Thailand

Water Related Infrastructure and the Climate Change

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Office of the National Economic and Social Development Board (NESDB)

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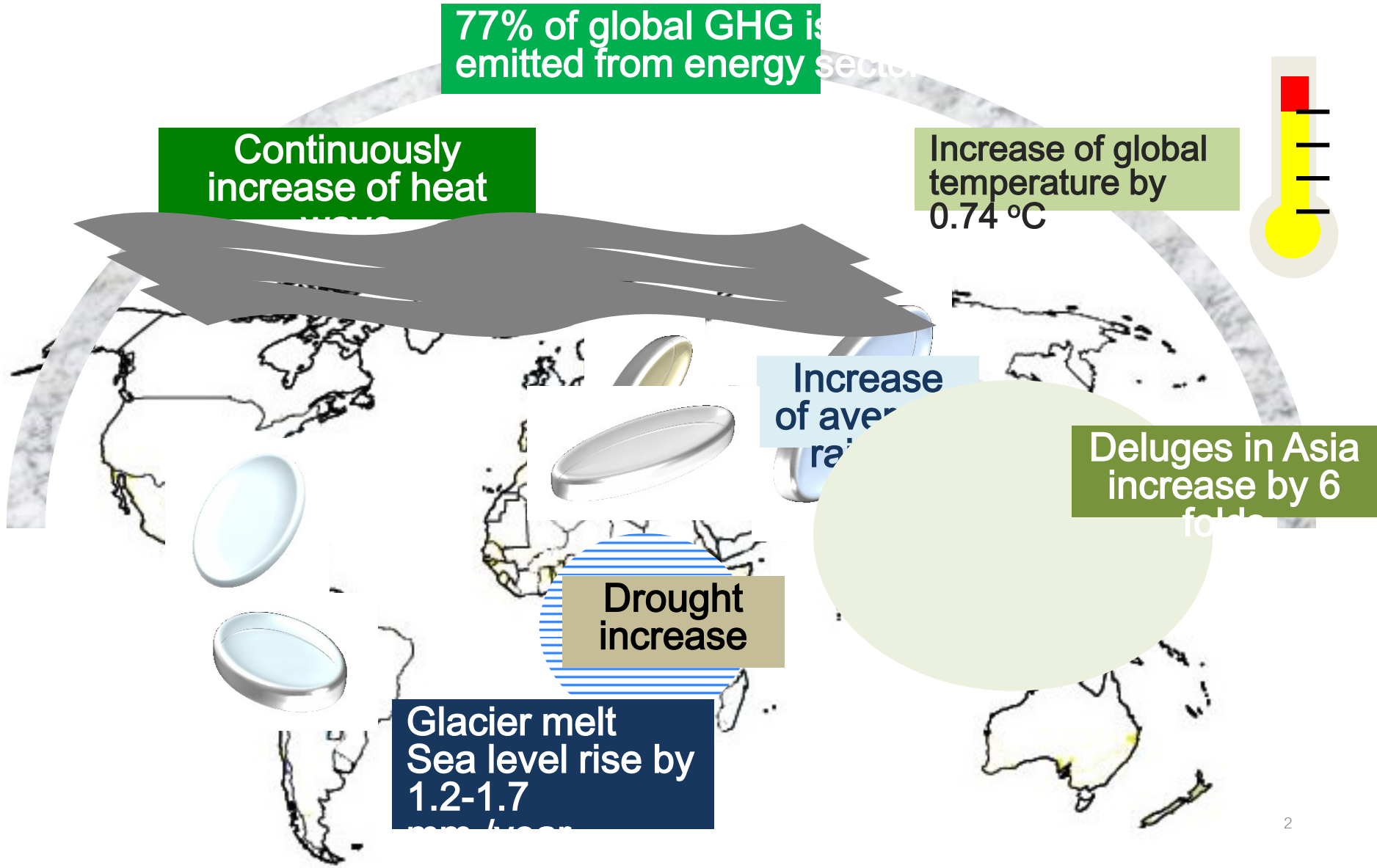
Swissotel Le Concorde, Bangkok, Thailand

Situation in the past 100 years

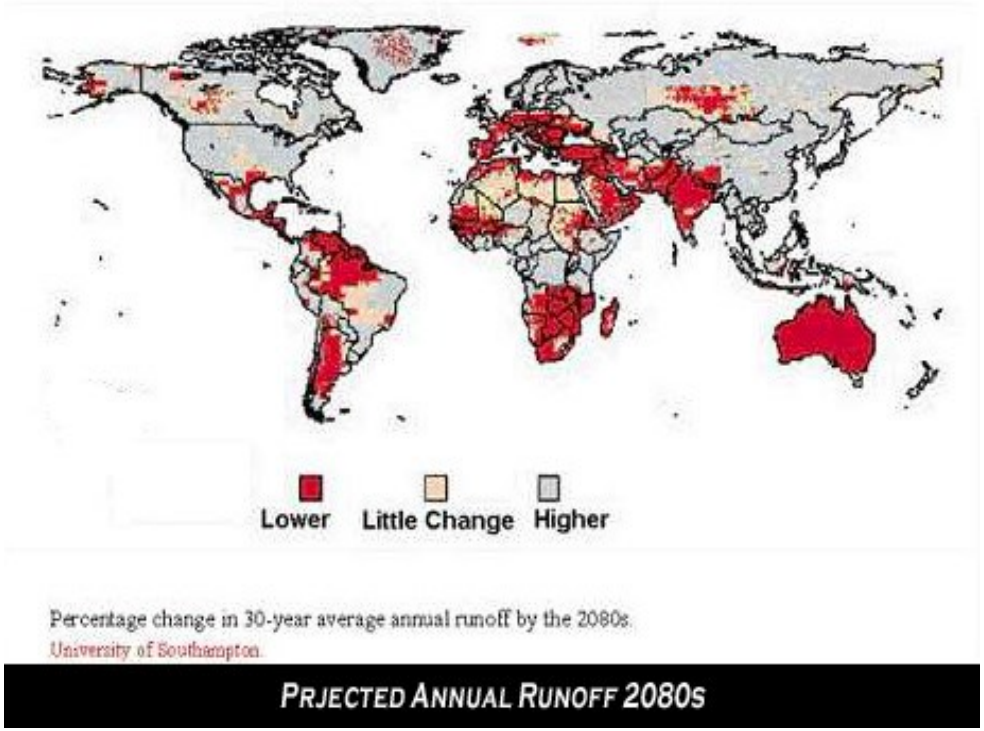


Global Trend (Mid 21 Century

- Rising in temperature
- Changing in the amount and frequency of rainfall

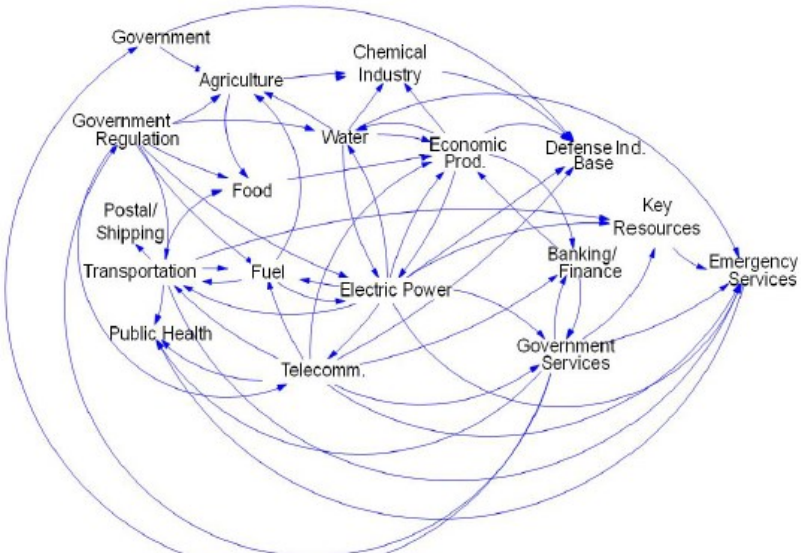
→ Changing in the quantity of annual runoff

→ More severe floods and droughts



- Annual runoff in high latitude and wet land areas around the equator will increase by 10-40% while the area in middle latitude and dry land around the equator will decrease by 10-30%
- Global dry areas will be widely extended and more severe scarcity of water supply in dry season will frequently occur.
- Risk of flash flood increase.

Climate change and infrastructure interdependency

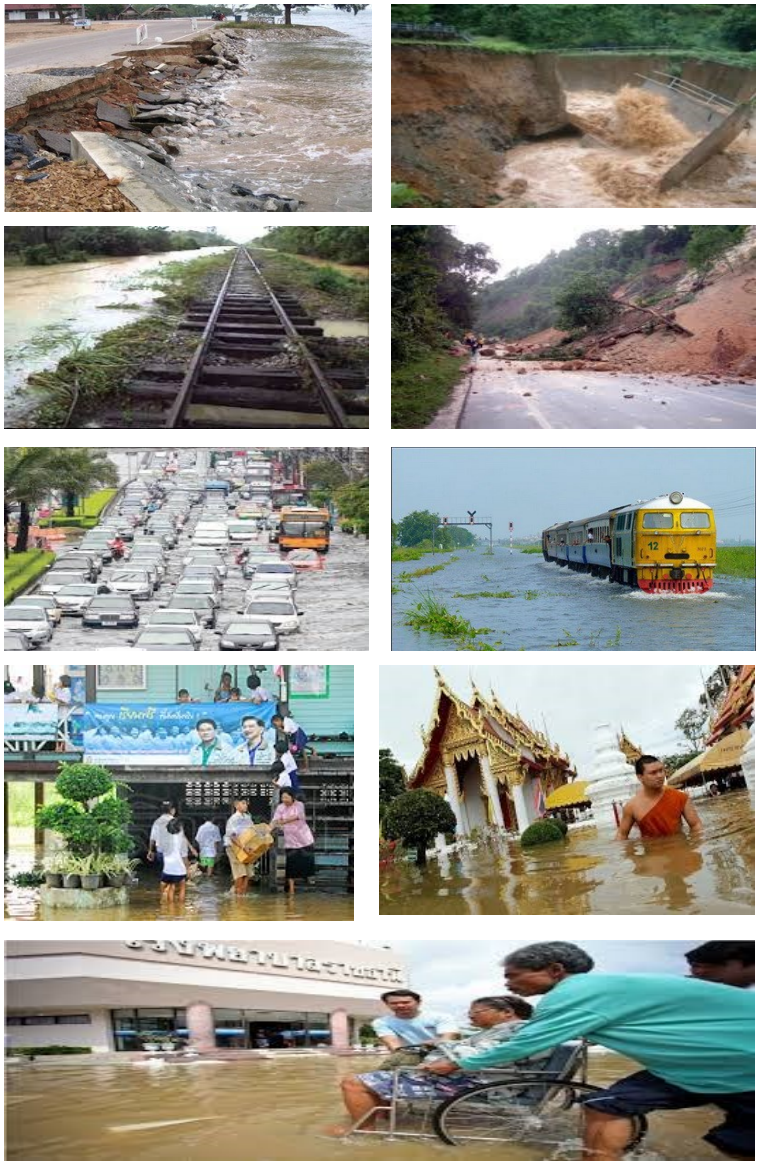


An illustration of infrastructure interdependencies

	System Impacts	Environment	Economy & Society
Transportation Impacts Due to River and Coastal Flooding	Increased travel time.. Loss of trips... More miles. More hours.	Also more emissions due to more travel miles.	Also loss of productivity and disruption of production chains.
River Flooding	Temporary loss of land and land activity.	More non-point source loads. Also extended floodplains, more debris, and more erosion.	Property losses. Also productivity and quality of life losses. In addition, see Transportation Infrastructure damage.
Sea Level Rise	Permanent loss of some coastal land. Temporary loss of land and land activities.	Also wetland loss and erosion.	Property losses. Also productivity and quality of life issues. In addition, see Transportation infrastructure damage.

Climate change can reduce national economic output, and thereby reduce national employment. Due to the interdependencies of infrastructure systems, the reduction of output in one industry or the loss of one infrastructure can cause the reduction in the output in other industries or other infrastructures.

Impacts of Climate Change on Infrastructures



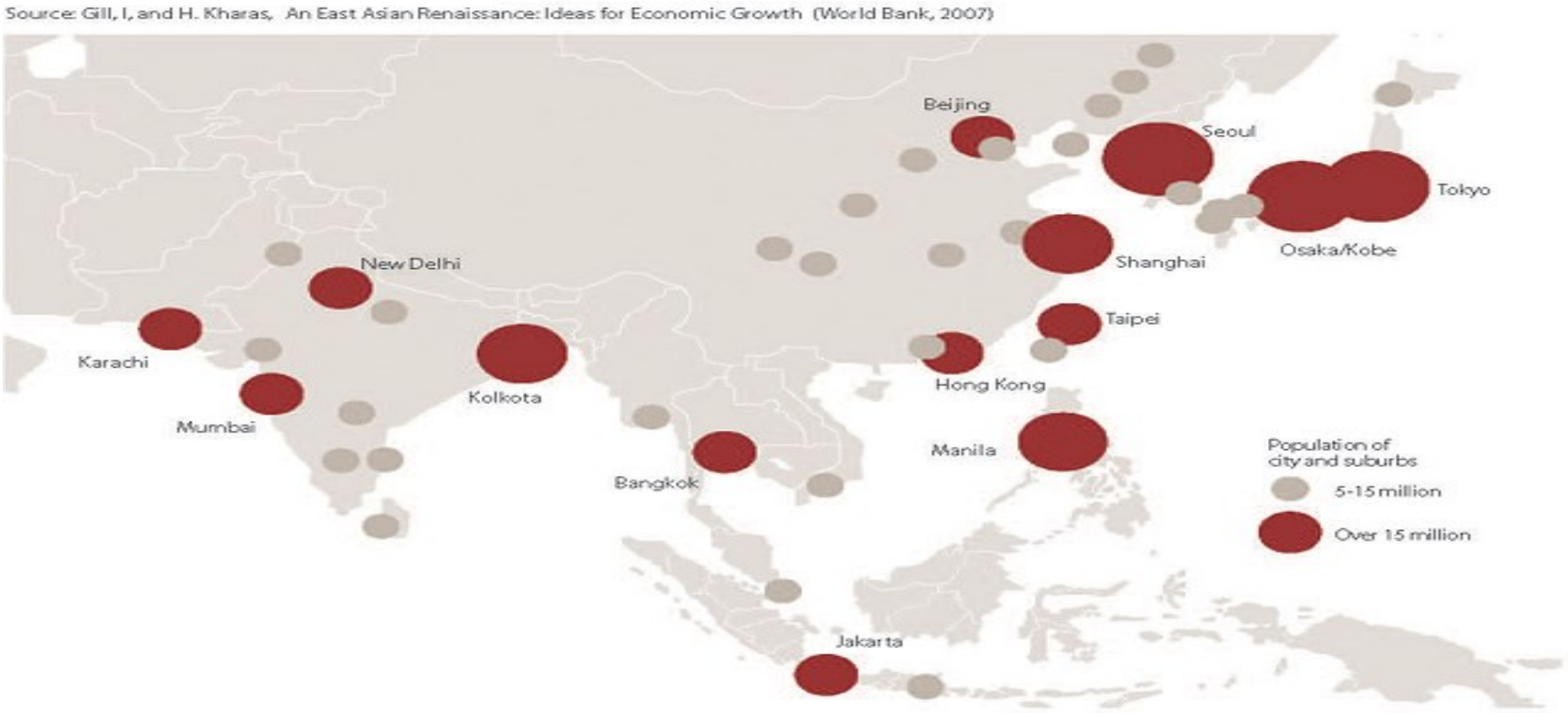
Urban infrastructure systems are disrupted by climate extreme events

- Roads and rails are destroyed from
  - Coastal erosion
  - Sea level rise
  - Floods
  - Landslide
- Schools, temples, and hospitals are damaged from frequent floods
- Cascading system failures occur after climate disaster such as electricity, water supply, waste collection

Risk prone area in Asia Pacific

85% of people exposed to earthquakes, cyclones, floods and droughts live in developing countries

In the past 10 years, the average disaster damage cost accounted for 30-190 US$ million of which 60% is in developing countries.

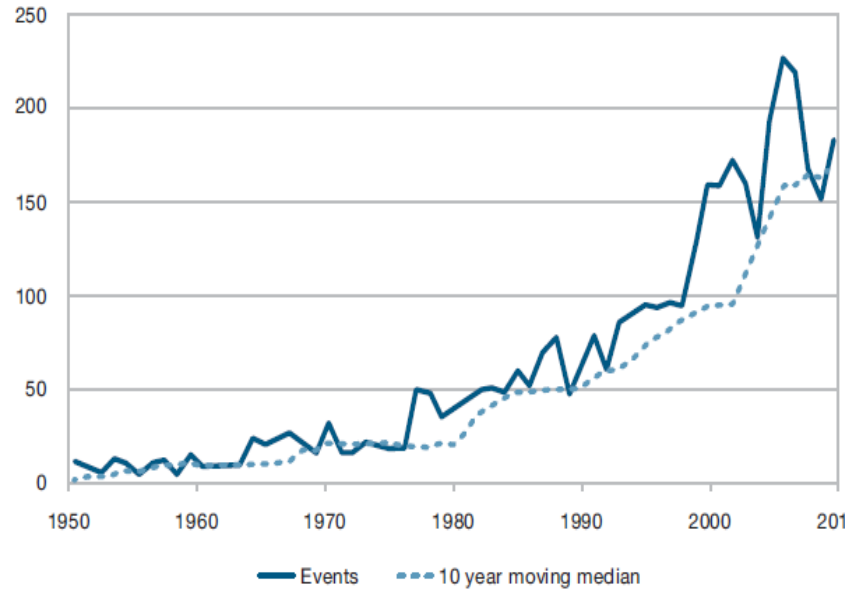


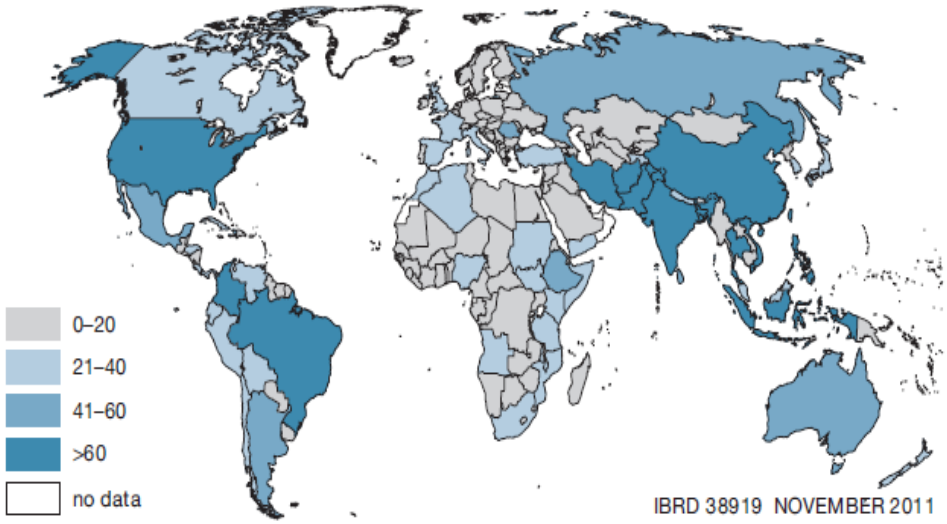
Asia Pacific frequently counters with flood where the loss of lives is highly reported

The poor reside near by costal cities in Eastern Asian Continent prone to higher risk from natural disaster

Urban flooding poses a serious challenge to development and the lives of people, particularly the residents of the rapidly expanding towns and cities in developing countries.

Flooding is the most frequent among all natural disasters.





Source: cities and flooding a guide to integrated urban flood risk management for the 21st century, The World Bank

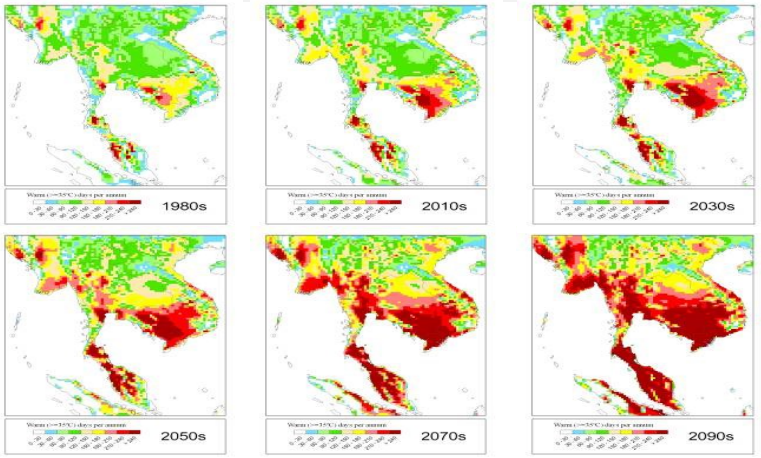
The occurrence of floods is the most frequent among all natural disasters.

In the past twenty years, the number of reported flood events have been increased significantly. The numbers of people affected by floods and financial, economic and insured damages have all increased. In 2010 alone, 178 million people were affected by floods. The total losses in some years such as 1998 and 2010 exceeded $40 billion.

Climate Change Impacts on Thailand

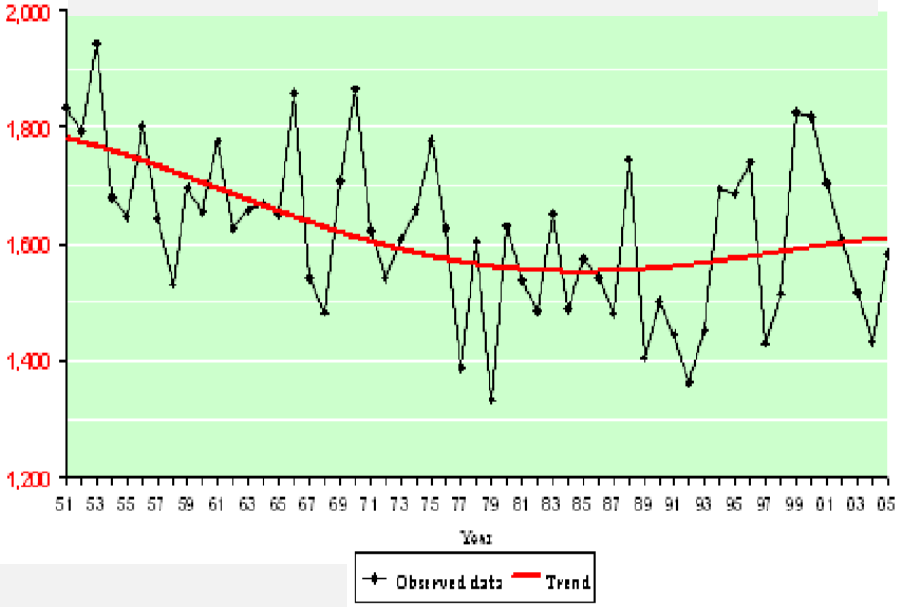
Temperature

- Increasing temperature around 1°C
- Longer summer season around 2 – 4 weeks



Rainfall

Decreasing annual rainfall in the next 20 years:
Central Region, some part of the North Eastern Region



Coastal Erosion

Increasing and severe risk of coastal erosion

Central Region	Eastern Region	Southern Region
Samutprakarn	Chachoengsao	Ranong
Petchaburi	Chonburi	Phuket
Prajuabkirikhan	Rayong	Krabi
	Chantaburi	Trang
	Trad	

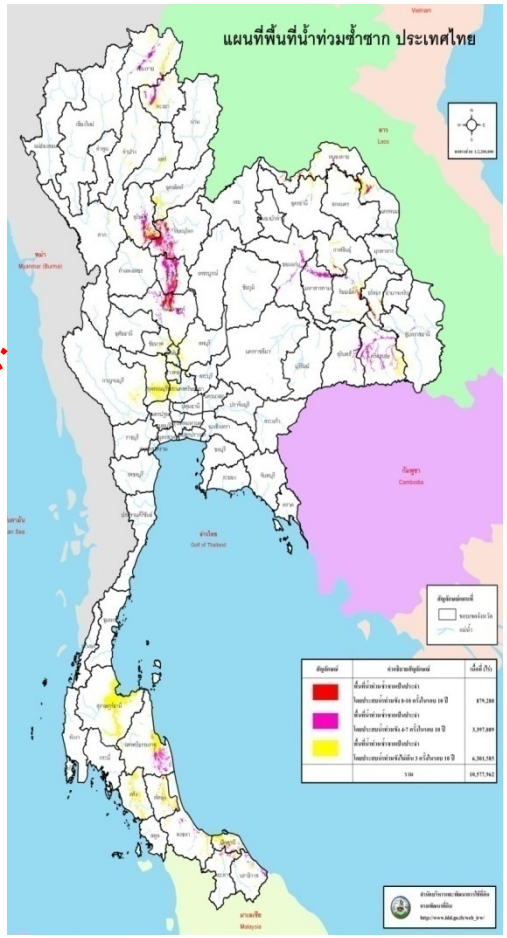
Source: SEA START

Natural Disasters occurred in Thailand

Ranking and population exposed to disaster (1980-2010)

Disaster	Population (head)	Ranking
Cyclone	5,147	52 From 89
Drought	2,440,010	31 From 184
Flood	819,822	7 From 162
Landslide	2,496	42 From 162
Earthquake	22,860	92 Fromจาก 153
Tsunami	3,487	54 Fromจาก 76

In terms of population, Bangkok was ranked **7** from **20** counties that prone to flood risk and ranked **10** in terms of losses in asset value



Source: Department of Land Development

Flood repeatedly occurred

8-10 times in a decade cycle in Sukothai, Pichit, Nakornsawan, provNongkai, Kalasin, Loi-ed, and Yasothorn provinces.

4-7 times in a decade cycle in chiengrai, Payao, Kon-kan, Mahasarakam, Srisaket, Ubonratchatani, Nakornsrithammarat, Patalung, Pattani, Yala and Narathiwat provinces.

Not exceeding 3 times in a decade in Chiang Mai, Lumpang, Phrae, Nan, Uttaradit, Tak, Kamphaeng Phet, Udon Thani, Chainat, Trang., etc., provinces.

Flood situation in the past 20 years

1995 — **Bangkok**

Chao-Phraya River swollen for 2 months with 50-100 cm. height.

2000 — **Hatyai, Songkla**

The worse flood that had ever occurred . Its damage costed more than 10,000 M฿ and lost 233 lives.

2001 — **Wangchin, Prae**

45 houses were washed away and lost 23 lives.

Petchabun

Flood and land slide : several houses were washed away and lost 147 lives.

2005 — **Chiangmai**

Flood repeated 4 times just over a month with 70 cm.- 2 meter high which was the highest water level that had ever flooded in Chiangmai for the past 50 years.

2006 — **Tak, Phitsanulok, Phetchabun, Sukhothai, Uttaradit provinces of lower Northern region**

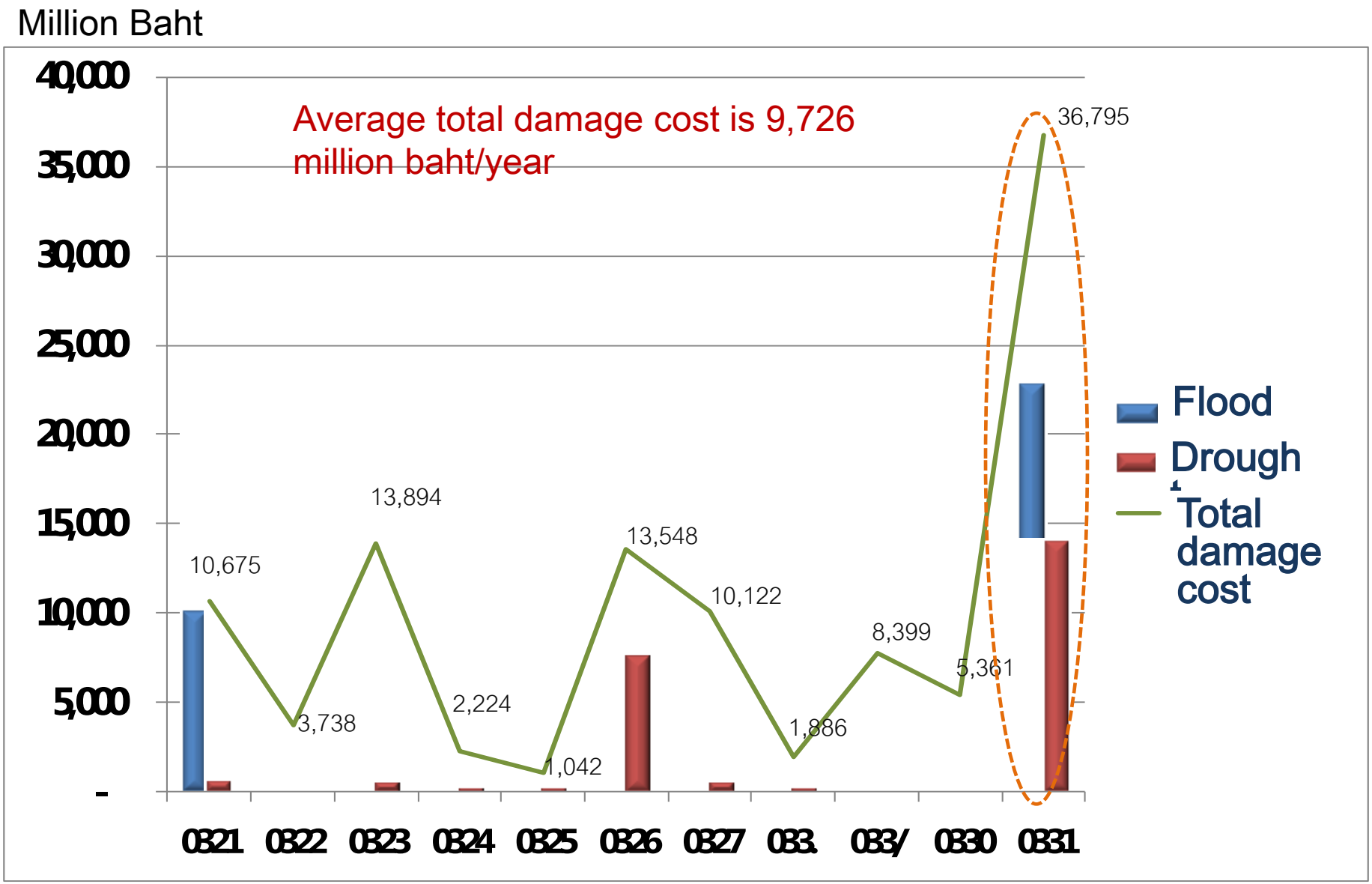
Flood and landslide caused 116 missing and death.

2010 — **Flood in Northern, Northeastern, Central, and Southern regions**

Covered the area of 50 provinces and lost 258 lives.

Source: Bangkok Business news and Department of Disaster Prevention and Mitigation

Damage cost owing to flood and drought in the past ten years

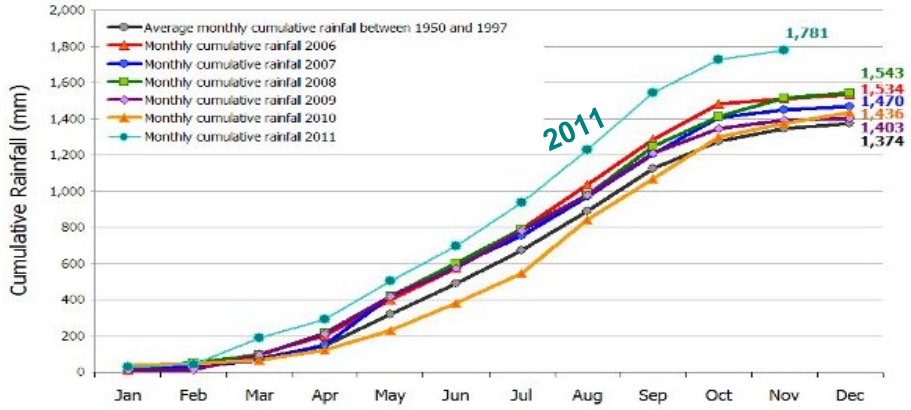


Source: Department of Disaster Prevention and Mitigation

2011 Thailand Flood

In 2011, Thailand encountered the worst floods crisis in 70 years due to heavy and widespread rainfall in major areas of the country during rainy season influenced by monsoon storms. The worst floods were in October and November, causing tremendous losses to people and affecting the economy.

CAUSES



Source: www.thaiwater.net

Unusually High Accumulated Rainfall

- The accumulated precipitation from January to October 2011 was **35% higher than average** as a consequence of La Niña, which brought five heavy tropical storms and monsoons.
- Consequently, the peak flows of rivers exceeded their capacity.

IMPACTS

67 out of 77 provinces were affected

4.9 million acres of agricultural land were flooded

13.4 million people were affected

2,329 houses were completely destroyed. 96,833 houses were partially damaged

Transport infrastructure was damaged

7 industrial estates (839 factories) were flooded.

2011 Thailand Flood: Impact on GDP

Source: NESDB GDP Quarter 4-2011 Report

Thailand: Impact of 2011 Flood

In the fourth quarter of 2011, Thai economy contracted by 8.9% compared to a 3.7% growth in the third quarter, mainly due to severe flood during October – November 2011.

The flood damages in agricultural, manufacturing and service sectors affected in the reduction of 328,154 Mil. Baht of Thailand's GDP (current price) and contributed to 3.7 percent decrease in economic growth. As a result, Thailand's overall economic growth in 2011 recorded merely 0.1 percent, which was lower than the initial estimated growth of 3.8 percent.

Summary of Damage and Losses in Social Sector

Health Sector

Damage: 600 public sector health facilities, provincial health offices and district health offices were damaged. Total damage is estimated at 1.68 billion baht.

Losses: approximately 2.1 billion baht

Housing Sector

Damage: 1.96 million houses were affected, about 19,000 of which were totally damaged. Total damage is estimated at 45.9 billion baht.

Losses: approximately 37.9 billion baht

Education Sector

Damage: 2,934 educational institutions were fully or partially damaged. Around 1,435,378 students were affected. Total damage is estimated at 13.1 billion baht.

Losses: approximately 1.8 billion baht

Cultural Heritage

Damage: More than 500 historical sites were damaged. Religious authorities & communities reported damage to 1,532 of their temples and support buildings. Total damage is estimated at 4.4 billion baht.

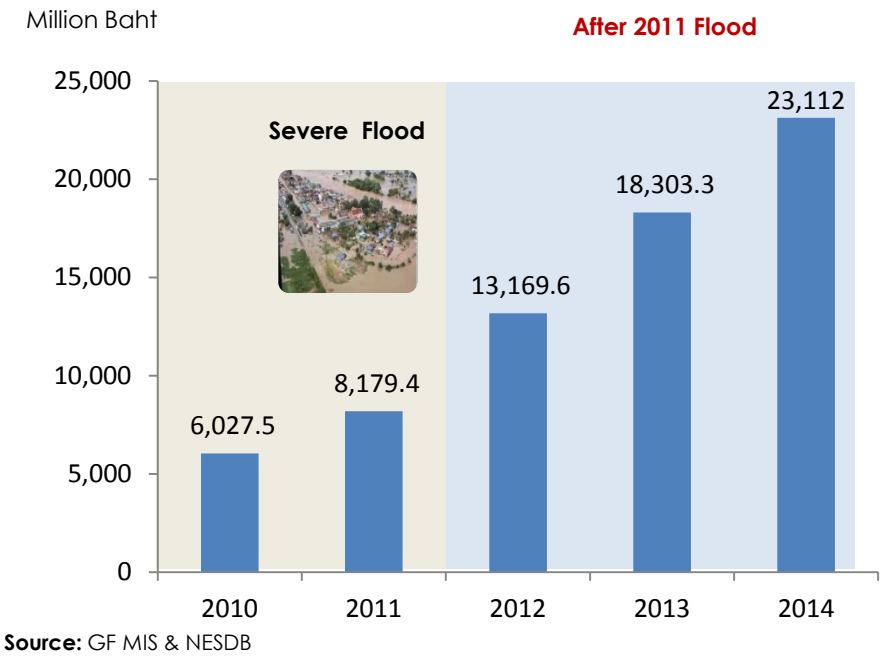
Losses: approximately 3.1 billion baht

Source: World Bank

Trend of Budget Allocation: After severe flood in 2011, Thai government has allocated more budget on disaster management including recovery, restoration and prevention, with approximately 5 percent increase annually during Fiscal Year 2010-2014. Key projects in 2014 include construction of river bank prevention dam for preventing flood and soil erosion, construction of flood prevention system around major communities, flood recovery and restoration in flood-hit area, and development of warning system and disaster prevention

Technical assistance: JICA conducted a study on The Comprehensive Flood Management Plan for the Chao Phraya River Basin. Now, the close cooperation on Business Continuity Plan (BCP) is in progress.

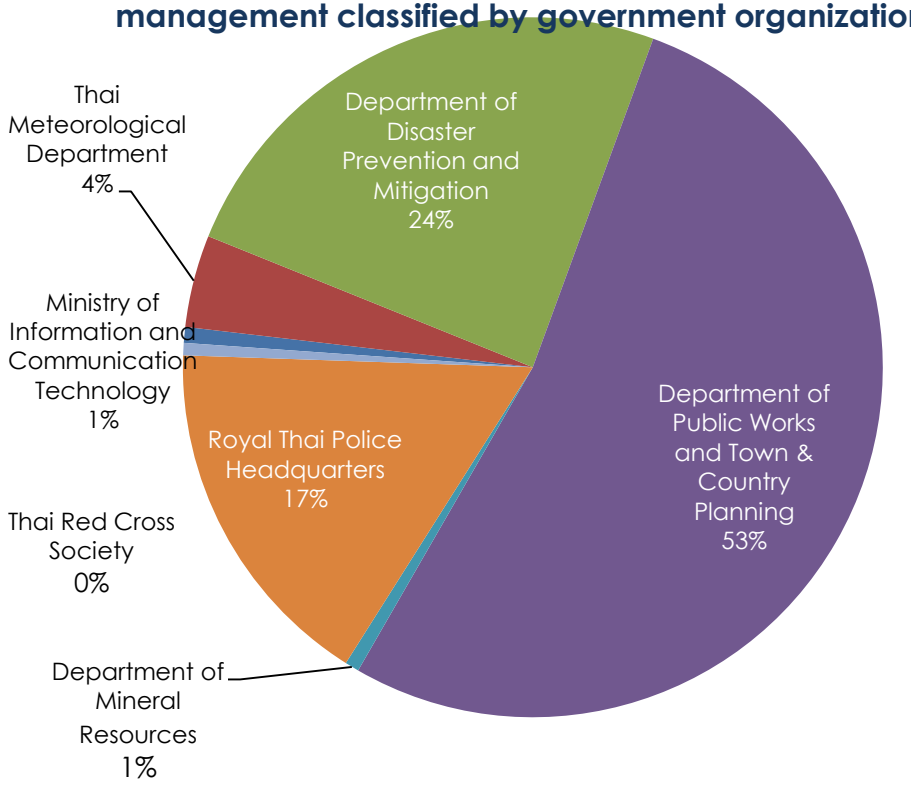
Budget on Disaster Management



Source: GF MIS & NESDB

Note:: Fiscal Year 2013 data is budget allocation

Fiscal Year 2014 budget allocation for disaster management classified by government organization



Lesson Learned from 2011 Flood

Beside from budgeting, water resource management must take into account:

1

Integrated and Systematic Water Resource Management

Management has to consider linkage between upper, middle, to lower basins and it has to be carried out by a single command authority instead of many water-related organizations.

2

Preparedness for unexpected flood

All stakeholders must be ready for any unexpected flood at all time with effective early warning systems under a clear responsible organization.

3

Public participation in all activities is essential

Public participation must be organized at all steps of water management from formulation of master plan to the project levels including monitoring and evaluation.

4

Laws and regulations must be updated

Laws and regulations concerning public land encroachment, especially waterway must be updated and strictly enforced.

Development guidelines of water resources in 11th NESDP (2012-2016)

Develop water resources for sustainably support agricultural sector

- Improve resources to increase the supply in potential water storage areas,
- Acquire new water resources for agricultural activities,
- Increase distribution capacity of irrigation system,
- Support water development at farm areas.

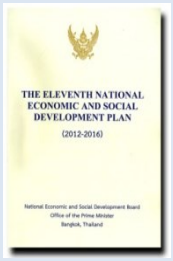
Food and Energy Security

Manage water for balance and sustainability of water resources

- Rehabilitate watershed areas, ground water, and underground water,
- Formulate a systematic water resource infrastructure master plan for domestic consumption,
- Mange water demand with fairness and equity principle,
- Develop databases and geographical information systems,
- Promote efficient, cost-effective, and environmentally sound water use.

Balance and Sustainable Water Resource

Next Phase of Water Management: **Conceptual Framework**



Conceptual Framework

Integrated Approach

Water resource management of the country needs an integrated approach, with all relevant agencies working together through an efficient management mechanism.

Benefits to people and country as first priority

Effects of the projects on people need to be taken into account, such as people's relocation, occupation, and income.

Creating understanding

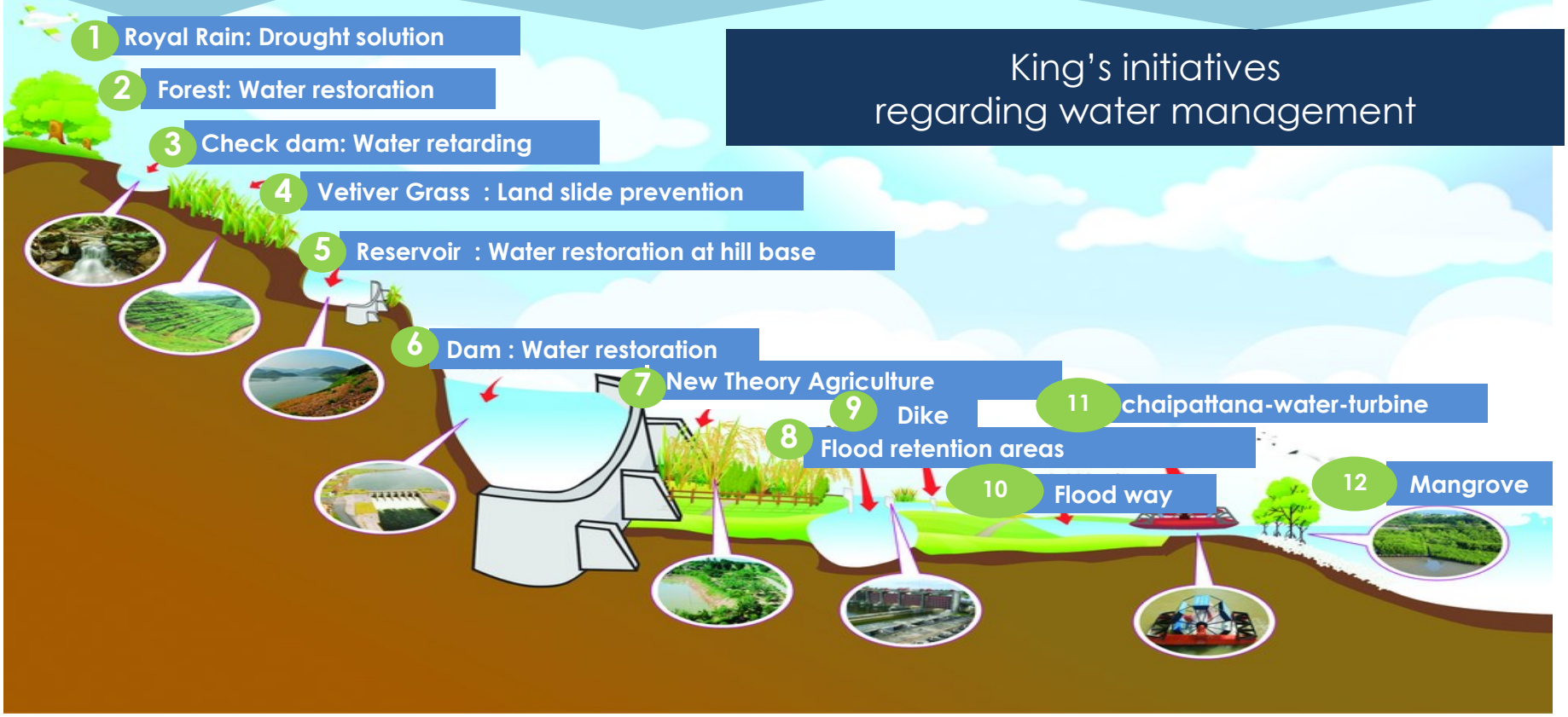
Project implementation needs to inform stakeholders about relevant information prior to and during implementation with simple and straight forward language.

Clear direction on management

Short-term, medium-term, and long-term plans are needed (1-year, 5-year, and 10-year plans) with clearly stated objectives and the activities and implementation in each year, as well as public relations to ensure enough information dissemination.

Conceptual Framework in Preventing Future Floods

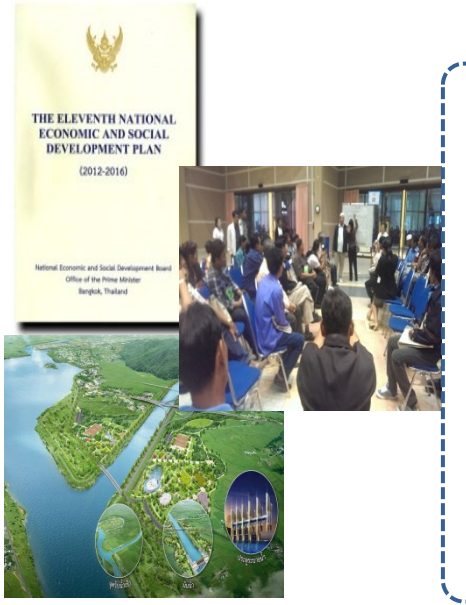
Upper river basin	Middle river basin	Lower River basin
Priority given to slowing down speed of the water flow	Priority given to the water management such as dam management, floodway and monkey cheek construction	Importance given to increasing flows of water out to the sea



Direction for the Next Phase

Restructuring of water resource management approach

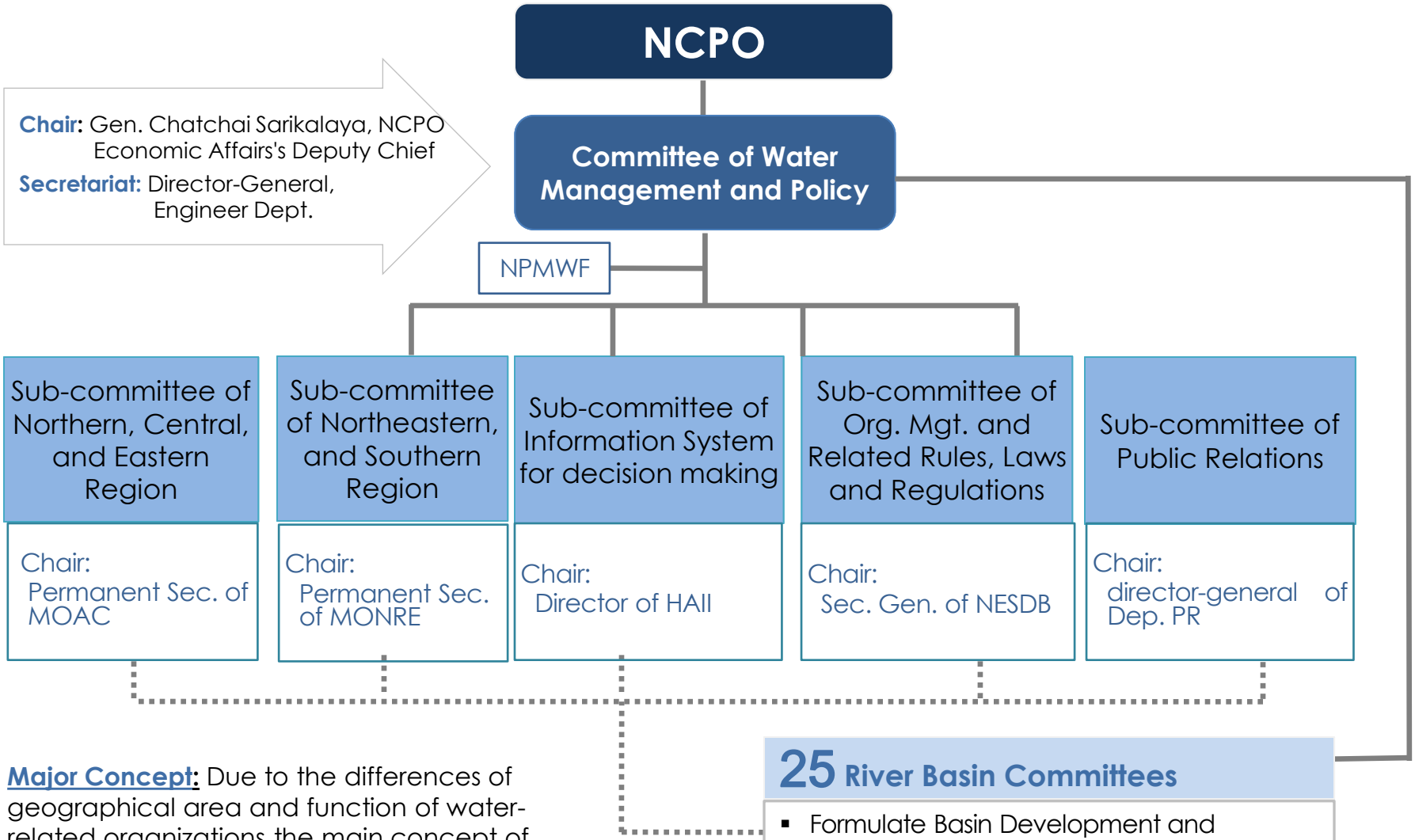
National Council for Peace and Order (NCPO) laid down a new structure for water resource management, with a clear and concise chain of command, covering all relevant areas, so that water resource management will be integrated and efficient.



Integrated water resource management

Prioritizing water resource management projects to be in line with the 11th National Economic and Social Development Plan (2012-2016) and to ensure that the Thai people will benefits the most. Moreover, selected projects must be ready and do not cause financial obligation for future governments. Management of water resource at a country and at a basin level will be coordinated.

NCPO has appointed the Committee of Water Management and Policy



Major Concept: Due to the differences of geographical area and function of water-related organizations the main concept of these 5 sub-committees is therefore, to make a concrete National Water Management and Policy by applying the idea of "Share the thoughts, divide the works".

25 River Basin Committees

- Formulate Basin Development and Management Plan.
- Prioritize and allocate water use in each sectors/activities
- Disseminate and create public understanding within basin

Progress of Water Management and Policy under NCPO

On 25th of Nov. 2014, the Cabinet has

- **Acknowledged the Strategy of Water Resources Management (2015-2026)** proposed by the Committee of Water Management and Policy with additional assignment and remarks,
- **Approved the cancelation of the Master Plan on Water Resource Management** initiated by previous government.

Assignment

1. Committee of Water Management and Policy should specify and phasing projects/ programs inline with the proposed strategy into 3 phases that are;
   - 1.1 Immediate period (2015-2016)
   - 1.2 Midterm period (2017-2021)
   - 1.3 Long term period (2022 onward)
2. MOAC by RID should coordinate with MOI, MONRE, and related agencies to speed up the operation process in resolving flood problem in Sukothai province .

Remarks

1. Clearly defy the strategy of water shortage management to cover industrial, agricultural and public consumption.
2. Set the priority of water management on water shortage and flood in the major area.
3. Specifically put the detail on 2015 budget allocation that has been approved and the detail on the incremental 2015 budget for water management.

The Strategy of Water Resources Management (2015-2026)

Committee of Water Management and Policy has revised the strategy of water resources management by taking the Cabinet's assignment and remarks into account and the strategy comprised of 6 sub-strategies;

1. **Restoration of watershed forest**; rehabilitate decadent forest, soil& water conservation

2. **Management of water shortage for consumption**; increase efficiency of rural and urban water supply system

3. **Management of water shortage for production (agriculture/ industry)**; develop water storage in community & farm land ,dev. underground water supply for agri., rehab. existing water storages and water ways., etc.

4. **Flood prevention and protection**; dev. Water retention, floodway, land use planning, improve water way., etc.

5. **Management**; improve farming practices, manage the irrigation, support basin org., etc.

6. **Management of water quality**; reduce waste water from the origin, increase the efficiency of waste water treatment

The development target of Water Resources Management (2015-2026)

2015
108,229 million baht

- Quick win , fast & effectively achieve the outcomes.
- Emphasize on flood and drought in major areas
- Put more attention on ready to implement projects but delayed with the issues of environment

2016
135,000 million baht

- Focus on medium to large projects study, survey and design
- Continue implementing Water Resources Management Plan started from 2015
- Improve laws, rules related with compensation and subsidy as well as land use permission

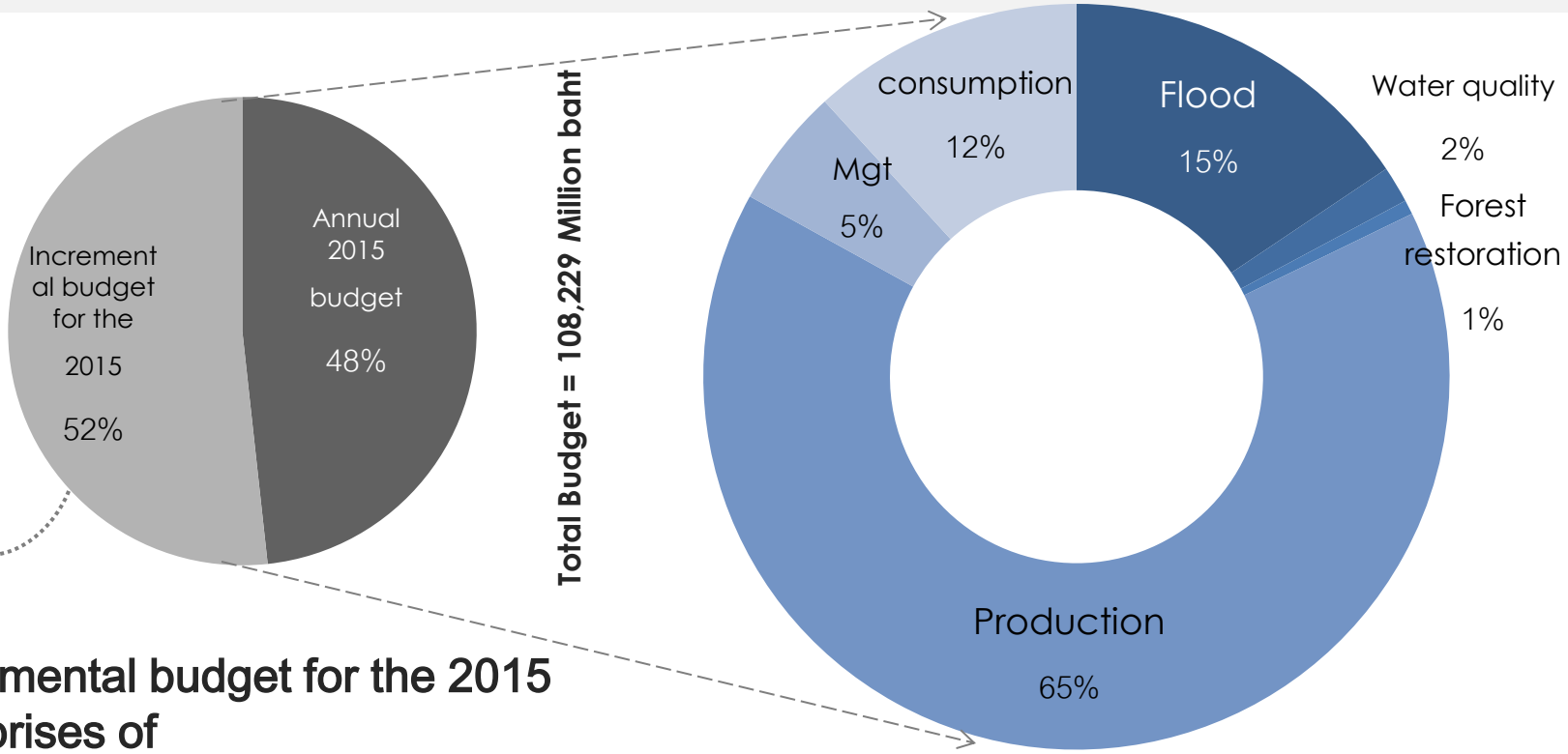
2017
onward

- Construct high performance medium to large projects

The Strategic Budget allocation for Water Resources Management (2015-2026)

On 30th Dec. 2014 the Cabinet has

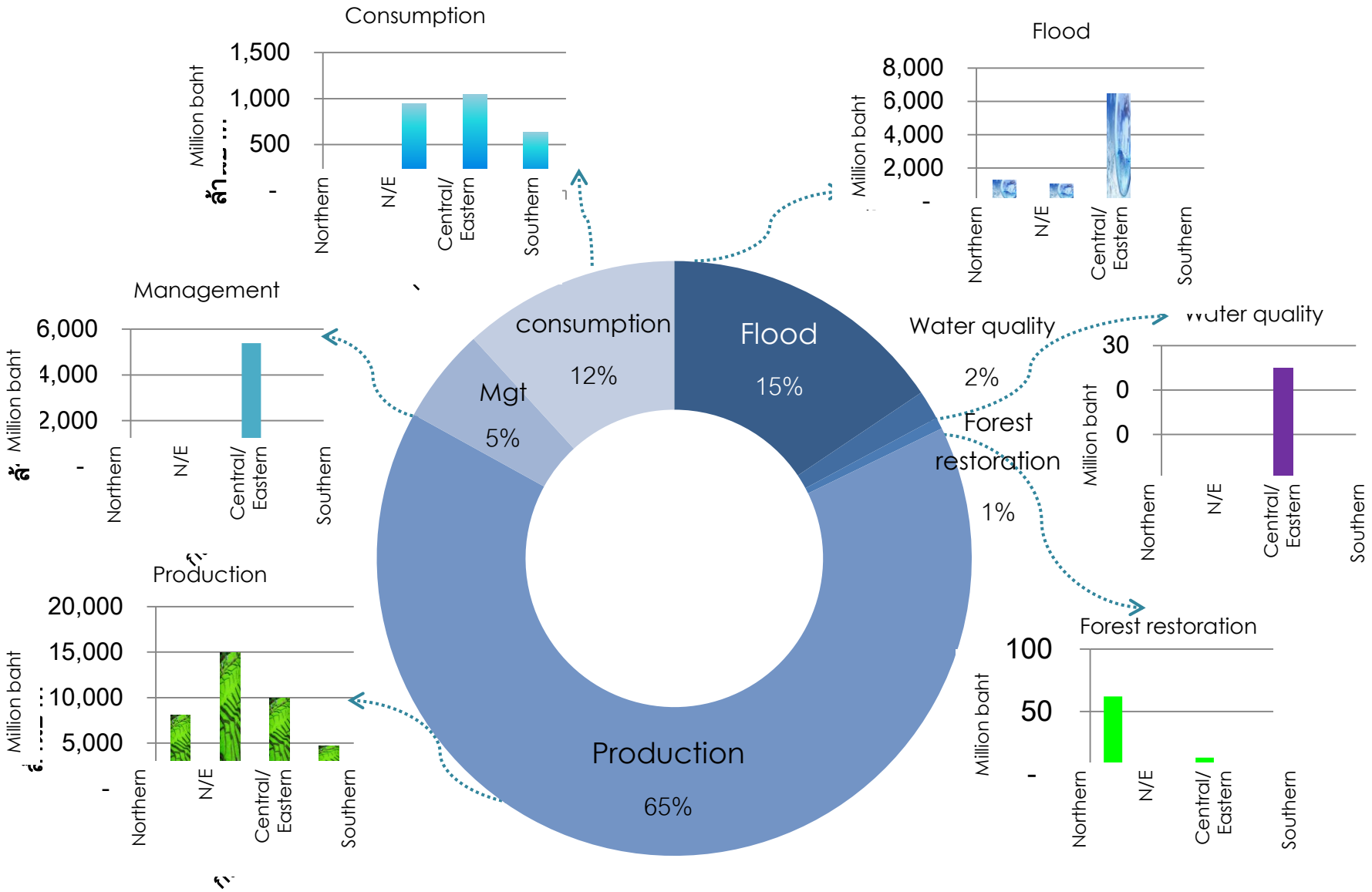
- Approved the revised strategy of water resources management
- Approved incremental budget for the 2015 with the amount of 55,985 mill. baht for water resources management.
- Assigned 25 agencies from 8 ministries to implement proposed projects/programs and coordinate with BB and PDMO
- Assigned the Committee to monitor and evaluate projects/programs.



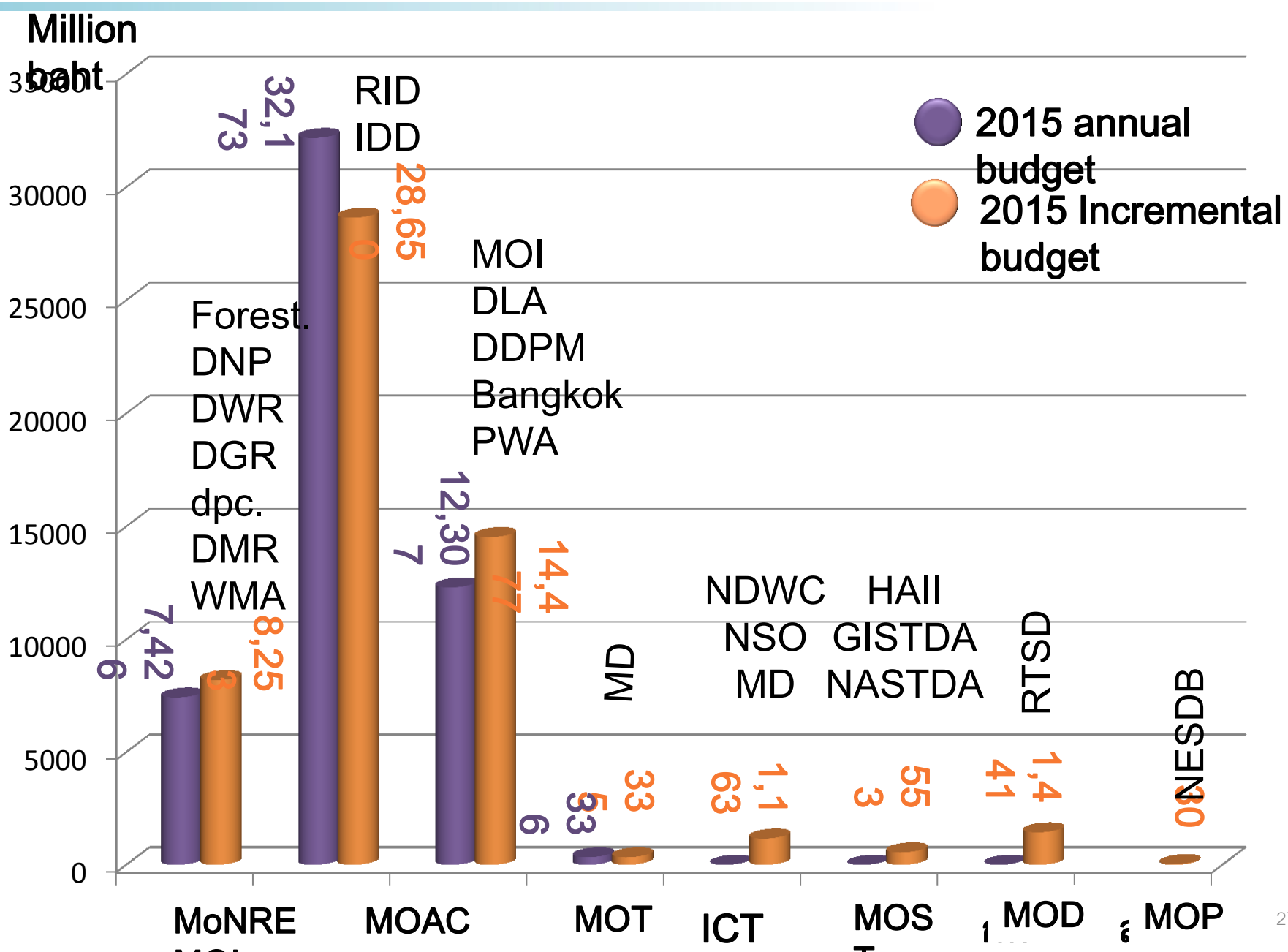
Incremental budget for the 2015 comprises of

- 39,707 mil baht loan for implementing 2,594 projects
- 16,278 mil baht from central fund

2015 budget allocation for Water Resources Management by region



2015 budget allocation for Water Resources Management by ministry



Targets of Water Resources Management Strategy

1. Restore 47,000 rais of forest area and 675,000 rais of Vetiver Grass are planted for land erosion protection
2. Increase water supply for consumption in 3,941 villages and urban water supply increased by 481 units
3. Enhance the irrigated farming for more than 150,000 farmer households with the planting area of 2.91 rais and water supply is sufficient for industrial and service sectors.
4. Prevent and mitigate flood impact in 24 major areas
5. Water quality of major rivers and basins are adequately
6. National water resources is efficiently managed with the
7. The important projects are well studied and prepared

Present and future of Thailand's water management

Thailand's water management problem

1. Water demand has significantly exceed water supply due to the exponentially increase of population and the expansion of urbanization while the development of new water storage is limited.
2. The frequency of drought and flood resulted from climate change is increased, therefore the annually precipitation has been fluctuated.
3. The deterioration of water transmission and allocation systems has caused 50 % loss of irrigated water.
4. Ineffective water use occurs mostly in Bangkok and vicinity with 400 ltrs on average/day compare to 122 ltrs from rural areas.
5. Inefficient water management system for consumption resulted in high transmission loss
6. Water management at national level lack of unity both in terms of law, regulation, and implementation mechanism.

Critical issues for the future of water resource dev.

- Enact Water resource Act
- Improve Org. Mgt. and Related Rules, Laws and Regulations

What's Next?

Enact Water resource Act

- Enact Water Resource Act as the master law for national water management and improve/ revise the existing rules, laws and regulations for the benefit of water resources management.

Improve Org. Mgt. and Related Rules, Laws and Regulations

- Revise/ restructure the existing water related organizations and management mechanisms into an integrated and sustainable approaches.
- Reduce duplication, support participation of stakeholders at all development levels, create network, fairness and equality.

Thank you

www.nesdb.go.th