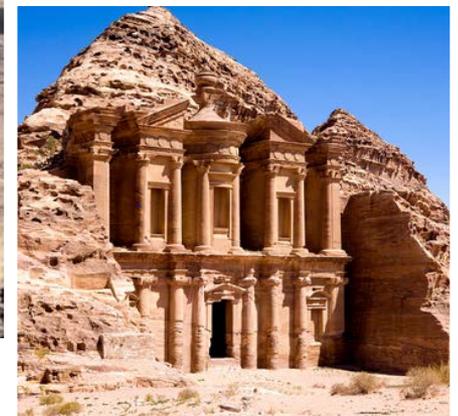


Managing floods and droughts across scales

INFORMATION ASSISTS FLOOD AND DROUGHT MANAGEMENT AND PLANNING – LINK BETWEEN BASIN PLANNING AND UTILITIES

19 OCTOBER 2015



Main Objectives

- Integrate information from relevant agencies and establish the **National Hydroinformatics Data Center** with high performance IT infrastructure
- Monitor, Surveillance and Forecast water situation during the **normal operation** and mitigate flood and drought during **crisis**
- Support **investment and policy decisions** in water resource management for a sustainable future

FRAMEWORK OF THE DSS

Operation and Data Usage Agencies

TMD RID DWR EGAT PWA MOST DPT

RTN BMA NDWC DDPM

LAOs NESDB BB

University/Research Institute

N

Normal

C

Crisis

D

Develop / Maintenance

Set water management plan

Warning and Situation Management

Set development direction for stability

Analyze and Forecast

Estimate risk and future trend

Monitor and surveillance

Analyze facts and problems

I

Infrastructures

Meteorology

Tools

Measurement Index

NHC

Hydrology

Society

Economy/Investment/Projects

Base Map

Public Utility

Disaster

Standards/Rules/Criteria

Shape File

Preliminary Analysis

SYSTEM COMPONENTS

DDPM

NDWC

RID
DWR
EGAT

Water
related
agencies

Local Water
Resources
Management
Center

Research
Center (COE)

Government
Sector/
University/
People

Data user

NHC System

Internal Operation System (Intranet)

Data processing system
for disaster warning

Internet GIS/MIS
System

Data processing system
for reporting

Security System

Data Center

Data / Graphics / Spatial

Data Management / Verification

Data Account/ Clearing House

Linking Data Standard

Data Linkage System/ Data Exchange

Computer, HPC & Network Systems

Group of Data

Meteorology

Hydrology

Infrastructure

Base Map

Map layer

Society

Disaster

Economy/Investment/Projects

Standards/Rules/Criteria

Measurement Index

Tools

Linked 13 agencies

**AIM: EXPAND NETWORK
TO COVER ALL 30 AGENCIES**

inspiring change

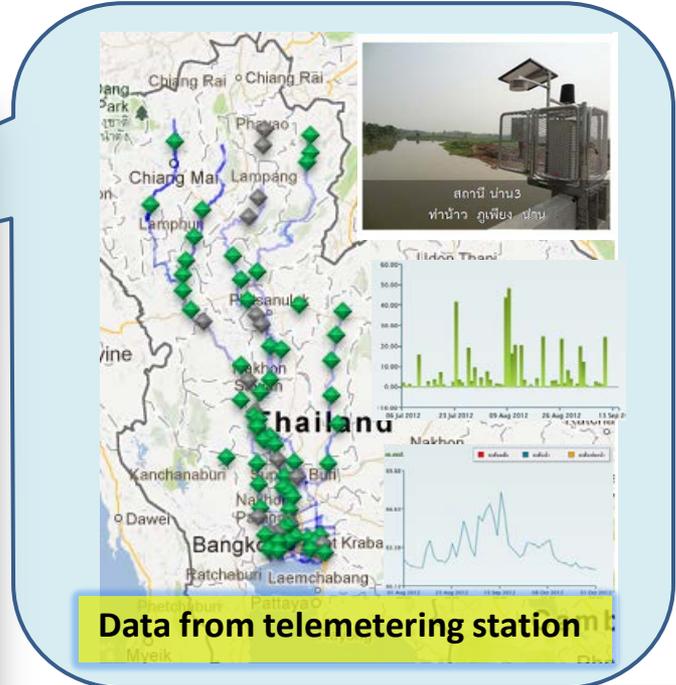
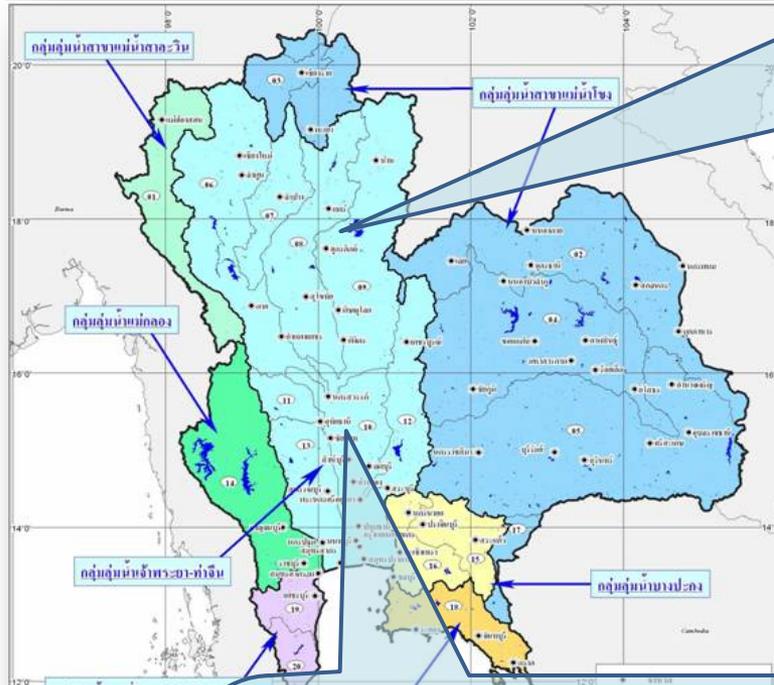


Already had data

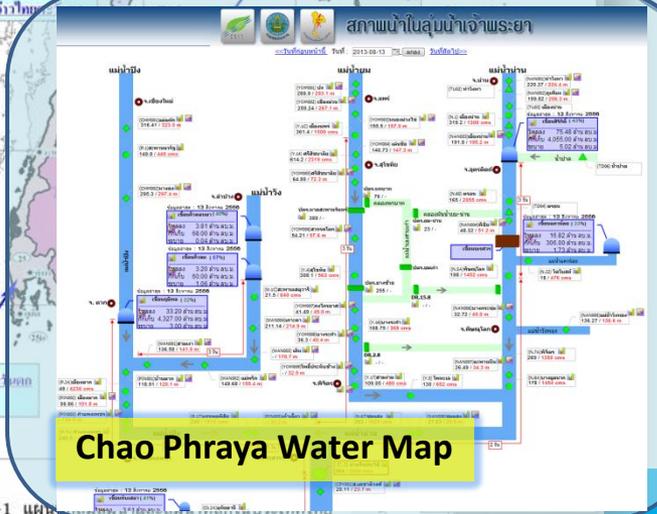
No data

OPERATION (NORMAL SITUATION)

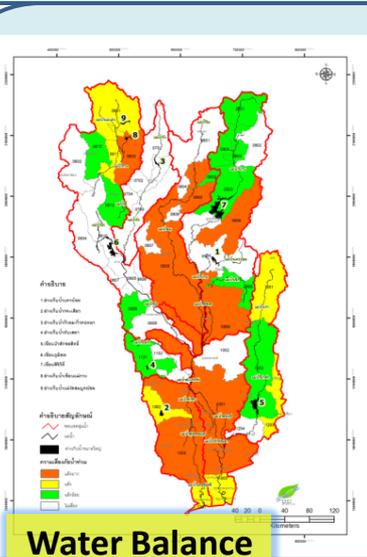
Chao Phraya River Basin



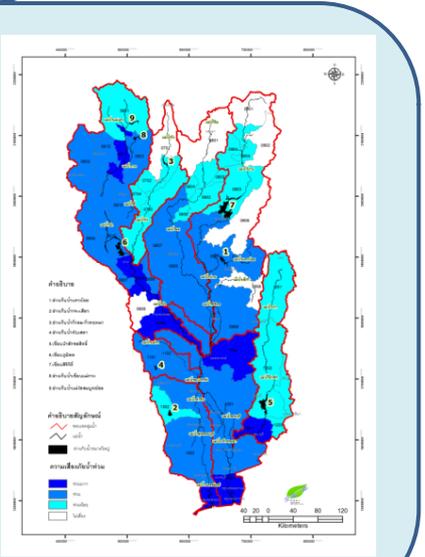
Data from telemetering station



Chao Phraya Water Map

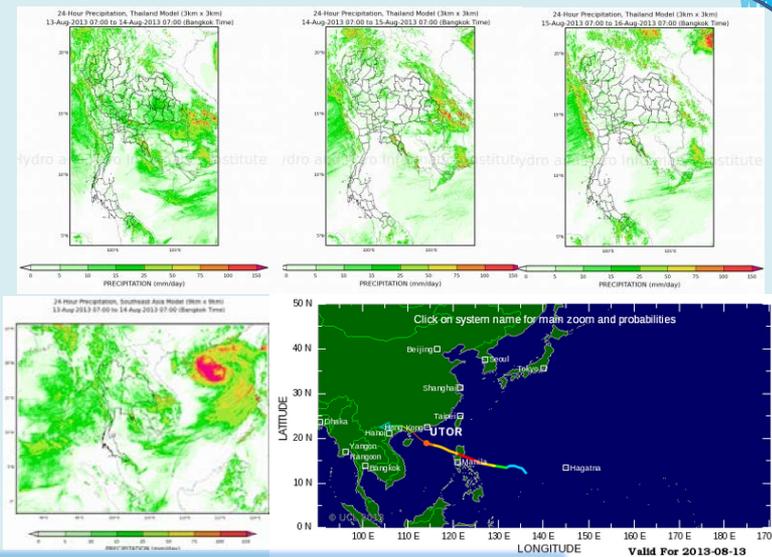
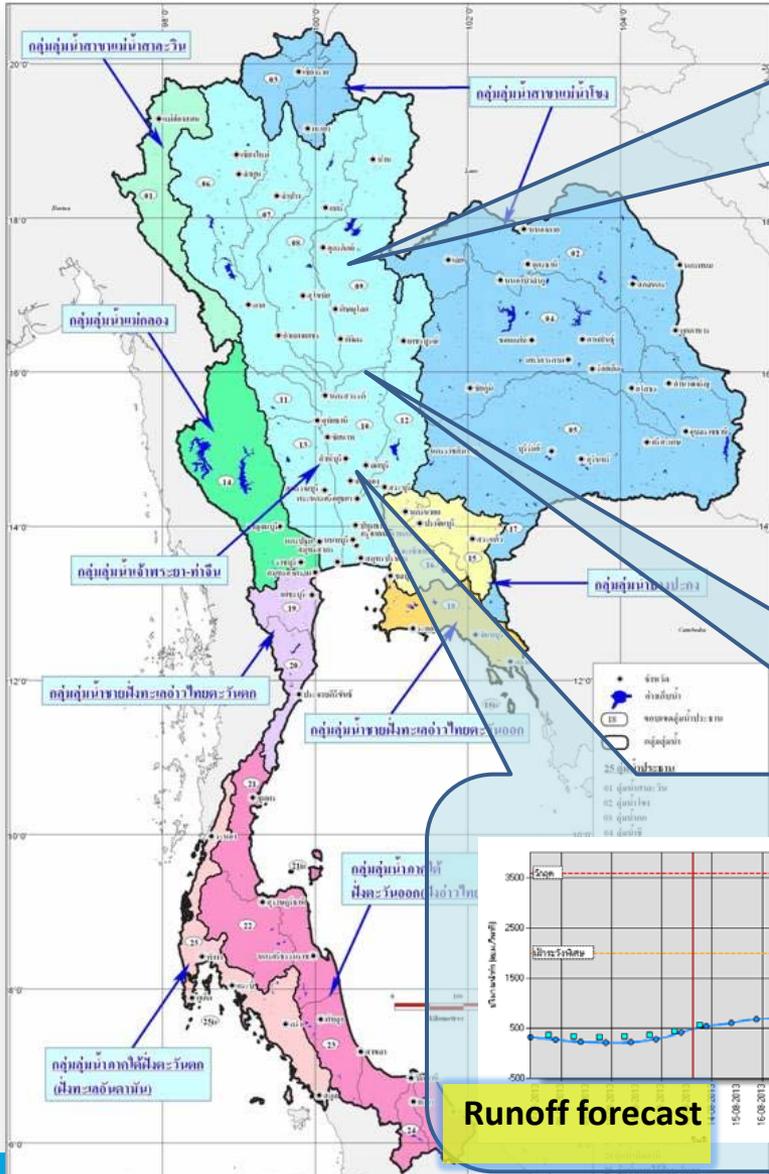


Water Balance

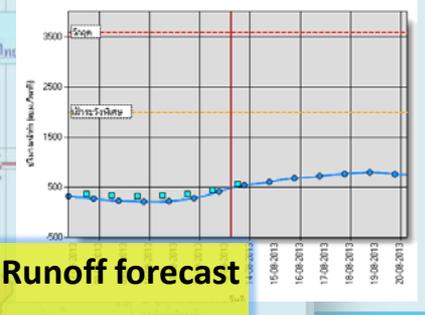


OPERATION (CRISIS SITUATION)

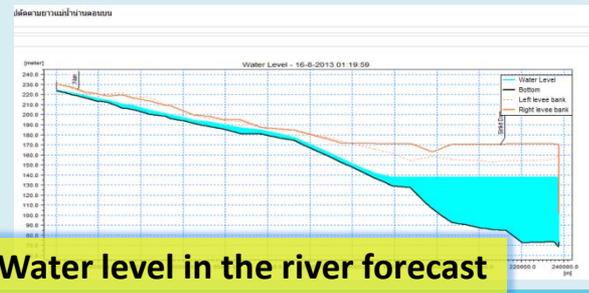
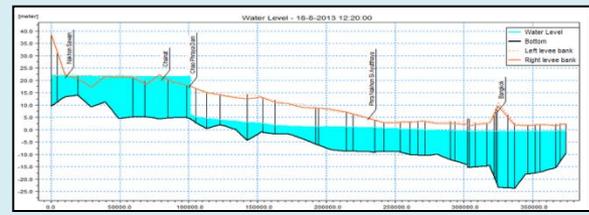
Chao Phraya River Basin



Precipitation and Storm Forecast

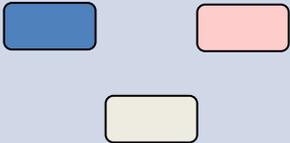
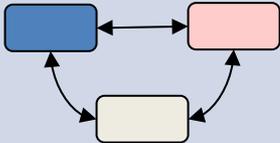
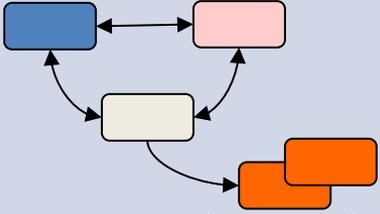


Runoff forecast

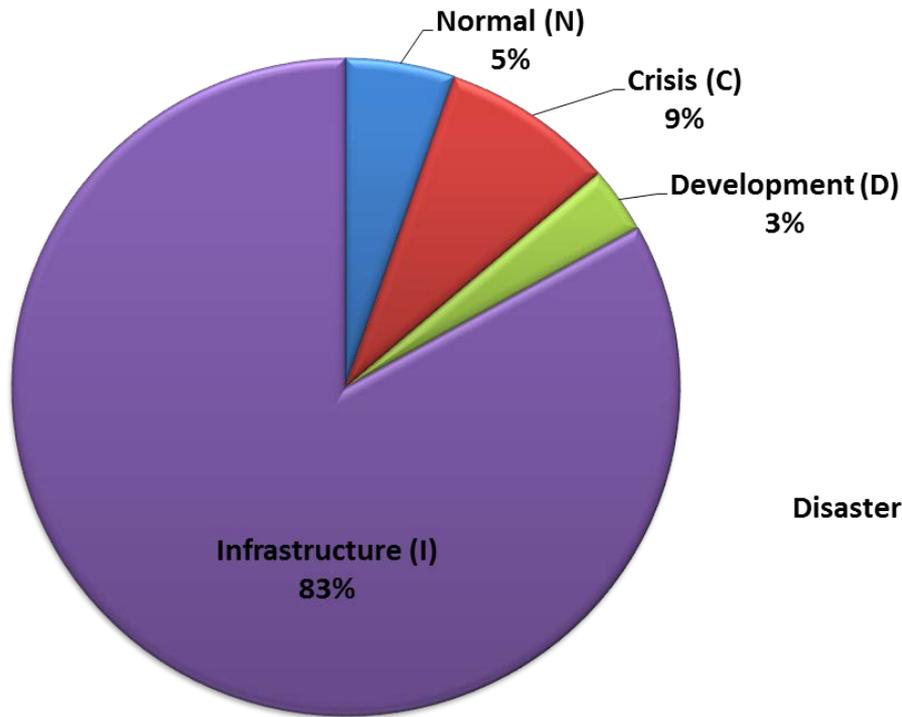


Water level in the river forecast

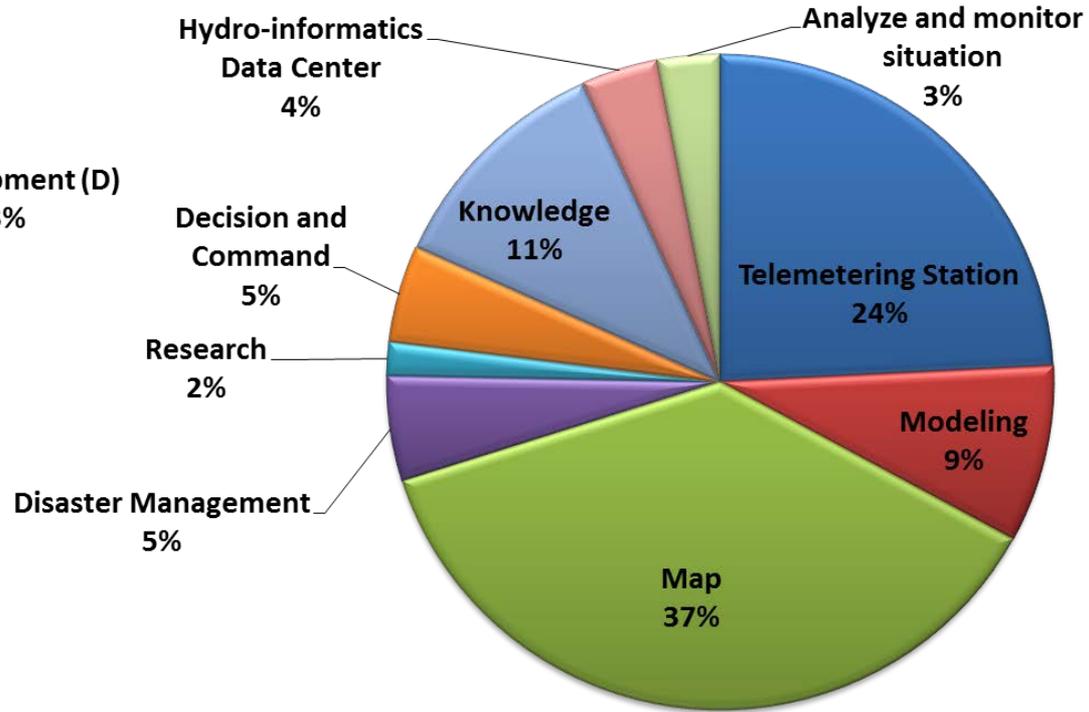
ADAPTIVE MASTER PLANNING

Stand-alone projects	Compilation of projects	Traditional master planning	Adaptive management
			 <p style="text-align: right;">Alternative plan</p>
<ul style="list-style-type: none"> • Focus on internal mission • Neglect overview and public successes 	<ul style="list-style-type: none"> • Focus on internal mission plan • Related or non-related or not duplicate to other mission 	<ul style="list-style-type: none"> • Linkage between internal project • Relate or non-related to other agencies 	<ul style="list-style-type: none"> • Linkage between all plans • Integrated between all agencies • Results are able to adapt for future development plan
Project-based	Package of individual projects	Strategy as a blue print for the future	Dynamic strategy
		Optimized and integrated	Dealing with an uncertain future
Low regret?	Low regret?	No regret	No future regret
Immediate implementation	Immediate implementation	Implementation during planning period (3 years)	Implementation during planning period (+3 years)
Short term	Short to medium term	Short to longer term	Short to long term

BUDGET GROUPING



Budget according to categories



Budget according to activities

SYSTEM ROADMAP



	Present	1 st Year (2015)	2 nd Year (2016)	3 rd Year (2017)
Decision system		<ul style="list-style-type: none"> Simulation Data Mart 	<ul style="list-style-type: none"> Simulation BI and DSS System 	<ul style="list-style-type: none"> Simulation on BI & DSS System
Disaster Management System	<ul style="list-style-type: none"> Flood Situation Report System on Communication CCTV System in Chao Phraya Basin 	<ul style="list-style-type: none"> War Room: collaborated disaster warning network Rescue Warning System Remote Signal System 	<ul style="list-style-type: none"> Disaster Monitoring System via CCTV Rescue Alert System E-Stock System 	<ul style="list-style-type: none"> Disaster Data Warehouse Integrated Water Management System on Communication
Analysis System/ Monitor Situation	<ul style="list-style-type: none"> Agencies' Operating Center Agencies' Website CCTV System in Chao Phraya Basin Media Box 	<ul style="list-style-type: none"> Daily & Weekly Water Situation Report System War Room of TMD, DWR, DDPM BMA GIS System Water Quality Monitoring Center 	<ul style="list-style-type: none"> Result Assessment System to DSS Bangkok Flood Monitoring Center Ground Water Monitoring System 	
Modeling	<ul style="list-style-type: none"> Weather Forecast System: 7-day Flood and Drought Risk Modeling Flood Forecasting System (Chao Phraya, Chi, Moon) 	<ul style="list-style-type: none"> Increase the capacity of 7-day forecast system Flood Forecasting System (Eastern Region) Water Quality Modeling (Chao Phraya, Tha Chin, Chi) 	<ul style="list-style-type: none"> Intermediate Weather Forecast System Flood Forecasting System (Southern Region) Water Quality Modeling (Mekong, Bangprakong, Moon) 	<ul style="list-style-type: none"> Seasonal Weather Forecast System (Long Term) Reservoir Management System and Irrigation System 25 River Basins Water Balance Modeling System Flood Forecasting System (Whole country) Water Quality Modeling (Ping, Wang, Yom, Nan)
Hydro Informatics	<ul style="list-style-type: none"> Data Network System: 13 agencies NHC Website NHC Mobile Application 1st phase Data Service System Mobile Data Center 	<ul style="list-style-type: none"> Data Network System: 30 agencies Data Warehouse 	<ul style="list-style-type: none"> Data Service System (Mobile equipment, website, data network) 	<ul style="list-style-type: none"> Increase the capacity of visualization and maintenance
Measurement System	<ul style="list-style-type: none"> 1,218 Telemetry stations (Water level, Runoff) 2,548 Telemetry Stations (Rainfall) 116 Automated water quality measuring stations 14 Weather Radar stations <p>** Activated stations as of 15/09/2014</p>	<ul style="list-style-type: none"> 1,668 Telemetry stations (Water level, Runoff) 2,548 Telemetry Stations (Rainfall) 116 Automated water quality measuring stations 14 Weather Radar stations 	<ul style="list-style-type: none"> 1,916 Telemetry stations (Water level, Runoff) 3,352 Telemetry Stations (Rainfall) 116 Automated water quality measuring stations 14 Weather Radar stations 	<ul style="list-style-type: none"> 2,082 Telemetry stations (Water level, Runoff) 3,352 Telemetry Stations (Rainfall) 116 Automated Water Quality Measuring Stations 14 Weather Radar stations 238 Automated surveying water quantity equipment Dam Remote Measurement System
Map System	<ul style="list-style-type: none"> 17 GNSS Network Stations Thailand Geoid Model Agencies' WMS 	<ul style="list-style-type: none"> 42 GNSS Network Stations Local WMS System: 90 sites 	<ul style="list-style-type: none"> 77 GNSS Network Stations Storage and Data Service System (RPSD) Local WMS System: 110 sites 	<ul style="list-style-type: none"> 112 GNSS Network Stations (whole country) High Resolution Thailand Geoid Model Center WMS System Local WMS System: 120+140 sites
Knowledge Management	<ul style="list-style-type: none"> Wikipedia of Water and 25 river basins basic data 	<ul style="list-style-type: none"> Water Law Data System 	<ul style="list-style-type: none"> Data Usage for disaster management KBMS System 	<ul style="list-style-type: none"> Knowledge Management System (KM)
Research	<ul style="list-style-type: none"> Intermediate-Long Terms Rainfall Forecast 	<ul style="list-style-type: none"> Center of Excellence on Water Management Systems 	<ul style="list-style-type: none"> Sea Water Encroachment Forecast System on Lower Chao Phraya River Standard of Thai Telemetry System Standard of Disaster Relief Equipment 	<ul style="list-style-type: none"> Standard of Procedures (Disaster Analysis and Assessment)

DATA ROADMAP



	Year 0 (Present)	Year 1-3 (2015-2017)	Year 5	>5 Years
Water Data	<ul style="list-style-type: none"> Hydrological – Dam – Water quality data from agencies 12 agencies data linkage 	<ul style="list-style-type: none"> Hydrological – Dam – Water quality (Real-time) of whole country Water consumption data Public data (Crowd-sourcing) 	<ul style="list-style-type: none"> Community water data Water consumption data (Real-time) 	<ul style="list-style-type: none"> Complete Water Data: whole country Hydrological cycle
Weather Data	<ul style="list-style-type: none"> Radar image Short-term rainfall forecasting data Agencies' Data analysis International Data analysis 	<ul style="list-style-type: none"> Weather Data (Real-time) whole country Public data (Crowd-sourcing) Short-term / Long-term rainfall forecasting data Strom Track Forecasting 	<ul style="list-style-type: none"> Short-term / Long-term rainfall forecasting data (High resolution) Rain Radar Data for Water Forecast Impact from climate change 	
Based Map	<ul style="list-style-type: none"> 17 GNSS Stations 	<ul style="list-style-type: none"> GNSS Stations: whole country +/-20 cm. flooding area DEM data 	<ul style="list-style-type: none"> +/-20 cm. DEM data: whole country 	<ul style="list-style-type: none"> +/-5 cm. DEM Data in the city +/-10 cm. DEM Data in agricultural area
Geographical Map Data	<ul style="list-style-type: none"> Geographical Town Map 1:50000 	<ul style="list-style-type: none"> Geographical Town Map 1:4000 Dyke and street height level data Lidar DEM of flood area: whole country Flood Map – Risk area 	<ul style="list-style-type: none"> Geographical Town Map 1:1000 (in the city area) Flood-Risk Map: whole country 	<ul style="list-style-type: none"> Geographical Town Map 1:1000 of whole country
Disaster	<ul style="list-style-type: none"> Disaster Data Center 	<ul style="list-style-type: none"> Disaster Data Center E-Stock SOPs 		
Key Index Measurement	<ul style="list-style-type: none"> Economic and Social Area - Base Infrastructure Data 	<ul style="list-style-type: none"> Area-based infrastructure data for water resource management - Volume of consumption - Consumption pattern 	<ul style="list-style-type: none"> Growth conditions Water use efficiency 	<ul style="list-style-type: none"> Water footprint
Economy/ Investment/ Project	<ul style="list-style-type: none"> Project related to water issues divided by agencies 	<ul style="list-style-type: none"> Project related to water issues: whole country 	<ul style="list-style-type: none"> Evaluation data on water project 	
Tools	<ul style="list-style-type: none"> Agencies' data 	<ul style="list-style-type: none"> Tools and Equipment Data 		
Standards/Criteria/ Rules&Regulations	<ul style="list-style-type: none"> Laws and Regulations 	<ul style="list-style-type: none"> Water Laws Thailand surface plane from Geoid model Standard of Telemetry Equipment 		



THANK YOU

Dr. Royol Chitradon

- Hydro and Agro Informatics Institute, Bangkok, Thailand ●
www.thaiwater.net