The 9th International Coordination Group (ICG) Meeting and
2nd AWCI Climate Change Assessment and Adaptation (CCAA) Study Workshop
GEOSS Asian Water Cycle Initiative (AWCI)

General review of the AWCI Status

Toshio Koike
The University of Tokyo

7 Year History of GEOSS/AWCI

2000 – **Integrated Global Observing Strategy (IGOS) Water Theme** Proposal

2001 – Water Theme Approved

2002 –Team Report Writing Team — World Summit on Sustainable Development (WSSD)

2003 – Preparation for "**Integrated Global Water Cycle Observation (IGWCO)**" — Ad-hoc (GEO)

2004 – IGWCO Team Report — Preparation for 10-year Implementation Plan

2005 – 1st IGWCO in Tokyo → **GEO/GEOSS**

2006 – 2nd IGWCO in Paris

2007 – 3rd IGWCO in DC — 1st GEOSS AP in Tokyo

2008 – 4th IGWCO in Geneva — 2nd GEOSS AP in Tokyo

2009 – 5th IGWCO in Kyoto — 3rd GEOSS AP in Kyoto

2010 – 6th IGWCO in New York — 4th GEOSS AP in Bali

2011 – 7th IGWCO in Tokyo

2012 – 8th IGWCO in Hawaii — 5th GEOSS AP in Tokyo

Asian Water Cycle Initiative (AWCI)

1st Sump. in Tokyo
1st TTM in Bangkok

2nd Simp. in Tokyo
1st ICG in Bali
3rd Simp. in Beppu
2nd ICG in Tokyo
3rd ICG in Beijing
4th ICG in Kyoto
5th ICG in Tokyo
6th ICG in Bali
7th ICG in Tokyo
1st CCAA/T in Tokyo
8th ICG in Seoul

9th ICG & 2nd CCAA in Tokyo

1st Asian Water Cycle Symposium, Tokyo, Nov. 2005

1st Task Team Meeting, Bangkok, Sep. 2006

1st Capacity Building Workshop, Sep. 2006

2nd Asian Water Cycle Symposium, Tokyo, Jan. 2007

1st GEOSS AP Symposium, Tokyo, Jan. 2007

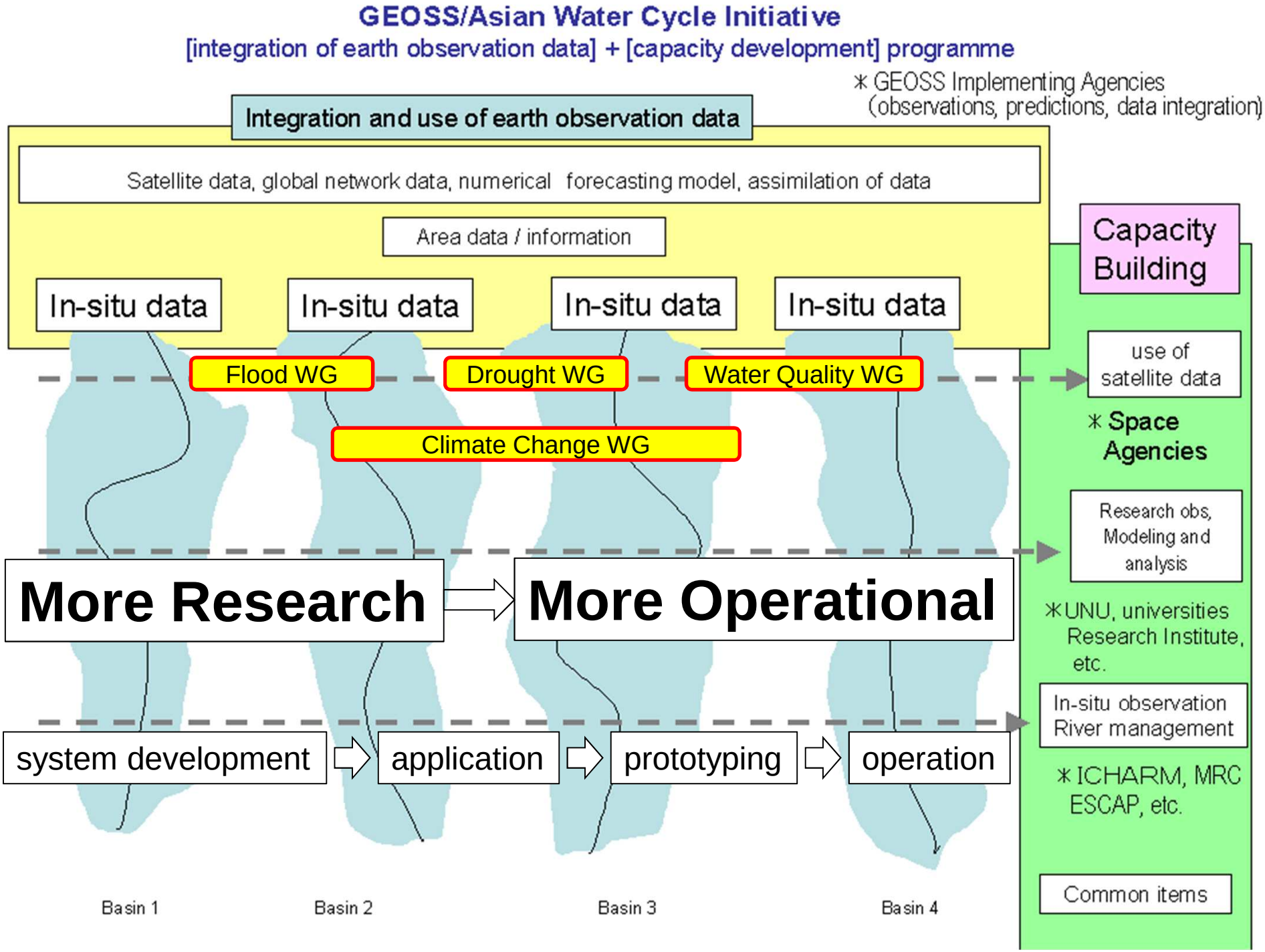
1st International Coordination Group Meeting, Bali, Sep. 2007

GEOSS
Asian Water Cycle Initiative (AWCI)

To promote integrated water resources management by making usable information from GEOSS, for addressing the common water-related problems in Asia.

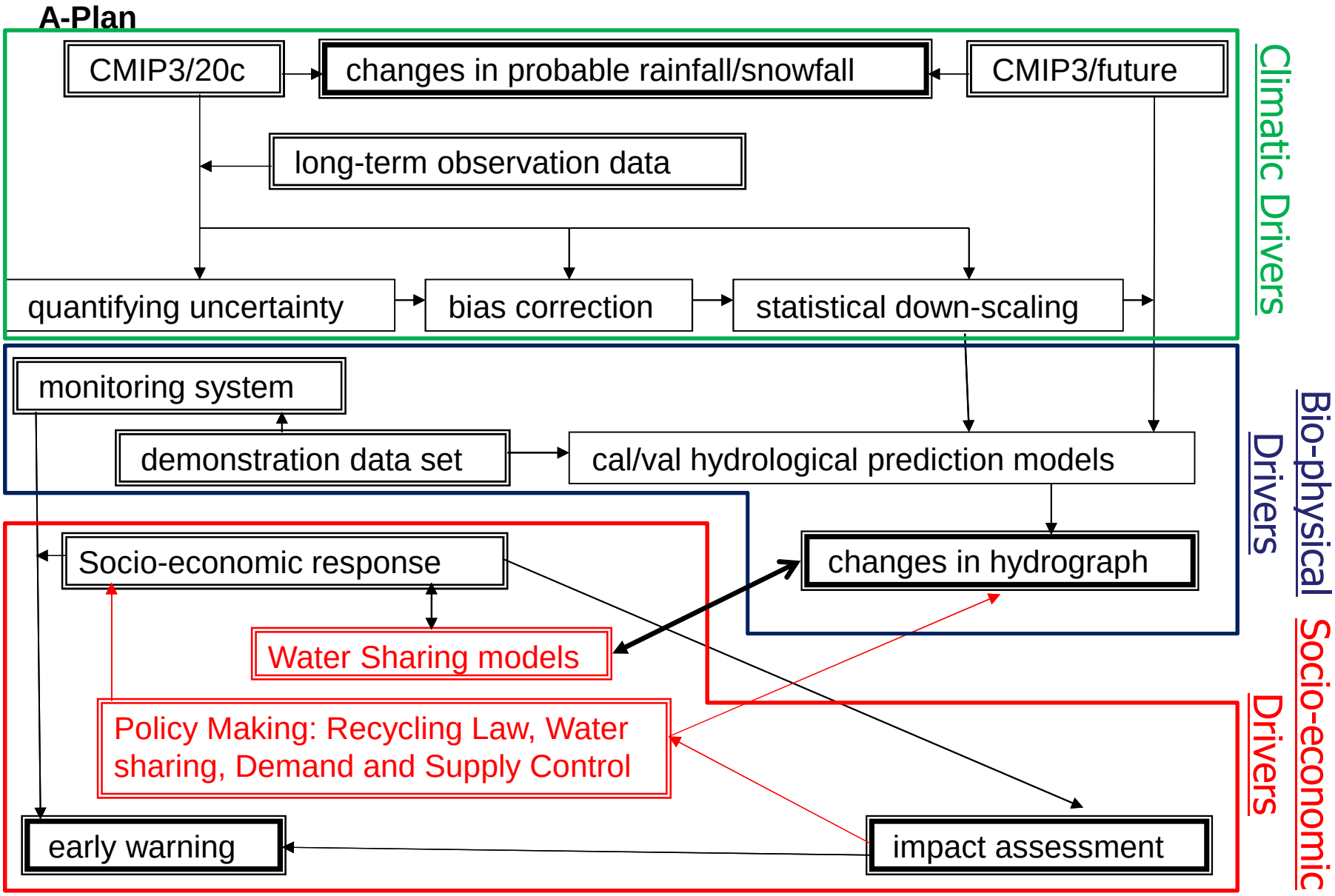
Uniqueness

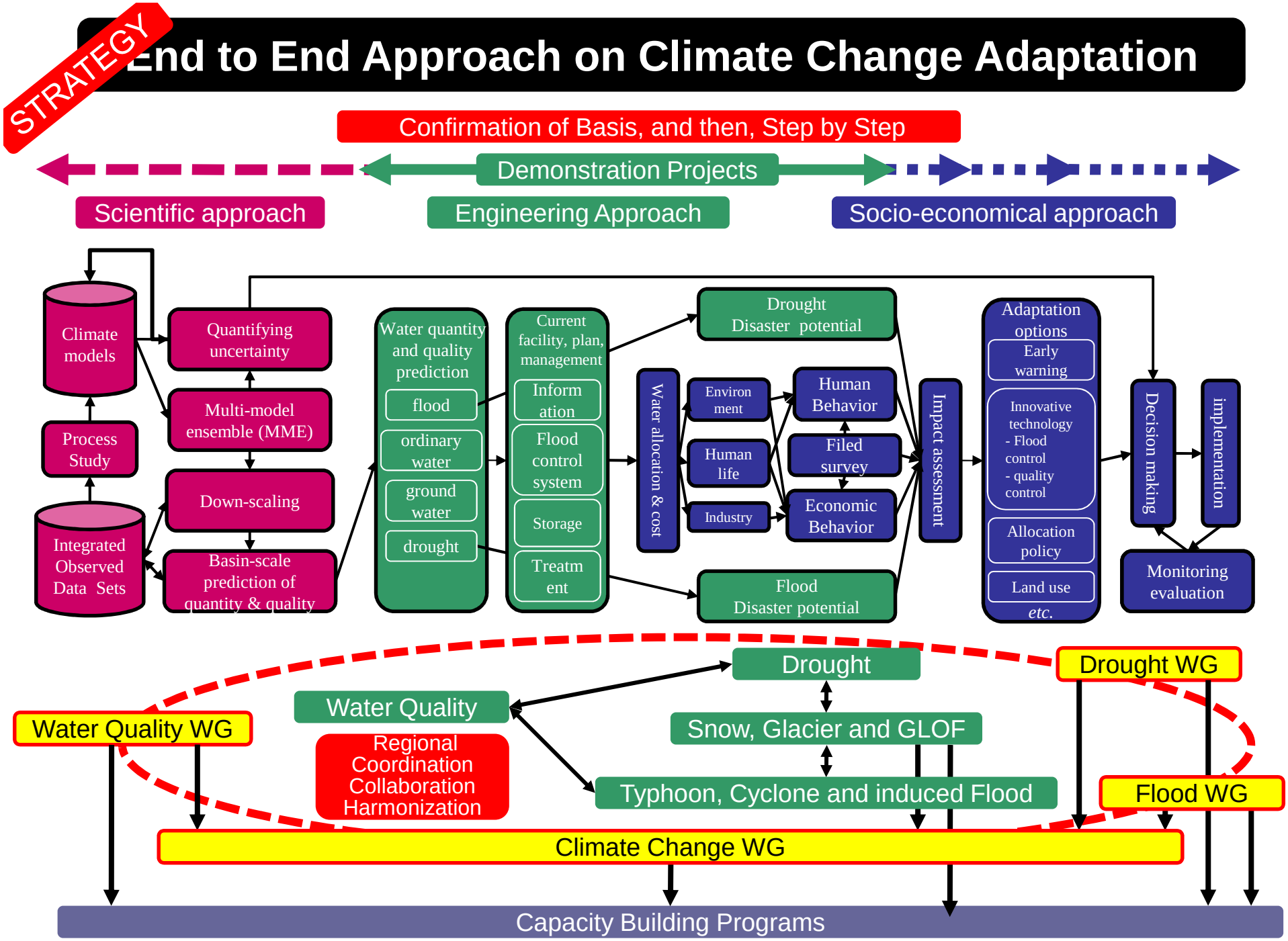
- A River Basin of Each Countries
- Observation Convergence
- Interoperability Arrangement
- Data Integration
- Open Data & Source Policies
- Capacity Building
- Early Achievements


GEOSS/Asian Water Cycle Initiative
[integration of earth observation data] + [capacity development] programme
＊GEOSS Implementing Agencies
(observations, predictions, data integration)
Integration and use of earth observation data
Satellite data, global network data, numerical forecasting model, assimilation of data
Area data / information
In-situ data
In-situ data
In-situ data
In-situ data
Capacity Building
Flood WG
Drought WG
Water Quality WG
Climate Change WG
use of satellite data
＊Space Agencies
Research obs, Modeling and analysis
More Research
More Operational
＊UNU, universities Research Institute, etc.
In-situ observation River management
system development
application
prototyping
operation
＊ICHARM, MRC ESCAP, etc.
Common items
Basin 1
Basin 2
Basin 3
Basin 4

Implementation Planning

Question 1: What should be added, removed and modified?




STRATEGY
End to End Approach on Climate Change Adaptation
Confirmation of Basis, and then, Step by Step
Demonstration Projects
Scientific approach
Engineering Approach
Socio-economical approach
Climate models
Process Study
Integrated Observed Data Sets
Quantifying uncertainty
Multi-model ensemble (MME)
Down-scaling
Basin-scale prediction of quantity & quality
Water quantity and quality prediction
flood
ordinary water
ground water
drought
Current facility, plan, management
Inform ation
Flood control system
Storage
Treatm ent
Drought Disaster potential
Flood Disaster potential
Water allocation & cost
Environ ment
Human life
Industry
Human Behavior
Filed survey
Economic Behavior
Impact assessment
Adaptation options
Early warning
Innovative technology - Flood control - quality control
Allocation policy
Land use
etc.
Decision making
implementation
Monitoring evaluation
Drought
Drought WG
Water Quality
Water Quality WG
Regional Coordination Collaboration Harmonization
Snow, Glacier and GLOF
Typhoon, Cyclone and induced Flood
Flood WG
Climate Change WG
Capacity Building Programs

The types of activities requiring the gap filling and capacity building

✓**Analysis of the current variability of extreme hydrometeorological phenomena (probability of occurrence, duration of hazardous period by the territory) and their after-effects for vulnerability assessment.**

✓**Future risk assessment in line with the Climate Scenarios and application of the advanced methods and tools.**

✓**Development of the large-scale maps of the current and future risk for individual phenomena in line with the needs of the sectors (construction, transportation, recreation area, etc.) for identification the high risk areas.**

✓**Assessment of potential of the hazardous phenomena risk reduction via improvement of forecasting and warning.**

Lao PDR's Implementation Plan input to AWCI 2

Implementation proposal

1. Steps and Strategy following the three approaches:

***Framework development approach*:**

- National Disaster Management Committee (NDMC) is the high level decision making body which composing of ministerial members and chaired by Vice-Prime Minister.
- Existing developed framework and legislation tools are:

National Water Resources Policy and Strategy
National Strategy on Disaster Management
National Climate Change Adaptation Plan of Action (NAPA)
It is proposed to Develop :
(1). National Policy or Decree on Meteorology and Hydrology (Hydro-Meteorological Services Act)
(2). Strategy and SOP on National Early Warning Systems
(3). Guidelines and Procedures on Applications of AWCI over Demonstration Basin and Replication to Nationwide.

ISSUES RELATED TO WATER NEXUS

Water-Agriculture Nexus:

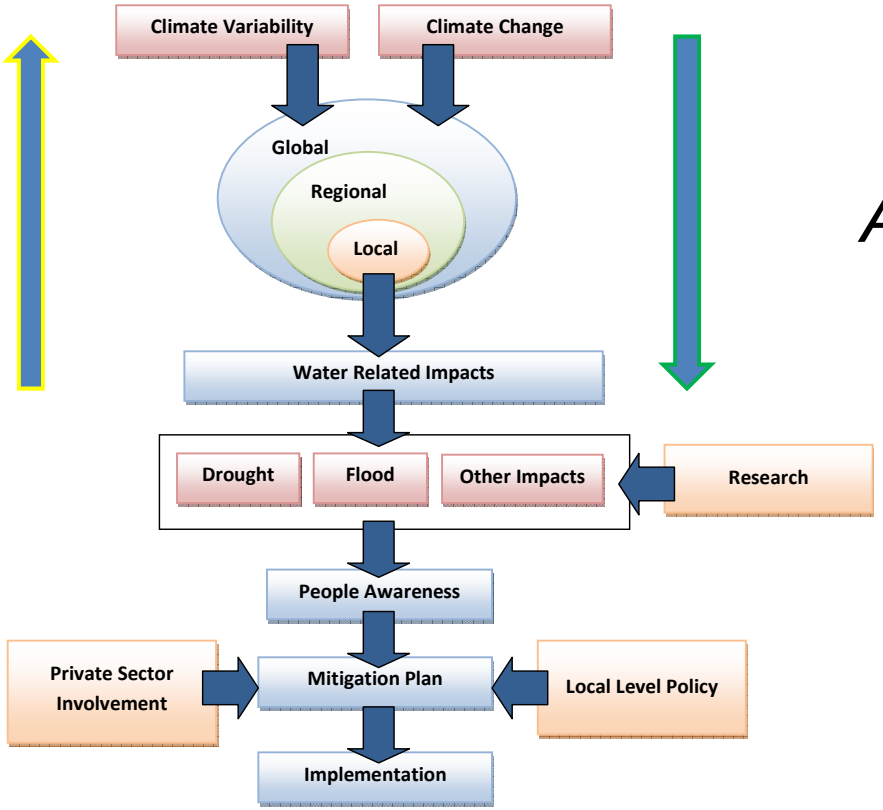
- Huge demand of food for huge population
- Scarcity of surface water
- Over exploitation of groundwater for irrigation and drinking
- Arsenic contamination of groundwater and Arsenic in the food chain pose health risk
- Damage to agricultural land in the coastal region due to salinity intrusion

Water-Biodiversity, Ecosystem Nexus:

- Reduced dry season flows
- Upstream diversion of river water across the borders
- Damage to ecosystem in the rivers and biodiversity of Sundarbans
- Increased concentration of inland surface water

Frame work Approach

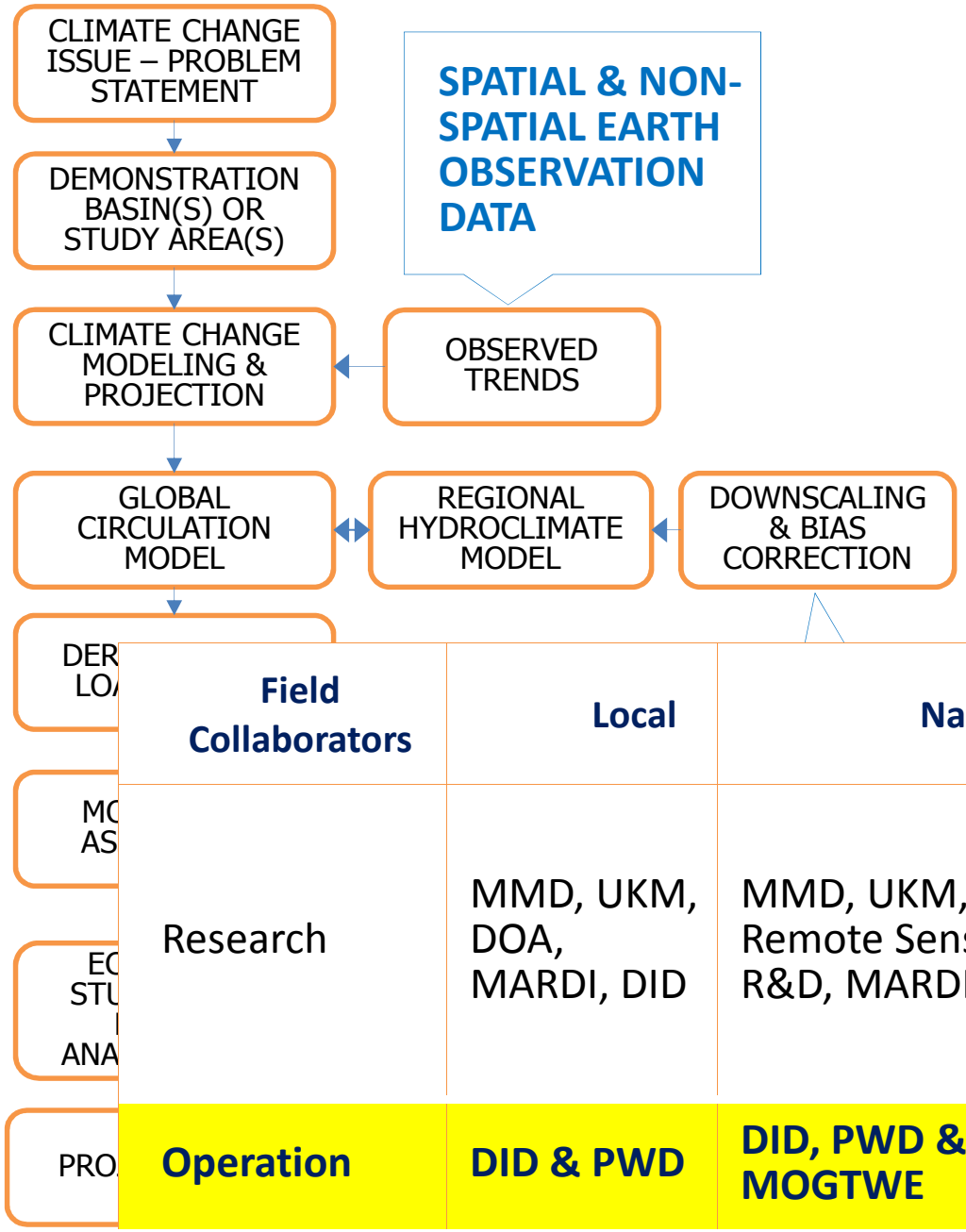
Country member



AWCI

Framework development based on simple approach

PROPOSED METHODOLOGY AND TECHNICAL PLAN



TECHNICAL GUIDELINES

CLIMATE CHANGE LOAD FACTOR

RAINFALL LOAD FACTOR

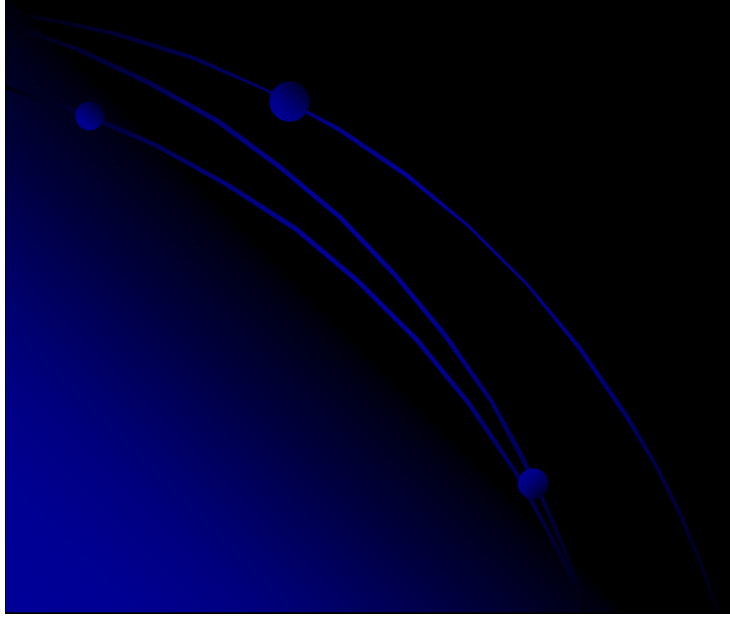
DRAINAGE SYSTEM, WATER RELATED INFRASTRUCTURE (ROAD & HIGHWAY) etc.

TEMP. LOAD FACTOR

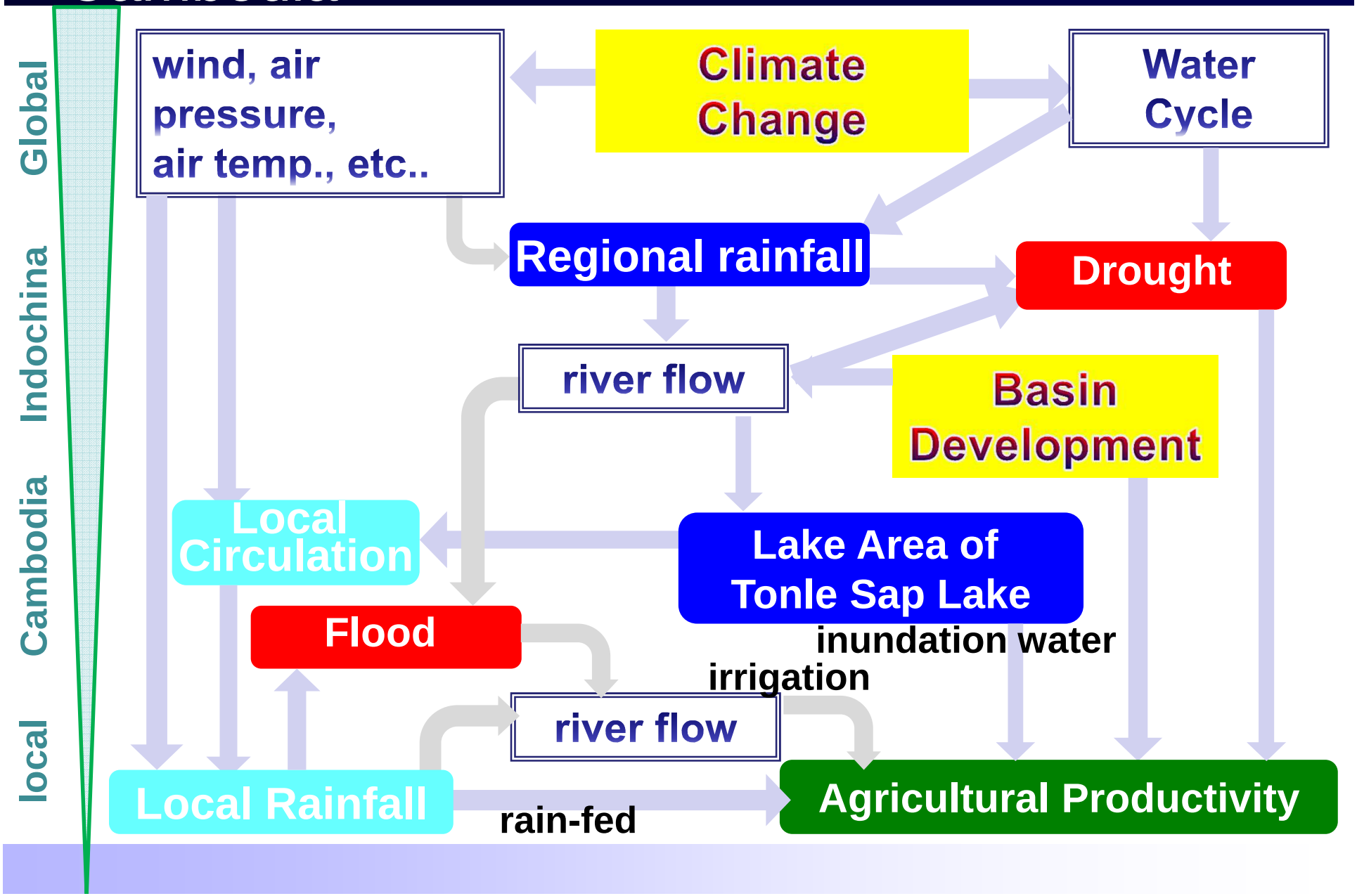
ROAD & HIGHWAY STANDARD

Field Collaborators	Local	National	Regional
Research	MMD, UKM, DOA, MARDI, DID	MMD, UKM, Agency Remote Sensing, TNB R&D, MARDI, DID	Univ. of Tokyo, Institute Water Management (IWM), JICA, RHIMES, Regional Water Knowledge Hubs
Operation	**DID & PWD**	**DID, PWD & MOGTWE**	-

Examples



hydro-meteorological situation in Cambodia



What you can do in “Cambodian group”?

Technology: Model development

- Hydrological Modeling + crop model +irrigation
- Data Assimilation Vegetation, Cloud
- Rainfall forecasting

Technology: Satellite observation

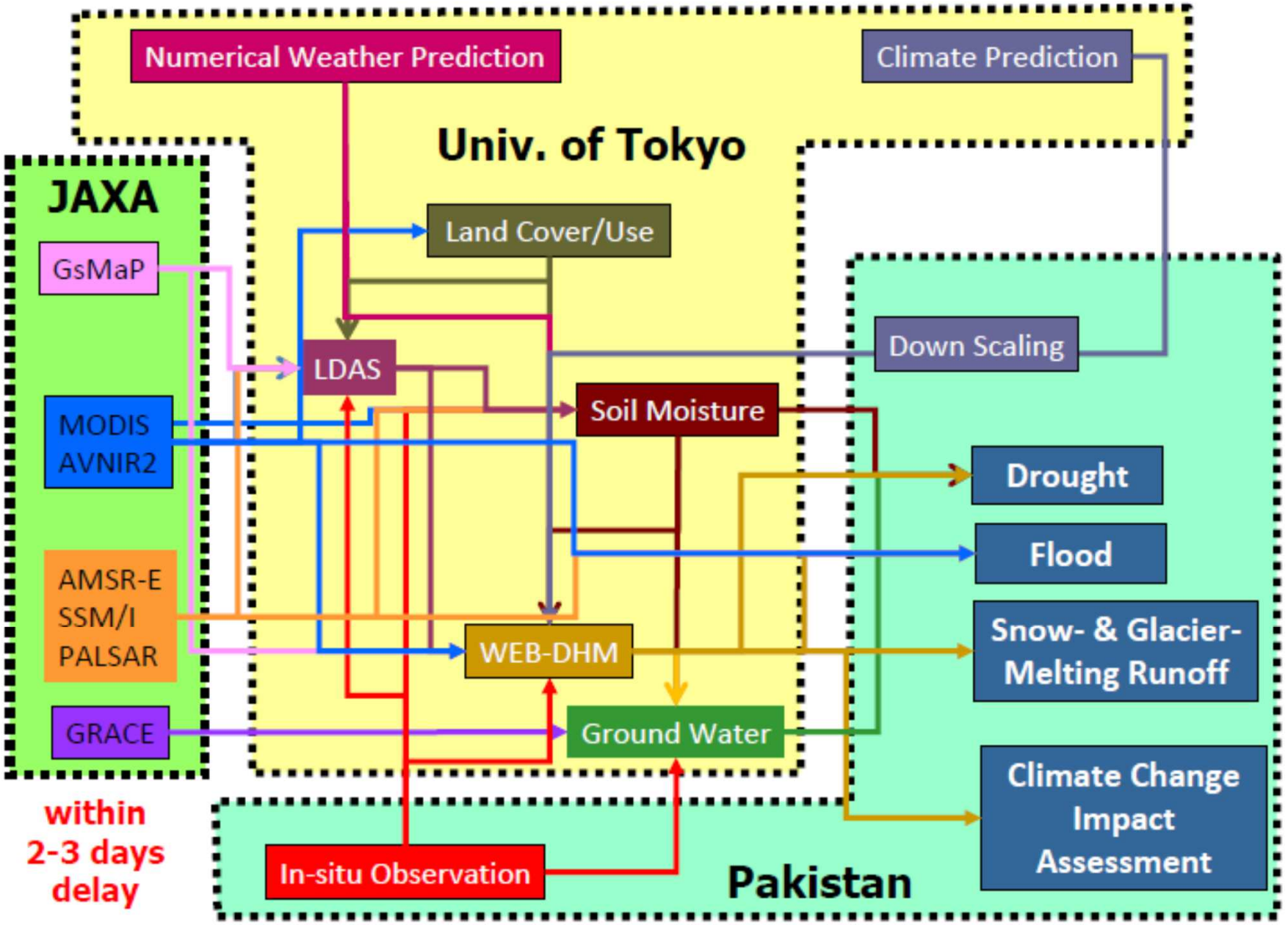
- soil moisture: PALSAR+ WEH-DHM
- DA of soil-moisture
- soil moisture: AMSR-E + LDAS-UT
- rainfall: TRMM + in-situ

- role of Tonle Sap Lake for the local circulation
- later withdrawal of IP monsoon
- effect of the climate change (local & large-scale)

Model application + Science: mechanism study

- optimization of crop calendar
- impact of climate change
- impact of land-use change
- impact of basin development incl. dam construction

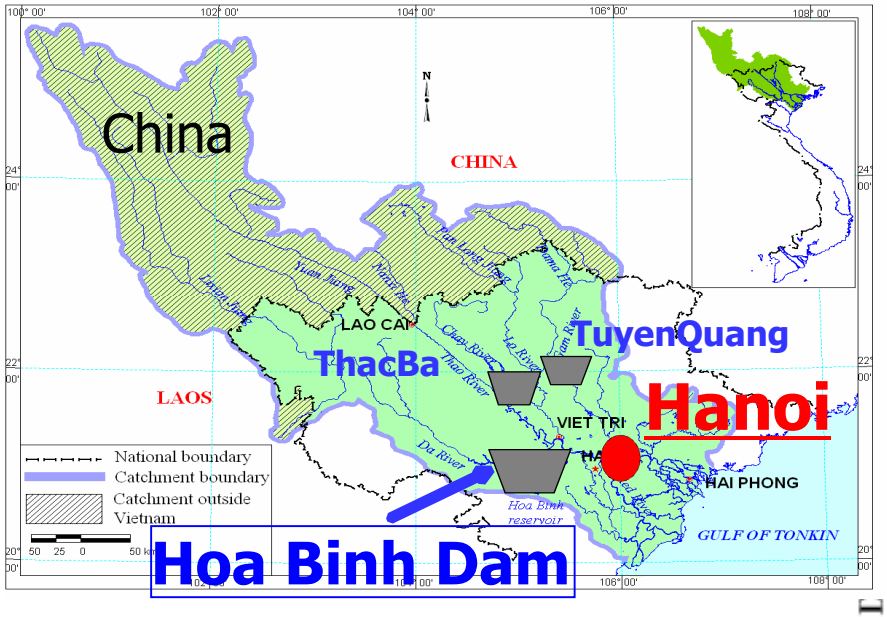
Model application + Assessment

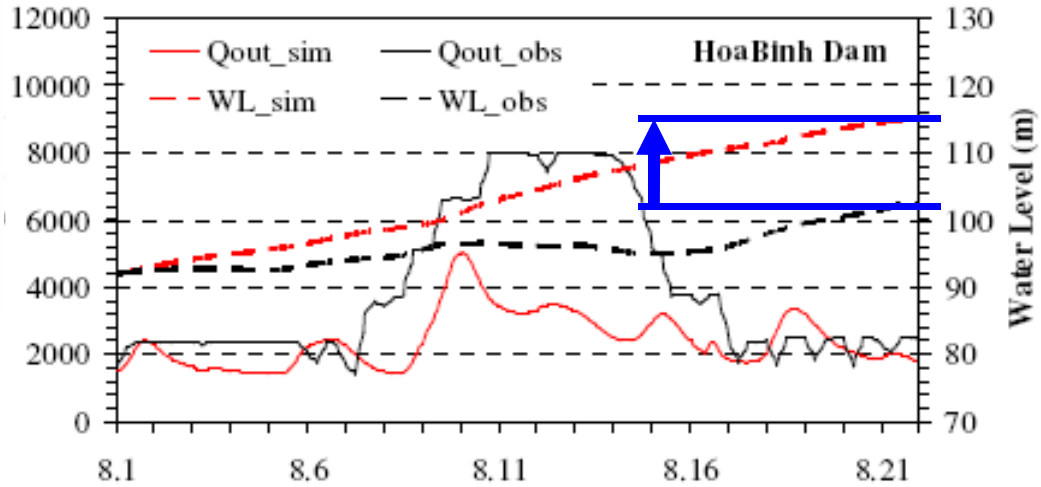

Numerical Weather Prediction
Climate Prediction
Univ. of Tokyo
JAXA
GsMaP
Land Cover/Use
LDAS
Down Scaling
MODIS
AVNIR2
Soil Moisture
Drought
Flood
AMSR-E
SSM/I
PALSAR
WEB-DHM
Snow- & Glacier-
Melting Runoff
GRACE
Ground Water
Climate Change
Impact
Assessment
within
2-3 days
delay
In-situ Observation
Pakistan

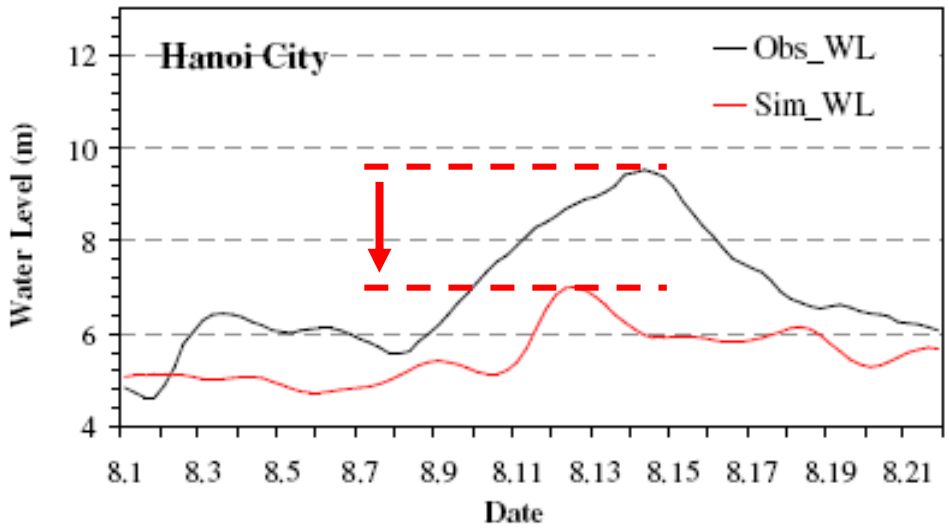
Toward the Final Stage as the SAFE Prototype

Target	Method	Development	Data Set	Application
Drought	Distributed Model	*completed*	*completed*	*on-going*
	Data Assimilation	*completed*	*completed*	*on-going*
	Index	*completed*	*on-going*	-
	Monitoring System	*on-going*	-	-
Flood	Algorithm	*completed*	*completed*	*completed*
	Distributed Model	*completed*	*completed*	*on-going*
Snow- & Glacier-Melting	Distributed Model	*completed*	*completed*	*completed*
	Mass Balance Model	*completed*	*completed*	*completed*
Climate Change Assess-ment	Model-selection	*completed*	*completed*	*completed*
	Bias Correction/Down-scaling	*completed*	*on-going*	*on-going*
	Hydrological Prediction	*on-going*	*on-going*	-
	Assessment	*completed*	*on-going*	*on-going*

The Red River Basin:
160,000 km²







Flood disaster in Hanoi

- Tropical cyclones
- Historical flood events with damages
- Death toll: around 100psn/year
  Economic loss: $1.2 billion (2006)

Increasing demand for hydropower generation

- Increasing by 15%in each year (due to economic growth & urbanization)
- Hydropower: 60% of total electricity
- Unstable water supply (70% of annual rainfall accumulates in Jul-Sep)

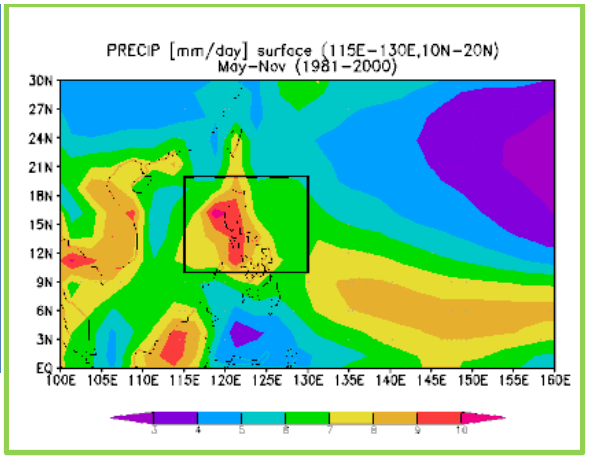
THE STUDY OF WATER SECURITY MASTER PLAN
FOR METRO MANILA AND ITS ADJOINING AREAS

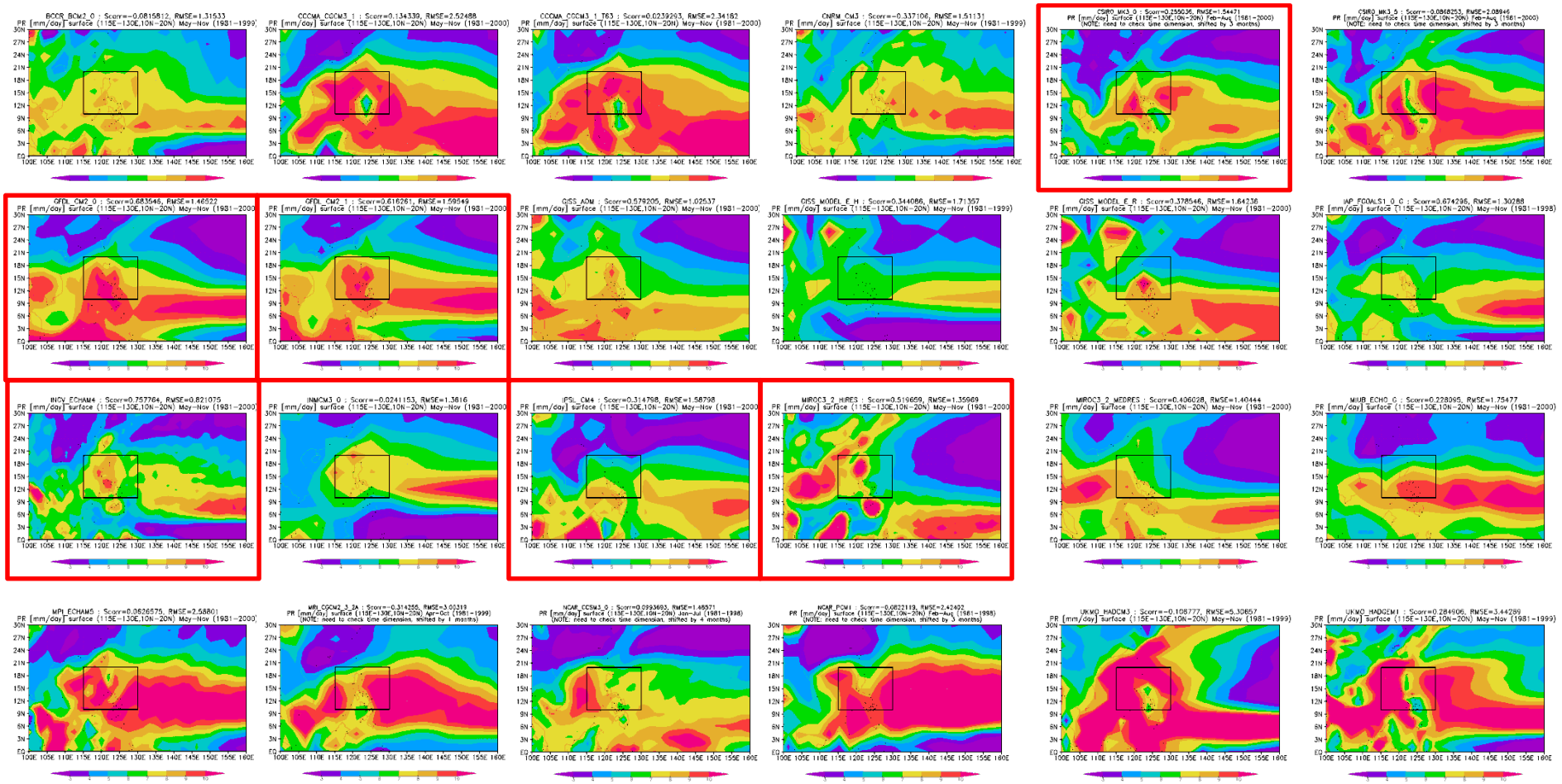
FINAL REPORT (DRAFT)
CLIMATE CHANGE IMPACT ASSESSMENT AND HYDOROLOGICAL SIMULATION

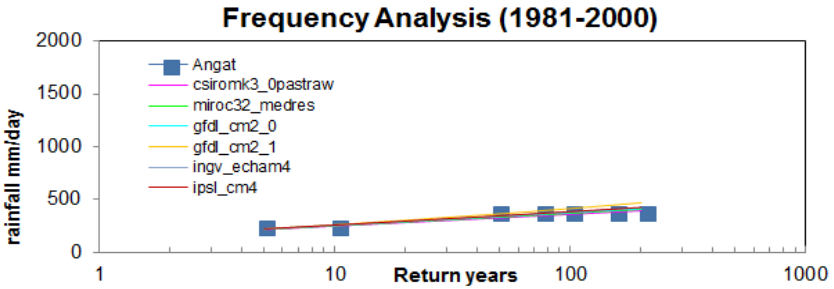
AUGUST 2012

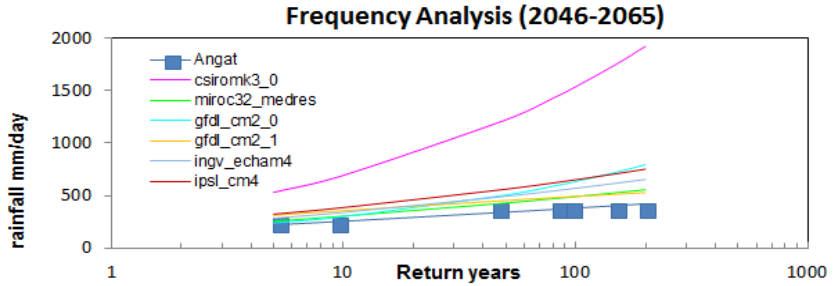
JAPAN INTERNATIONAL COOPERATION AGENCY
THE UNIVERSITY OF TOKYO
NIPPON KOEI CO., LTD.

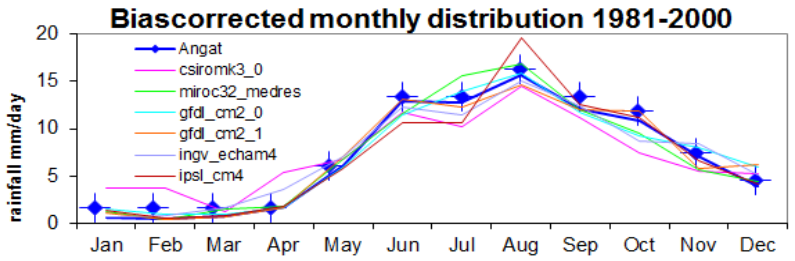
MODEL SELECTION: Precipitation (May-November)

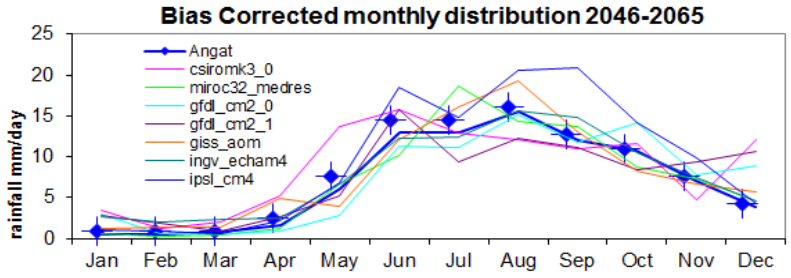


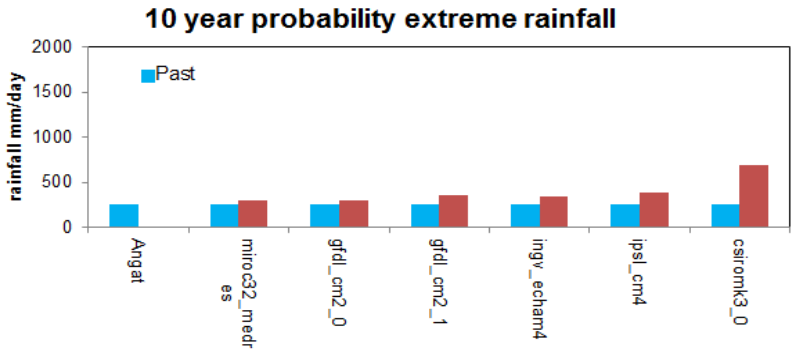


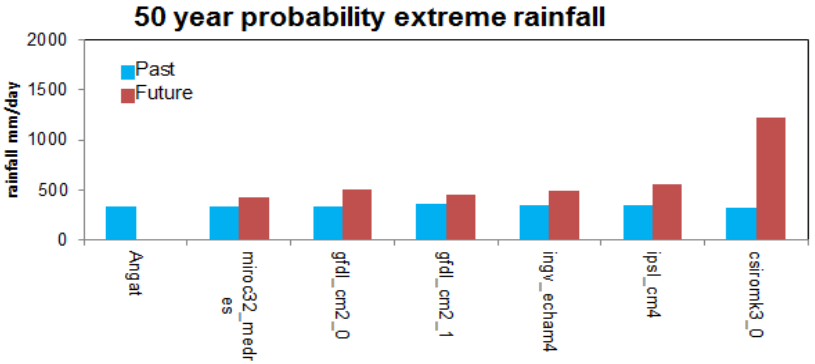

Frequency Analysis (1981-2000)
rainfall mm/day
2000
1500
1000
500
0
1
10
100
1000
Return years
Angat
csiromk3_0pastraw
miroc32_medres
gfdl_cm2_0
gfdl_cm2_1
ingv_echam4
ipsl_cm4


Frequency Analysis (2046-2065)
rainfall mm/day
2000
1500
1000
500
0
1
10
100
1000
Return years
Angat
csiromk3_0
miroc32_medres
gfdl_cm2_0
gfdl_cm2_1
ingv_echam4
ipsl_cm4


Biascorrected monthly distribution 1981-2000
rainfall mm/day
20
15
10
5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Angat
csiromk3_0
miroc32_medres
gfdl_cm2_0
gfdl_cm2_1
ingv_echam4
ipsl_cm4


Bias Corrected monthly distribution 2046-2065
rainfall mm/day
25
20
15
10
5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Angat
csiromk3_0
miroc32_medres
gfdl_cm2_0
gfdl_cm2_1
giss_aom
ingv_echam4
ipsl_cm4


10 year probability extreme rainfall
rainfall mm/day
2000
1500
1000
500
0
Past
Angat
miroc32_medres
gfdl_cm2_0
gfdl_cm2_1
ingv_echam4
ipsl_cm4
csiromk3_0


50 year probability extreme rainfall
rainfall mm/day
2000
1500
1000
500
0
Past
Future
Angat
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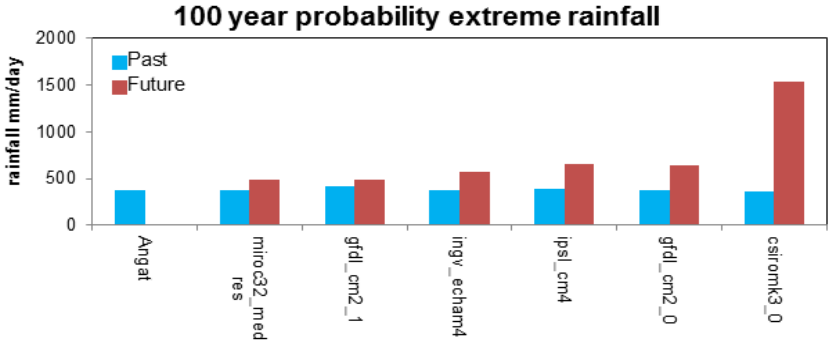
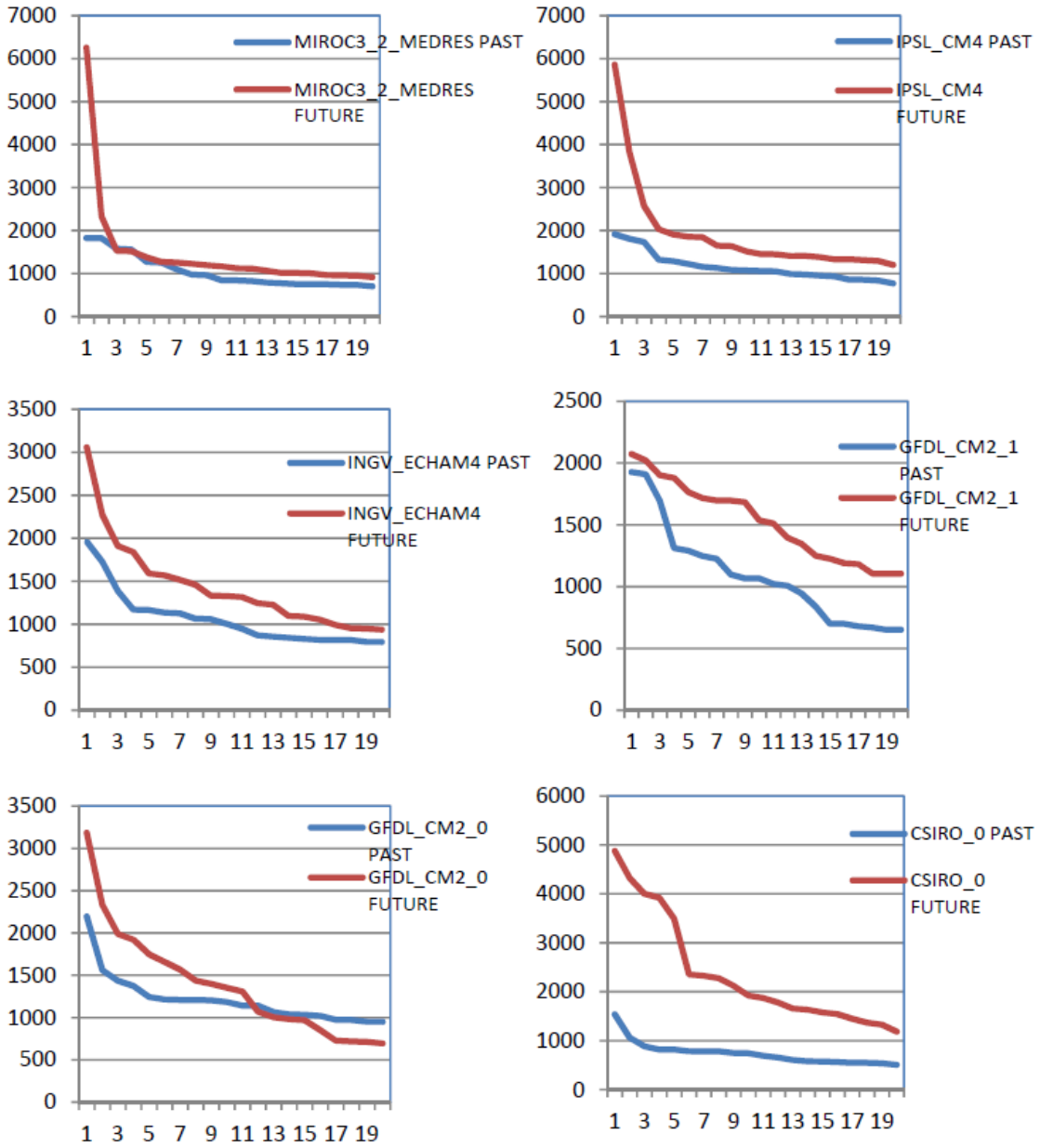
gfdl_cm2_0
gfdl_cm2_1
ingv_echam4
ipsl_cm4
csiromk3_0


100 year probability extreme rainfall
rainfall mm/day
2000
1500
1000
500
0
Past
Future
Angat
miroc32_medres
gfdl_cm2_1
ingv_echam4
ipsl_cm4
gfdl_cm2_0
csiromk3_0



Changes of Flood in Angat Dam Basin

Changes of Drought in Angat Dam Basin

GCM Model	**Drought Discharge (m^3/s)** *(average 355th rank)*		**# of days/year** that **baseflow < past drought discharge** *(average of 355th rank)*		**Upper Limit of Drought Discharge(m^3/s)** *(10th percentile of 355th rank)*		**# of days/year** that **baseflow < past drought discharge** *(10th percentile of 355th rank)*		**Longest # of days for each year below average drought discharge**	
	Past	Future	Past	Future	Past	Future	Past	future	Past	Future
MIROC	0.144	0.151	27	34	0.123	0.107	2	13	100	135
IPSL	1.85	6.46	22	0	1.6	5.939	2	0	59	0
INGV	0.17	0.194	30	11	0.138	0.156	3	0	104	76
GFDL_1	0.156	0.173	39	28	0.123	0.131	1	0	134	88
GFDL_0	0.174	0.175	44	64	0.122	0.116	3	13	167	255
CSIRO	0.15	0.154	37	34	0.13	0.11	5	15	193	191

red = drier in future; more frequent below drought discharge
blue = wetter in future; less frequently below drought discharge

Changes of Drought at San Isidro gauge, Pampanga River Basin

GCM	**Drought Discharge (m^3/s)** *(average 355th rank)*		**# of days/year** that **baseflow < past drought discharge** *(average of 355th rank*		**Upper Limit of Drought Discharge(m^3/s)** *(10th percentile of 355th rank)*		**# of days/year** that **baseflow < past drought discharge** *(10th percentile of 355th rank)*		**Longest # of days for each year below average drought discharge**	
	Past	Future	Past	Future	Past	Future	Past	future	Past	Future
MIROC	3.84	2.529	22	34	0.899	0.58	3	9	93	106
IPSL	11.78	12.547	19	19	3.791	4.209	2	1	54	87
INGV	5.05	3.96	18	22	1.528	1.451	3	5	54	57
GFDL_1	4.78	2.93	30	43	0.749	0.665	2	2.95	96	111
GFDL_0	3.64	2.43	29	34	0.746	0.695	5	6	100	124
CSIRO	12.66	9.948	21	35	2.763	1.905	2	7	57	79

red = drier in future; more frequent below drought discharge
blue = wetter in future; less frequently below drought discharge