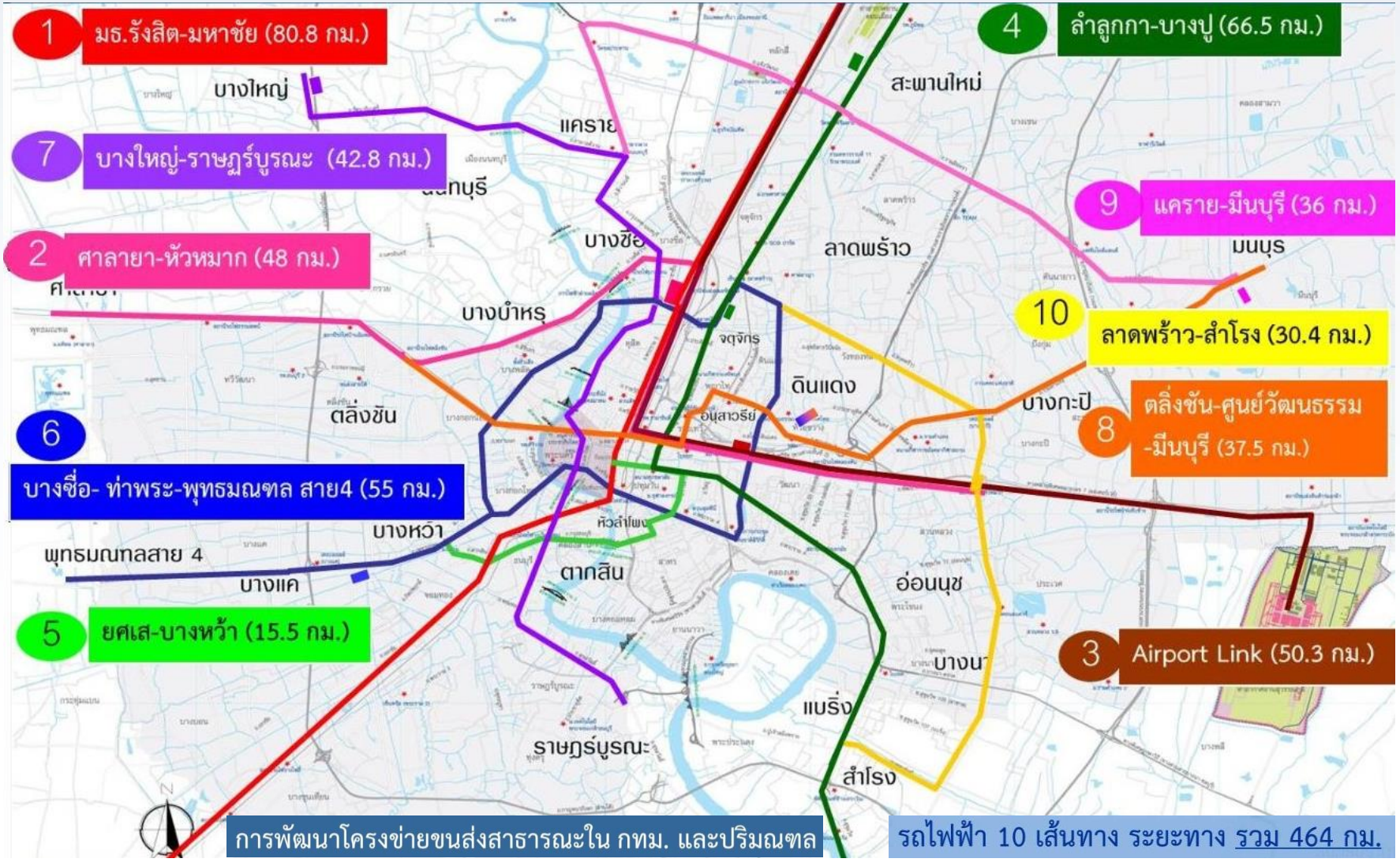


Coastal Erosion : Mangrove Forest Planting

Relevant Project Implementation



Mass Rapid Transit Master Plan in Bangkok Metropolitan Region



Relevant Project Implementation



Bangkok Mass Transit, BMT

ระบบขนส่งมวลชนกรุงเทพมหานคร (อังกฤษ: Bangkok Mass Transit, BMT) เป็นระบบรถไฟฟ้าขนส่งมวลชนในกรุงเทพมหานคร ที่ดำเนินการโดยกรุงเทพมหานคร (องค์กรปกครองส่วนท้องถิ่น) (กทม., BMA) และบริษัท กรุงเทพธนาคม จำกัด (KT) โดยเป็นส่วนหนึ่งของโครงข่ายระบบขนส่งมวลชนทางราง ในกรุงเทพมหานครและปริมณฑล นอกเหนือไปจากระบบรถไฟฟ้าขนส่งมวลชนอื่น ได้แก่ ระบบรถไฟฟ้ามหานครของการรถไฟฟ้าขนส่งมวลชนแห่งประเทศไทย (รฟม.) และโครงการระบบรถไฟชานเมือง (สายสีแดง) ของการรถไฟแห่งประเทศไทย (รฟท.)

Relevant Project Implementation



Bangkok Mass Transit, BMT

1. Current

1.1 **BTS Light Green line** - (22.25 km)
1.2 **BTS Dark Green line** - (14.5 km)
1.3 **BMA Bangkok BRT** - (16.5 km)

2. Under Construction

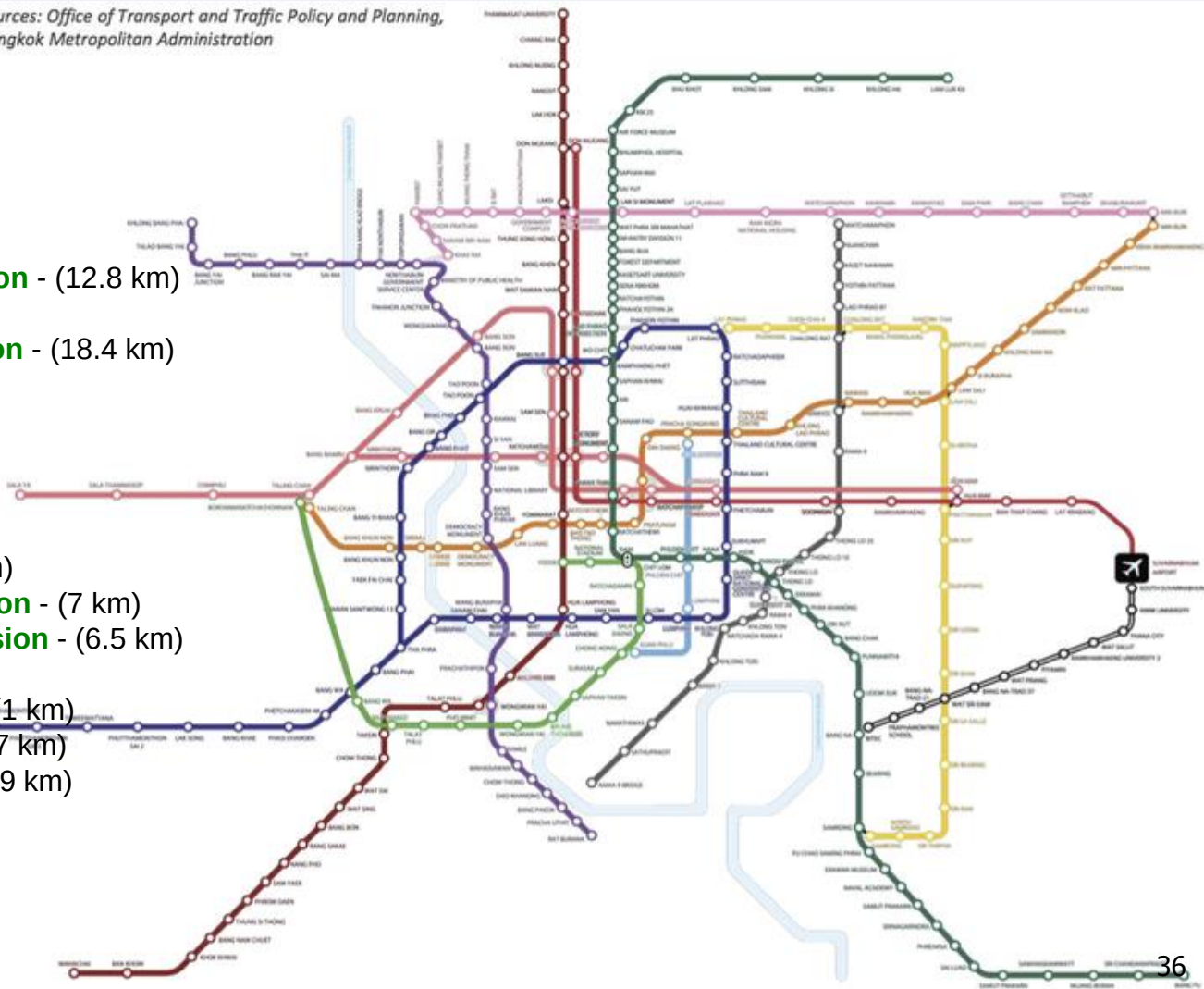
2.1 **BTS Light Green line South extension** - (12.8 km)
- Operational in 2020

2.2 **BTS Light Green line North extension** - (18.4 km)
- Operational in 2020

3. Future

BMA Gold line Light Rail - (2.7 km)
BMA Grey line Monorail - (16.25 km)
BTS Dark Green line extension - (7.5 km)
BTS Light Green line Bang Pue extension - (7 km)
BTS Light Green line Lam Lukka extension - (6.5 km)
BMA Bang Na Light Rail - (18.3 km)
BTS Dark Green line Yotse extension - (1 km)
BMA Grey line Monorail Phase II - (12.17 km)
BMA Grey line Monorail Phase III - (11.49 km)
BMA Light Blue line - (9.5 km)

Sources: Office of Transport and Traffic Policy and Planning, Bangkok Metropolitan Administration



Relevant Project Implementation



Adaptation Related Projects

Cooperation with World Bank and Asian Disaster Preparedness Center (ADPC)

- The Development of the Multi Hazard Map for disaster management and Standard of Procedure for disaster management.

Cooperation with SEA-START RC for "The Coastal Cities at Risk (CCaR) Project"

- The Coastal Cities at Risk (CCaR) Project supported by Southeast System for Analysis, Research & Training Regional Center (SEA-START RC) Program

Relevant Project Implementation



Adaptation Related Projects

Cooperation with the United Nation International Strategy for Disaster Reduction (UNISDR) for "Making Cities Resilient Project"

- To enhance the capacity of BMA officers to assess the disaster risk of Bangkok posed by the impacts of climate change

Cooperation with the Rockefeller Foundation for "Resilience in Bangkok"

Bangkok Resilience City



Background

- Bangkok was selected as one of the first 32 cities to partner with 100 Resilient Cities (100RC) pioneered by the Rockefeller Foundation.
- The project is designed to enable 100 cities from around the world to better address the increasing shocks and stresses of the 21st century.

RESILIENT BANGKOK

Bangkok Resilience City



Technical Support and Resources

BMA receives technical support and resources from
100 Resilient Cities (100RC)

- **To hire a Chief Resilience Officer (CRO)**
- **To develop and implement a City Resilience Strategy**
- **To exchange and learn among 100RC cities**




RESILIENT BANGKOK

Bangkok Resilience City



Bangkok Resilience Strategy

Vision

Safe, Livable & Sustainable City for All

Strategic Area

- #1: Increasing Quality of Life
- #2: Reducing Risk and Increasing Adaptation
- #3:Driving a Strong and Competitive Economy

Goal

- #1: Health and Wellbeing for All City Residents, Now and into the Future
- #2: Safe, Accessible & Convenient Transportation Network
- #3: Environmental Friendly Urbanization
- #4: Improving the City's Flood Resilience
- #5: Increase Public and Community Driven Action on Awareness, Preparedness and Adaptation
- #6: Strengthening Institution Capacity and Regulation
- #7: Facilitating City and Community-Based Economy
- #8 Expanding Tourism, Service Industry & Hospitality

Actions
(Initiatives)

Bangkok Resilience City



10 of 60 projects to be implemented in short term :

1) Event Based Surveillance for Pandemics
2) Improving work Places and Living Conditions for Migrant Workers in Bangkok
3) Driver Behavior Change Campaign to Reduce Road Accidents
4) Sustainable Waste Management
5) Developing New Recreational Parks
6) Development of Green Space and Riverside Promenade along the Banks for the Chao Phraya River
7) Youth Education Program for Disaster Safety
8) Search and Rescue Training Program
9) Resilience Training for BMA Social Planners and Analysts
10) Develop Economy, Trade, Finance and Investment Analysts for BMA

RESILIENT BANGKOK

Bangkok Resilience City



Challenges to Build Resilience in Bangkok

Inclusive policy

Coordinated actions

Database

Raising awareness and participation

Networking

Capacity building

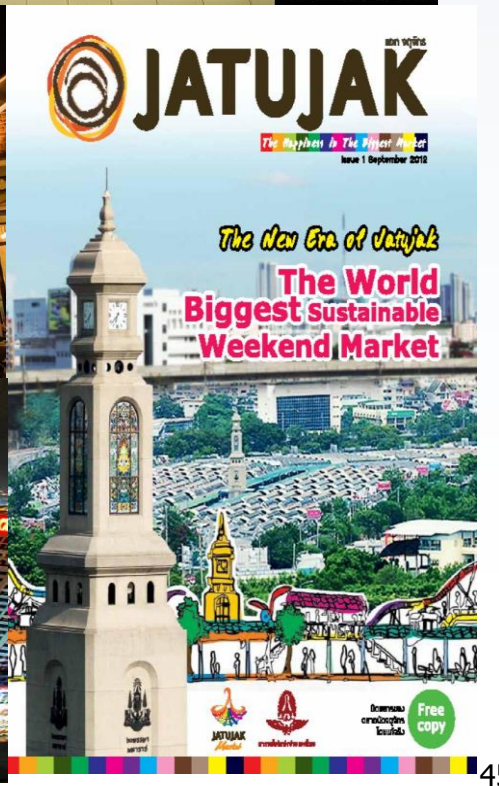
Bangkok Attractions





Shopping Paradise






Resilience Future
is
everyone's business