JICA's Initiative on Climate Change Adaptation in Water Related Disasters

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ISDR Asia Partnership Technical Workshop to Develop the Regional Roadmap for Promoting Regional Cooperation on Disaster Risk Reduction and Climate Change Adaptation

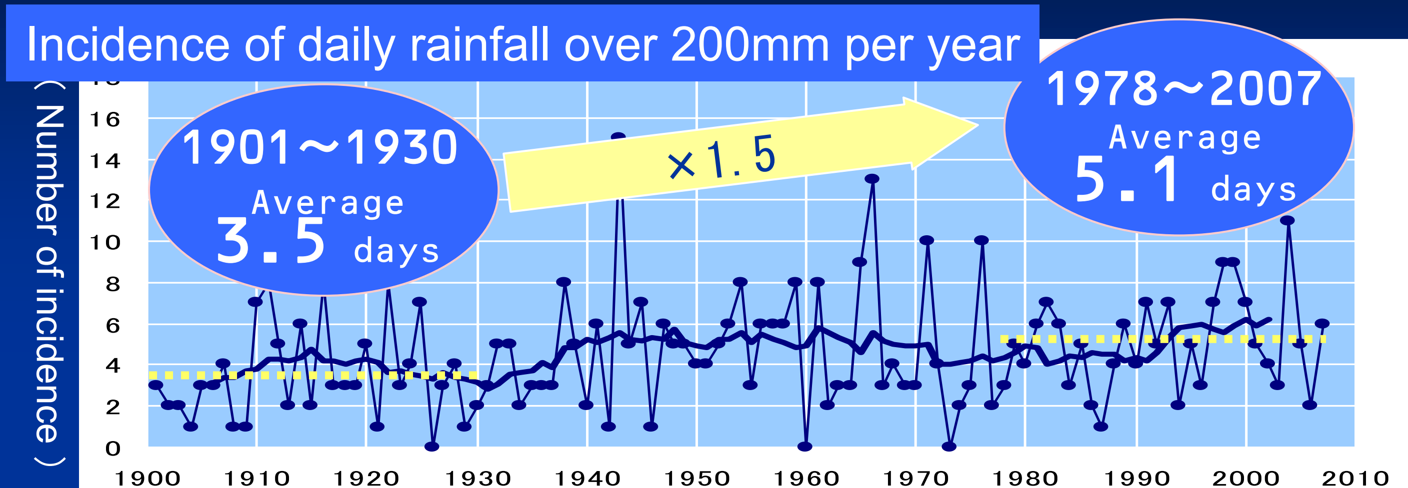
1-2 July, Bangkok

outline

1. Situation in Japan
2. Staitionarity is dead
3. JICA’s new initiative
4. Case study
5. Conclusion

Recent change on Climate in Japan

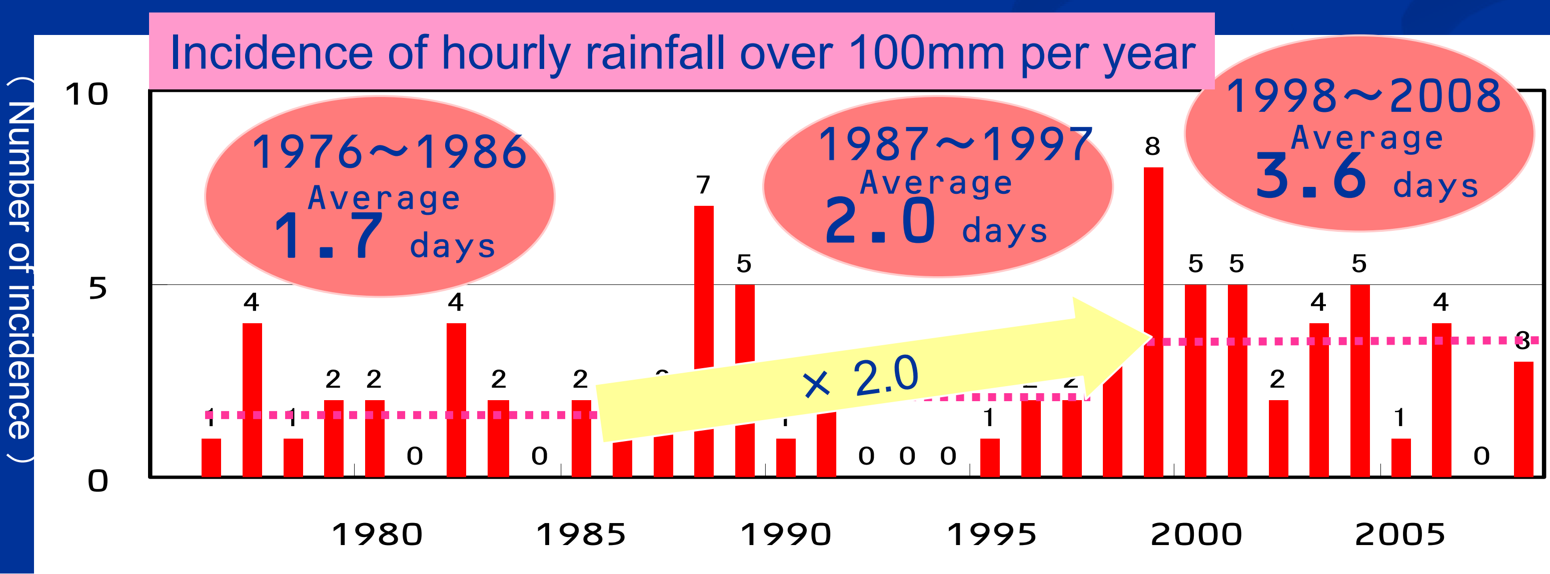
Daily rainfall over 200mm is significantly increasing



Source: JMA

（year）

Hourly rainfall over 100mm is increasing



Source: JMA

（year）

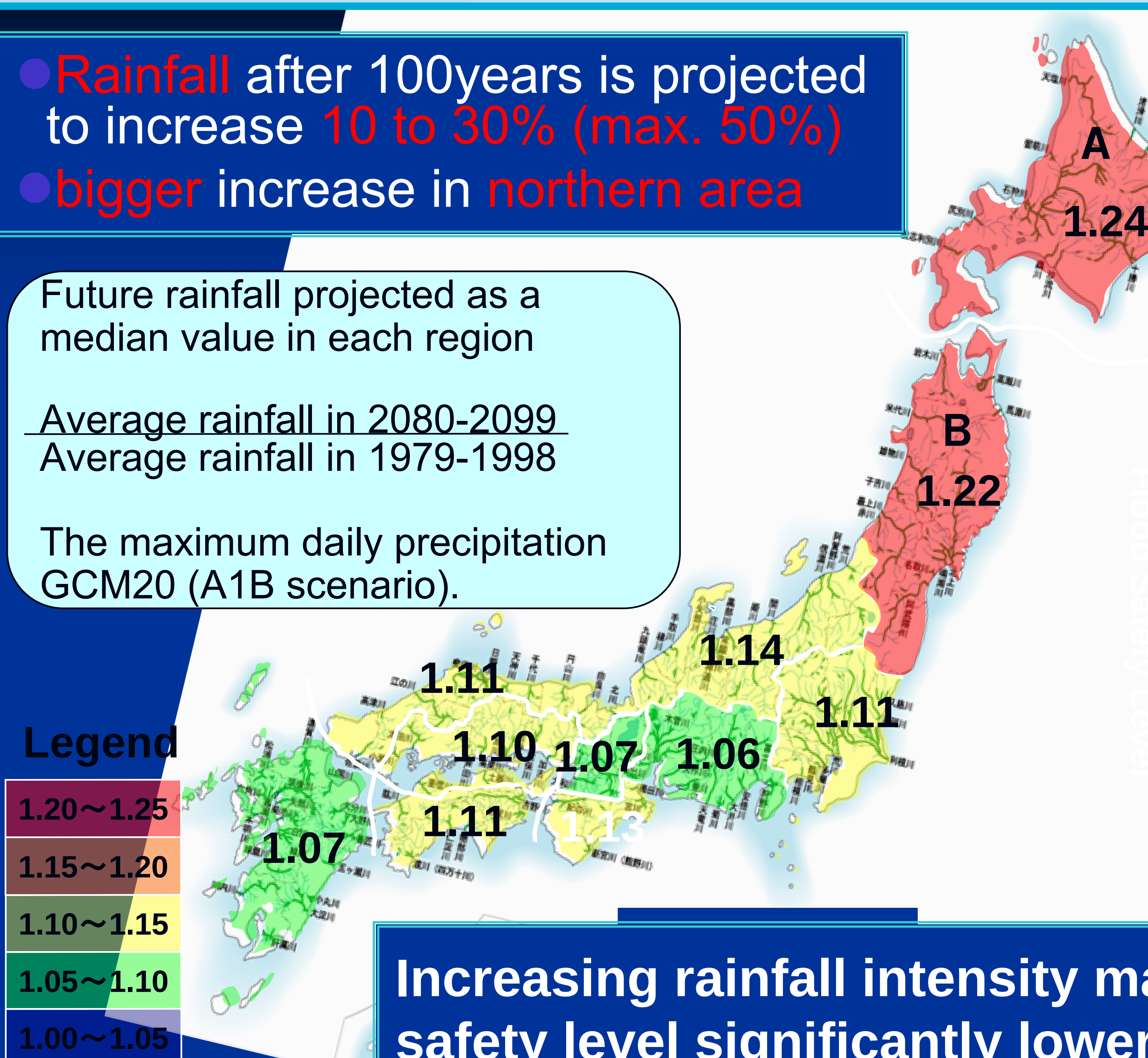
Projection of future Climate

- Rainfall after 100years is projected to increase 10 to 30% (max. 50%)
- bigger increase in northern area

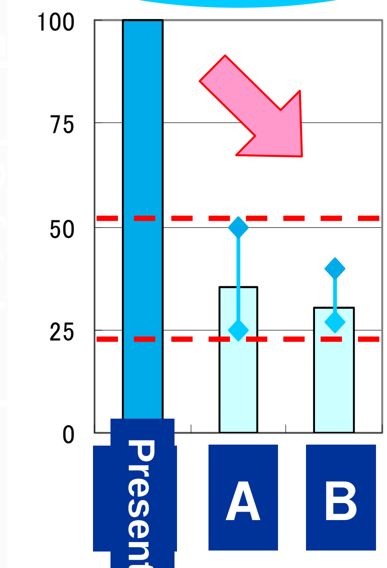
Future rainfall projected as a median value in each region

$$\frac{\text{Average rainfall in 2080-2099}}{\text{Average rainfall in 1979-1998}}$$

The maximum daily precipitation GCM20 (A1B scenario).



Decline of flood safety level

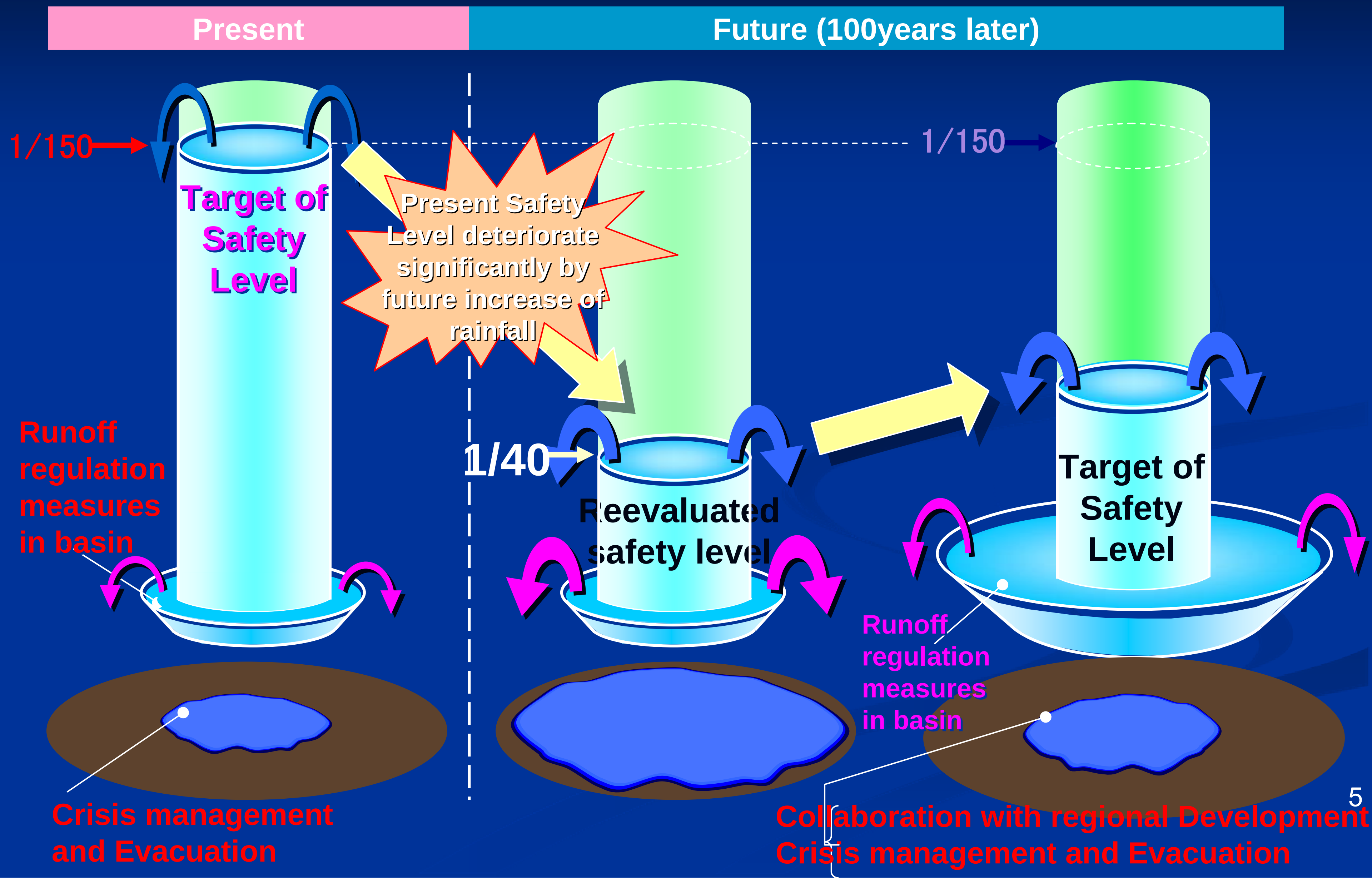


Increasing rainfall intensity make flood safety level significantly lower than present

国土交通省

Ⅲ Basic concept for managing increasing risks

- Multiple measures in flood management -



2. Stationarity is dead

2. Stationarity is Dead[1)]
we are in trouble

☺ Conventional Method of Water Planning

Assumption: fluctuate within an unchanging envelope of variability

☹ Under changing and uncertain climate

- ✓ Climate is changing
  - Return period (ex. 100 years flood or 10 years drought) is never foundation of planning
- ✓ Prediction possible, but with uncertainty

New Designing methods of water infrastructures are needed

River bank heights, dam reserve capacity, bridge heights etc.

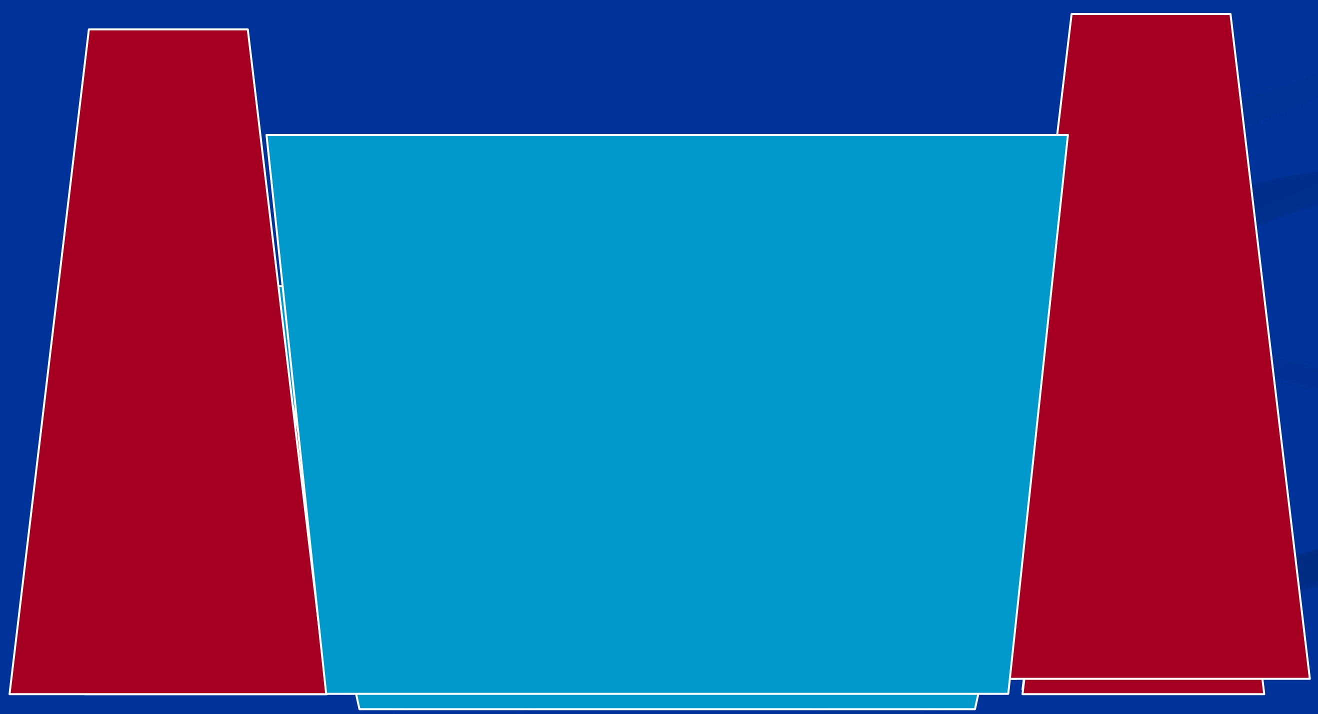
1) Milly P. C. D., J. Betancourt, M. Falkenmark, R. M. Hirsch, Z. W. Kundzewics, D. P. Lettenmaier, R. J. Stouffer (2008), Stationarity is Dead: Whither Water Management, *Science*. 319, p. 573-574.

Furthermore……

2. Stationarity is Dead

Is flood Control Philosophy Dead, also?

- Can we continue to construct higher dykes according to increasing flood scale?



2. Stationarity is Dead
Flood Control Philosophy is Dead as Well.

- Conventional philosophy is abandoned.

  "Long liner bank system along river from river mouth to mountain"
- Proposed philosophy

  "Multi-layered measures in river basin"

  1) Step 1: Strategic area protect by structures

  2) Step 2: Urban planning and land use regulation for risk areas

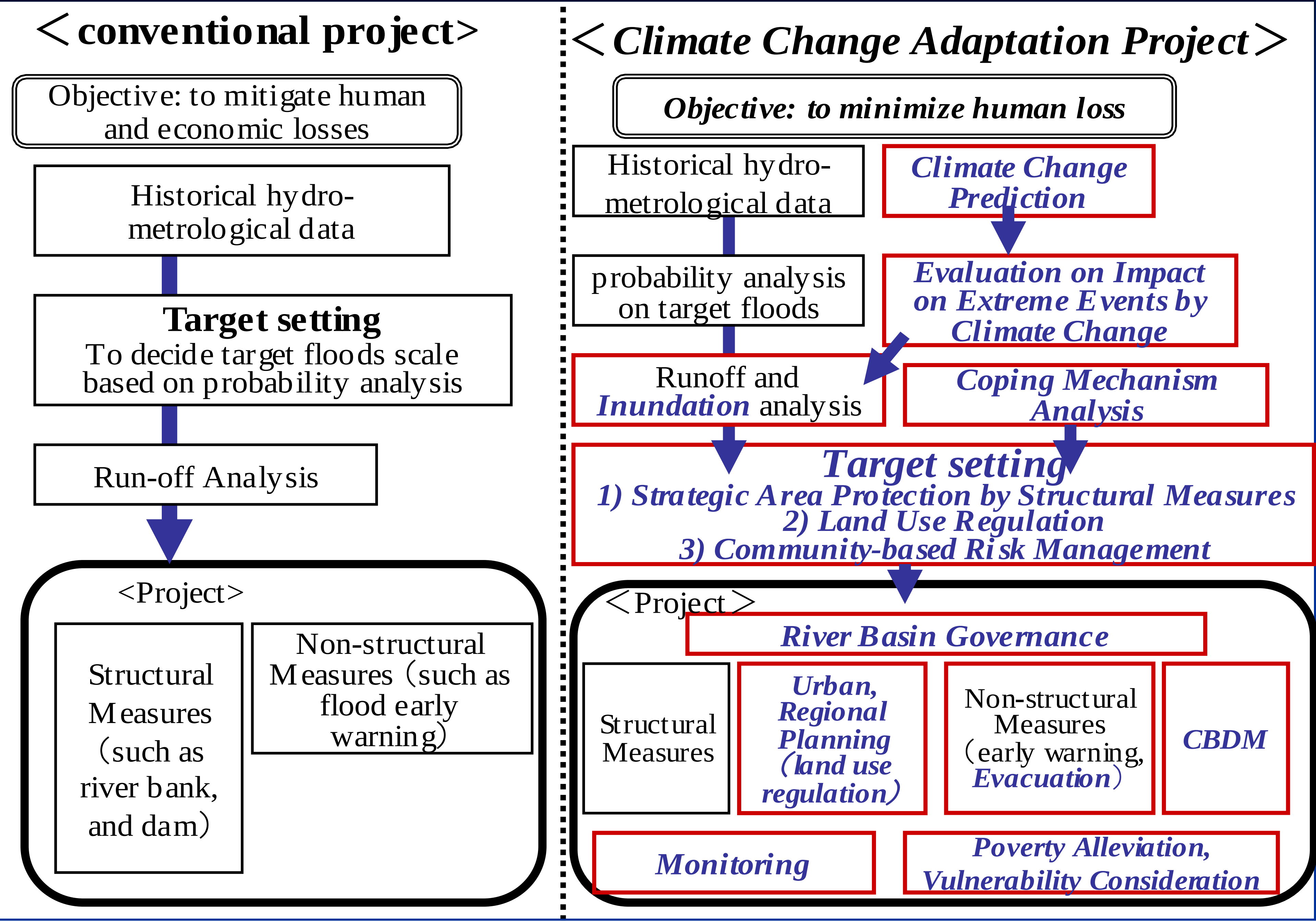
  3) Step 3: CBDM

2. Stationarity is Dead

Sustainable society resilient to changes

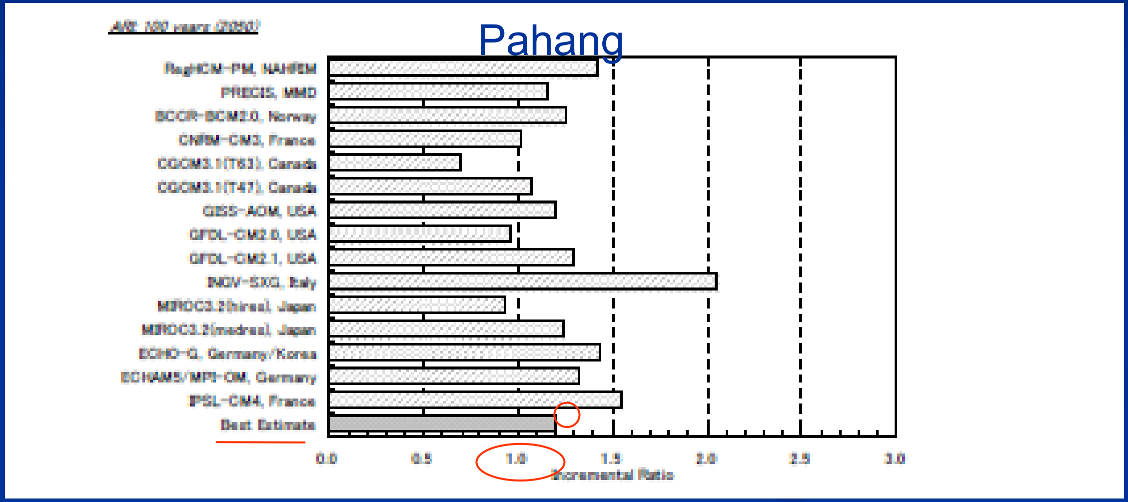
1. to respond continuously changing climate
2. to plan and implement infrastructure projects through predicting future impacts with uncertainty
3. to change systems of water management according to developing technology for prediction and adaptation of climate change

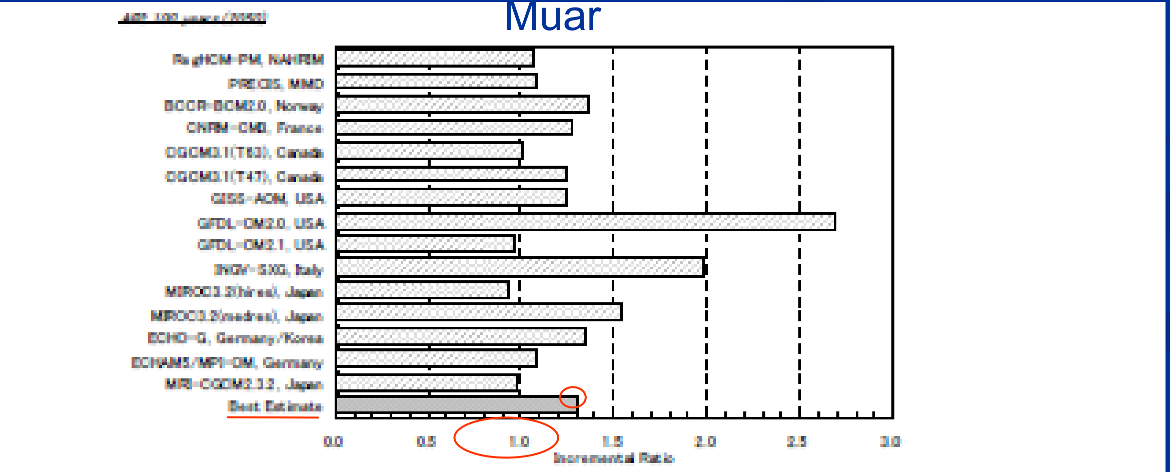
3. JICA's new initiative



＜conventional project＞
Objective: to mitigate human and economic losses
Historical hydro-metrological data
Target setting
To decide target floods scale based on probability analysis
Run-off Analysis
<Project>
Structural Measures（such as river bank, and dam）
Non-structural Measures（such as flood early warning）
＜Climate Change Adaptation Project＞
Objective: to minimize human loss
Historical hydro-metrological data
Climate Change Prediction
probability analysis on target floods
Evaluation on Impact on Extreme Events by Climate Change
Runoff and Inundation analysis
Coping Mechanism Analysis
Target setting
1) Strategic Area Protection by Structural Measures
2) Land Use Regulation
3) Community-based Risk Management
＜Project＞
River Basin Governance
Structural Measures
Urban, Regional Planning（land use regulation）
Non-structural Measures（early warning, Evacuation）
CBDM
Monitoring
Poverty Alleviation, Vulnerability Consideration

Climate change prediction ensemble of GCM





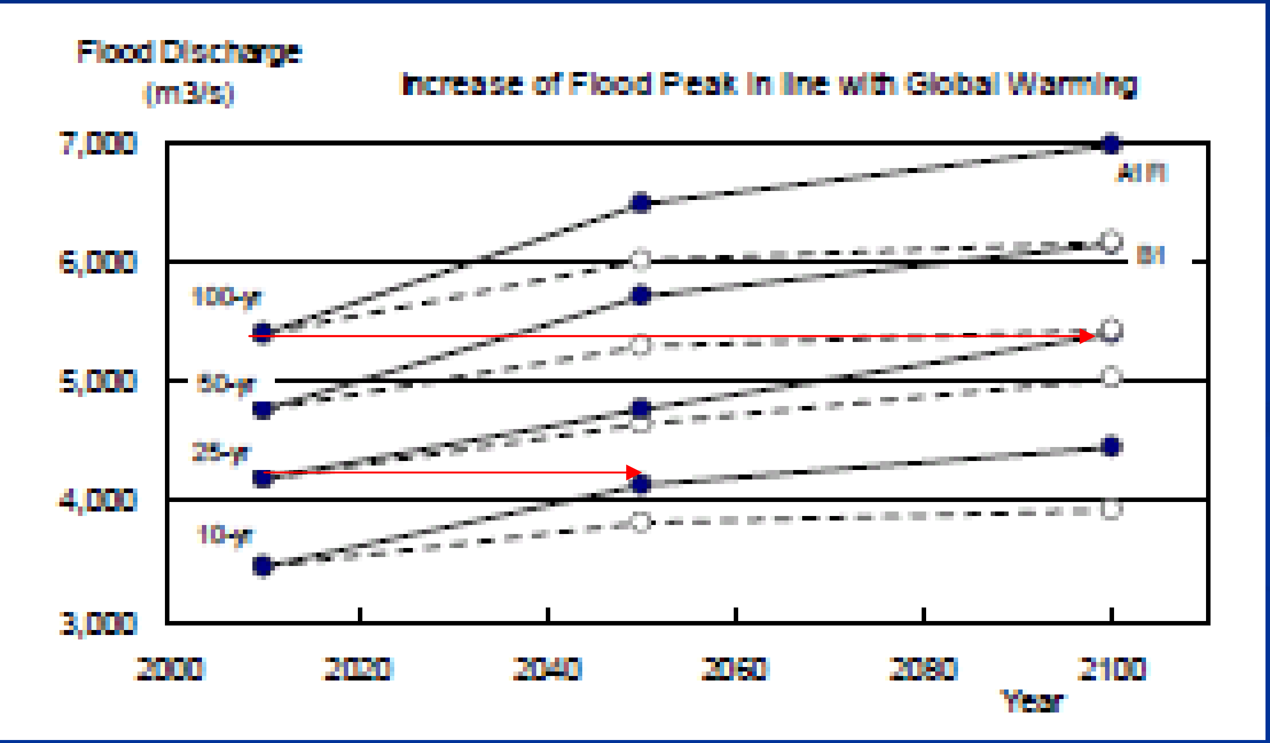
Incremental ration of RegHCM-PM was obtained by relative ratio of the 1984-1993 result and 2041-2050 results

Climate change adaptation measures

- Governance at river basin level
  - various sectors, organizations, stakeholders are involved
  - Need for consensus building and responsibility sharing
- Structure measures
- Non-structural measures, early warning and evacuation
- Land use regulation
- CBDM
- Capacity Development
- Monitoring
- Poverty alleviation and consideration on vulnerability group

4. Case study

4-1 Tagaloan River Basin, the Philippines



100 yrs flood
→ 25-50yr flood in 2100

50 yrs flood
→ 25yr flood in 2050

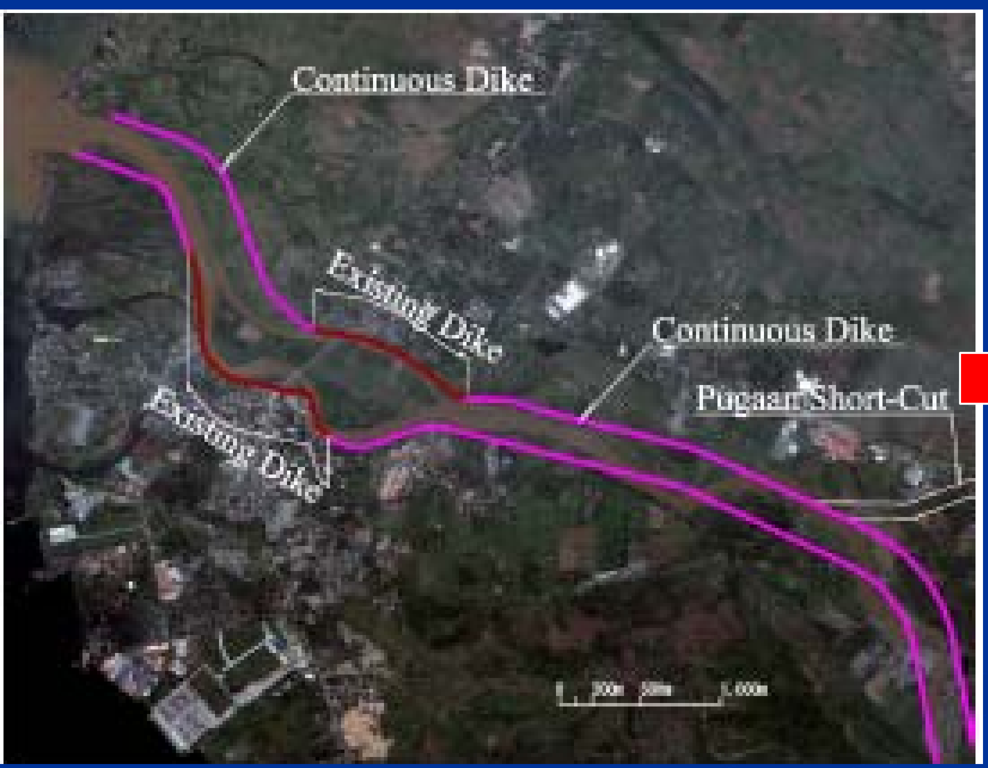
Tagaloan River Basin, the Philippines

Scenario		Increase rate of rainfall intensity (%)	Return period (year)	Design rainfall (mm) 5yr	10yr	25yr	50yr	100yr	Probable Flood Discharge (m3/s) 25yr	50yr
Status quo		-		125	142	164	181	198	4190	4770
A1F1	2050	11		150	170	197	217	237	4780	5720
	2100	14		161	183	211	233	255	5400	6150
B1	2050	20		138	157	182	200	219	4650	5290
	2100	29		142	162	187	206	225	5030	5430

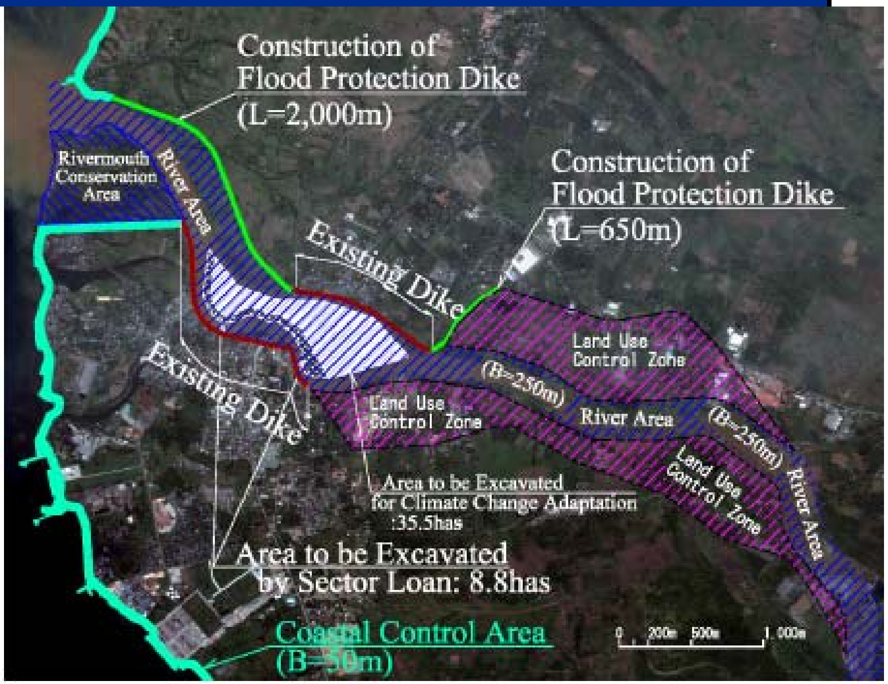
Tagaloan River Basin, the Philippines

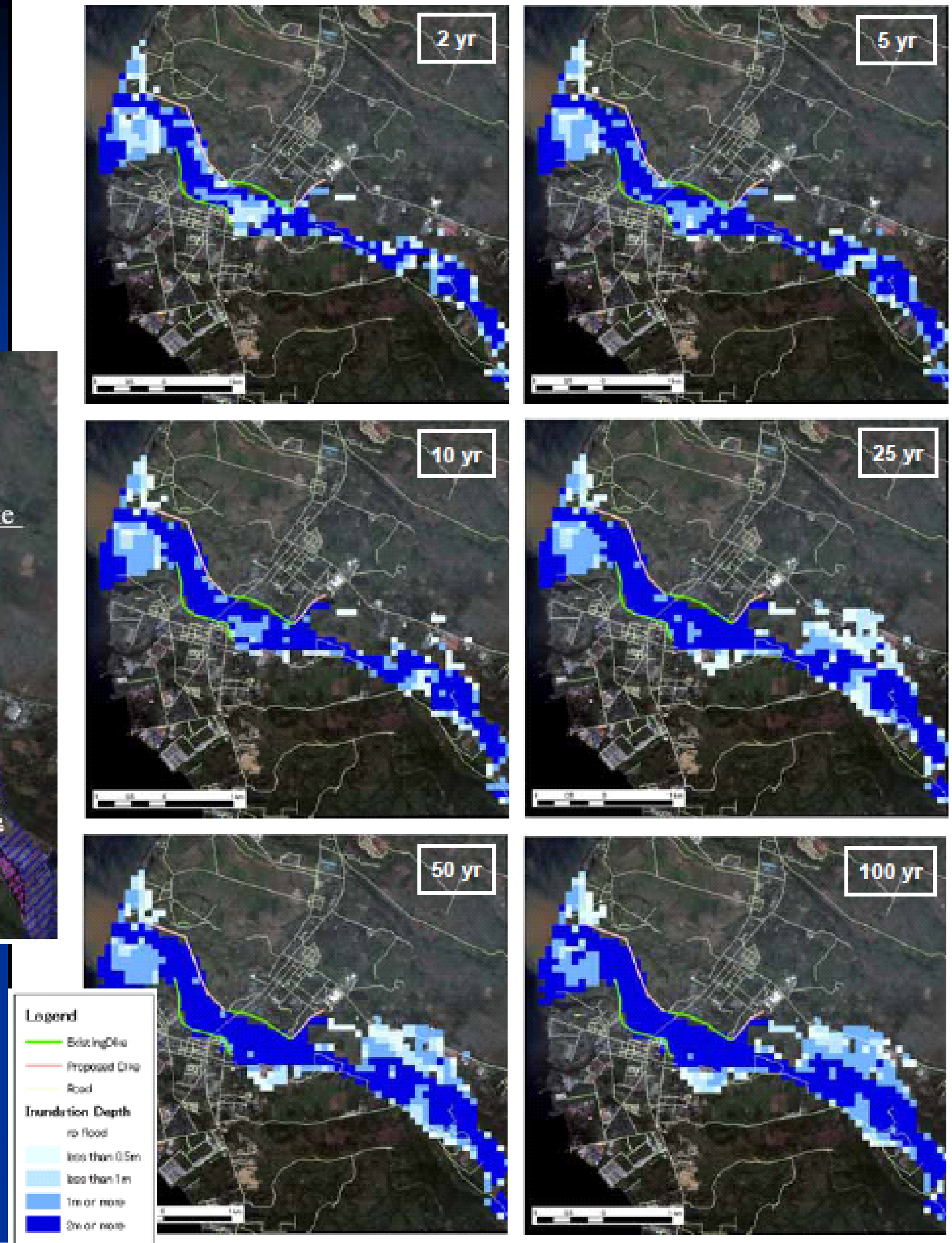
Planning

Original MP



Revised MP


Construction of Flood Protection Dike (L=2,000m)
Rivermouth Conservation Area
River Area
Construction of Flood Protection Dike (L=650m)
Existing Dike
Land Use Control Zone
Existing Dike
(B=250m)
Land Use Control Zone
River Area
(B=250m)
Land Use Control Zone
River Area
Area to be Excavated for Climate Change Adaptation :35.5has
Area to be Excavated by Sector Loan: 8.8has
Coastal Control Area (B=50m)
0 200m 500m 1,000m


2 yr
5 yr
10 yr
25 yr
50 yr
100 yr
Legend
Existing Dike
Proposed Dike
Road
Inundation Depth
no flood
less than 0.5m
less than 1m
1m or more
2m or more

4-2. Metro Manila Suburb, Philippines : Cavite Area

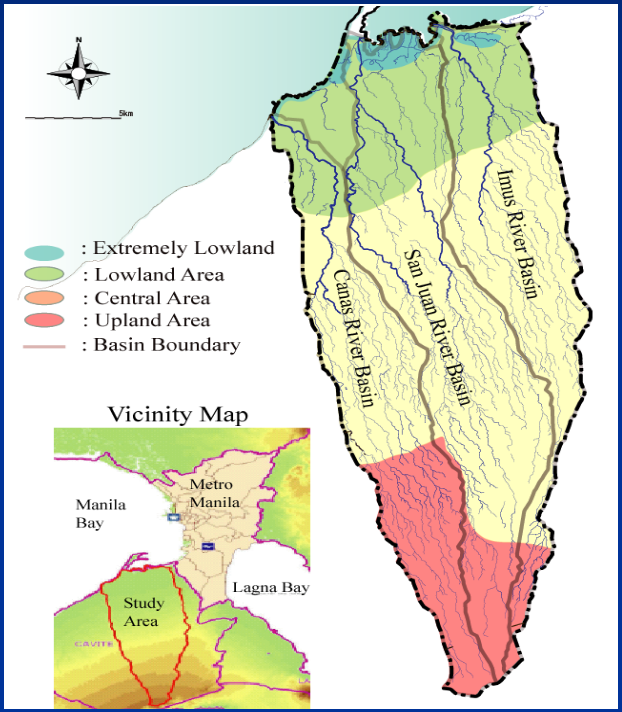
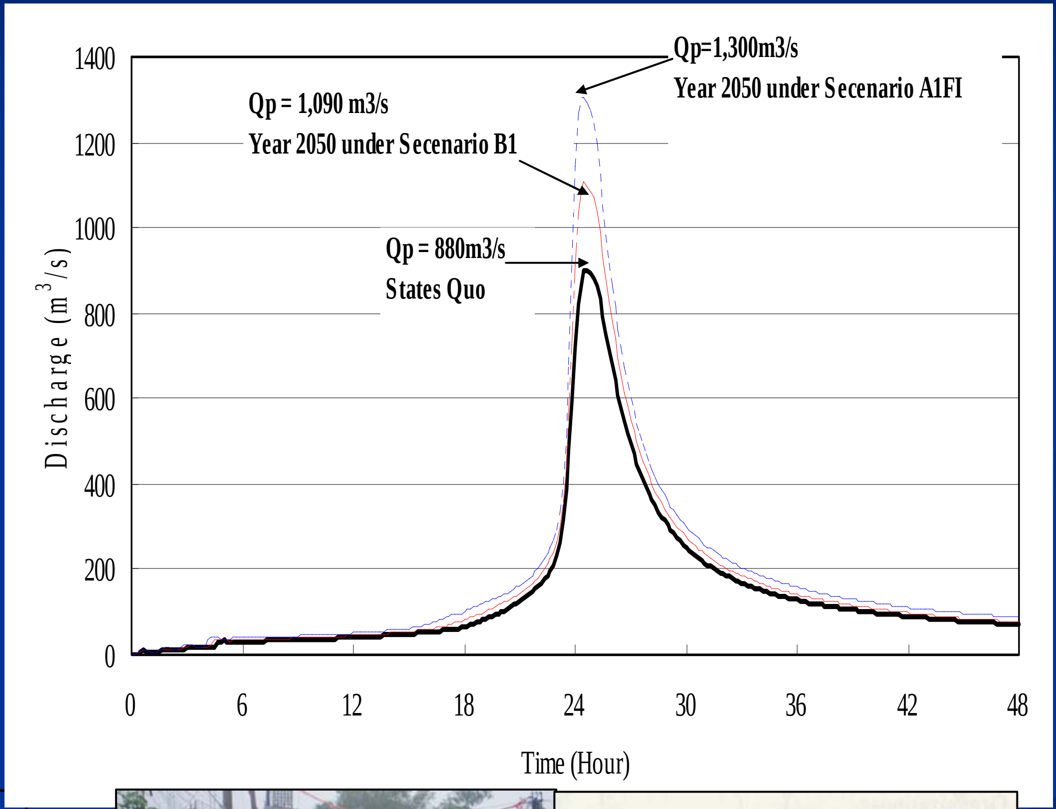
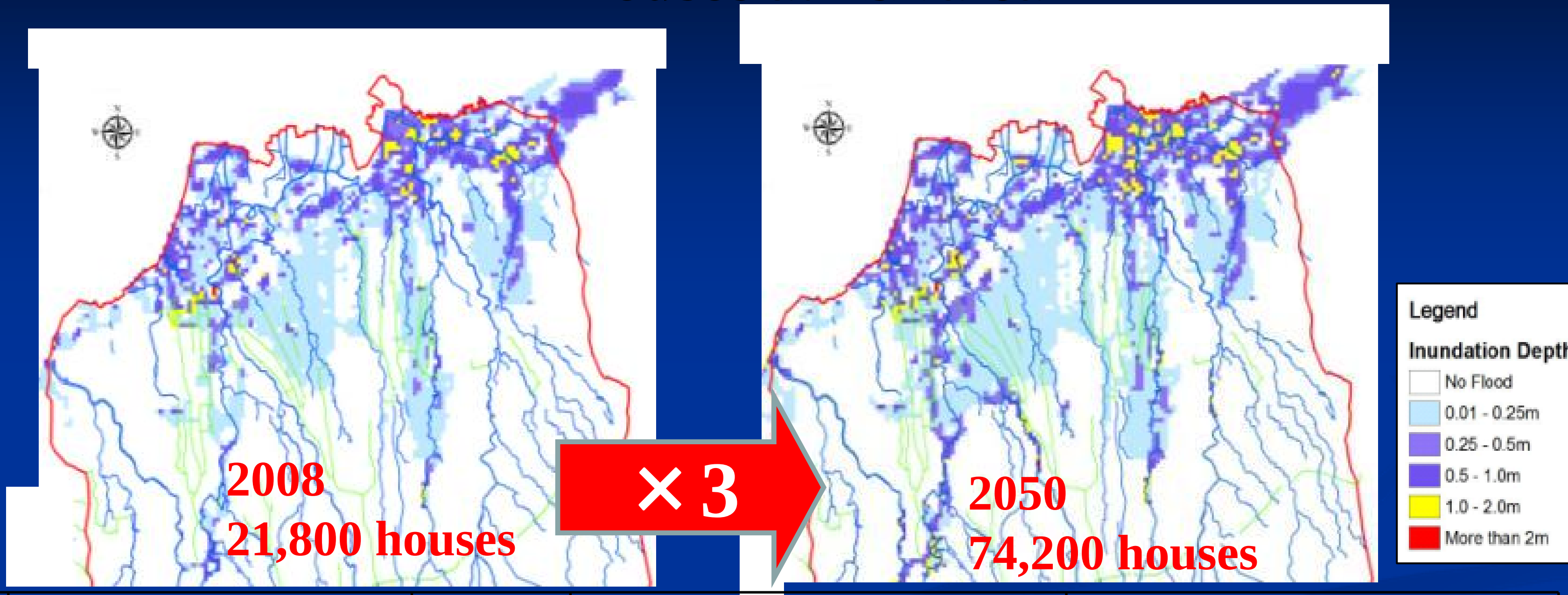


Fig. 1 General Map of Study Area



River Basin	Catchments Area (km2)	River Length (km)
Imus	115.5	45.0
San Juan	147.76	43.4
Canas	112.32	42.0
Residual	32.84	-
Total	407.4	

危険地域の家屋数
Houses at risk area



Case No.	Scenario of Climate Change	Urbanized Ratio	Probable Flood Inundation Area (km^2): Flood Depth below 1m	Probable Flood Inundation Area (km^2): Depth above 1m	Probable Flood Inundation Area (km^2): Total	Number of Houses/Buildings Inundated (thousand houses): Flood Depth below 1m	Number of Houses/Buildings Inundated (thousand houses): Flood Depth above 1m	Number of Houses/Buildings Inundated (thousand houses): Total
1	Status Quo	26%*	31.51	1.05	32.56	20.1	1.7	21.8
2	States Quo	43%**	35.82	1.50	37.32	31.4	2.9	34.4
3	In 2050 under B1 Scenario		41.10	2.52	43.62	35.5	4.4	39.9
4	In 2050 under A1FI Scenario		44.64	3.54	48.18	38.4	5.9	44.3
5	States Quo	65%***	41.05	2.45	43.50	56.4	7.2	63.6
6	In 2050 under B1 Scenario		43.92	2.97	46.89	60.1	8.5	68.6
7	In 2050 under A1FI Scenario		47.27	3.98	51.25	63.0	11.2	74.2

multiplication of CC and Urbanization

都市化　Urbanization

気候変動
Climate Change

表面流
Surface flow

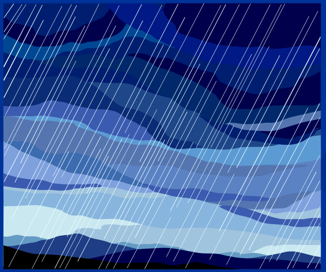
雨
Rain

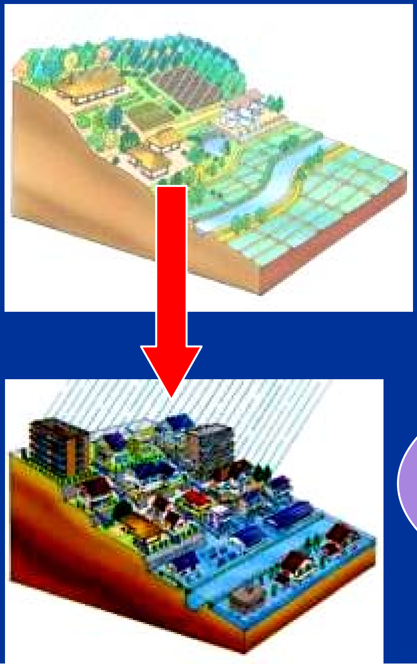
海面上昇
Sea Level

危険地域の家屋
Houses at risk area

洪水
Floods volume

危険地域
Risk area

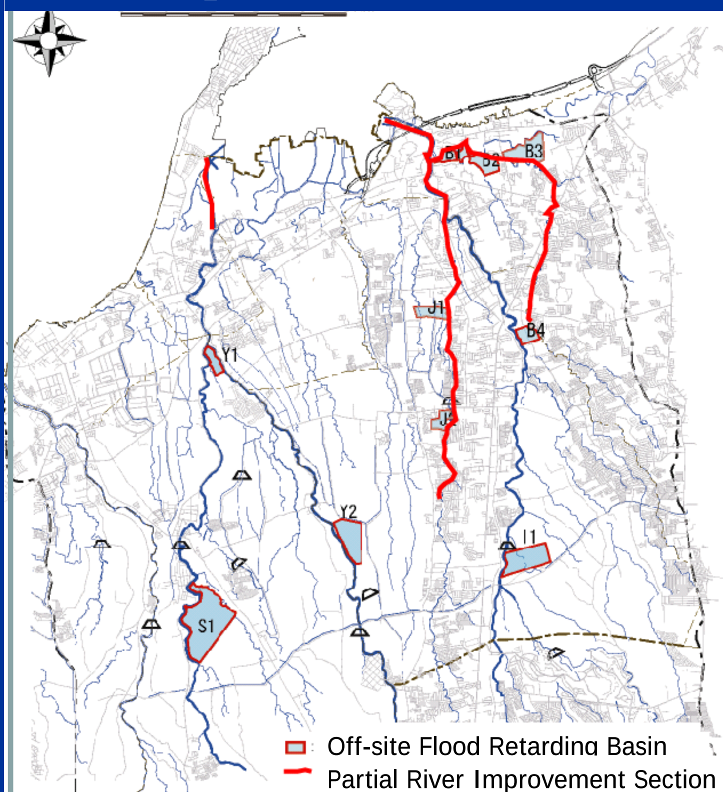


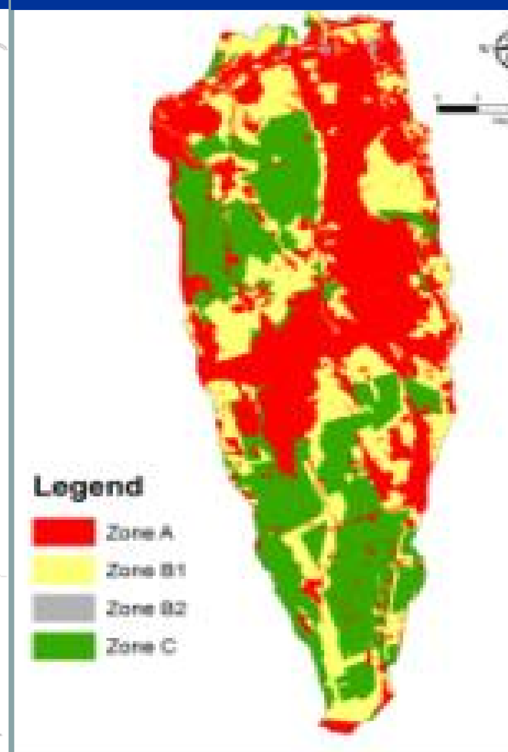


適応策検討　Climate Change Adaptation

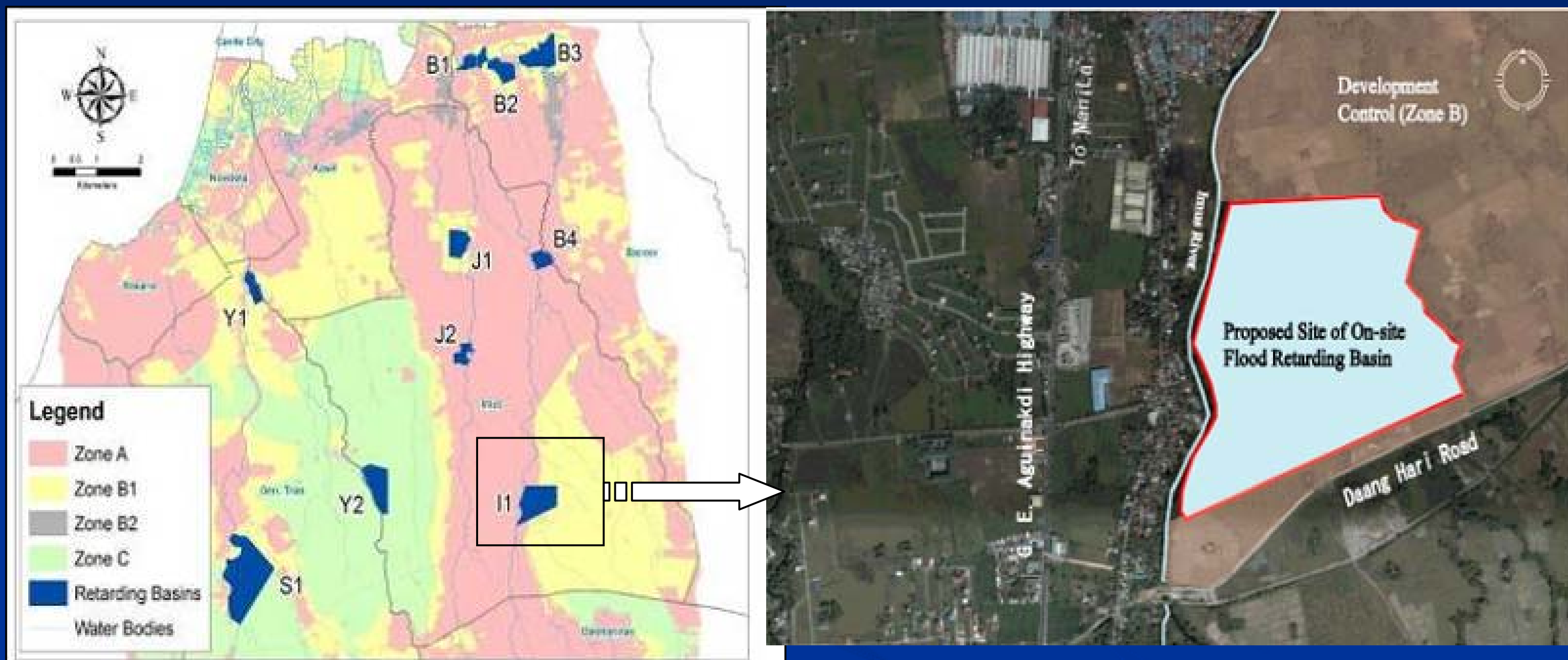
遊水地計画を将来拡張する可能性
→都市計画に開発抑制地域として線引き

1．河川工事・遊水地 River improvement works	2.土地利用規制 Land Use Control	3. 調整池Retarding Basin in Urban area



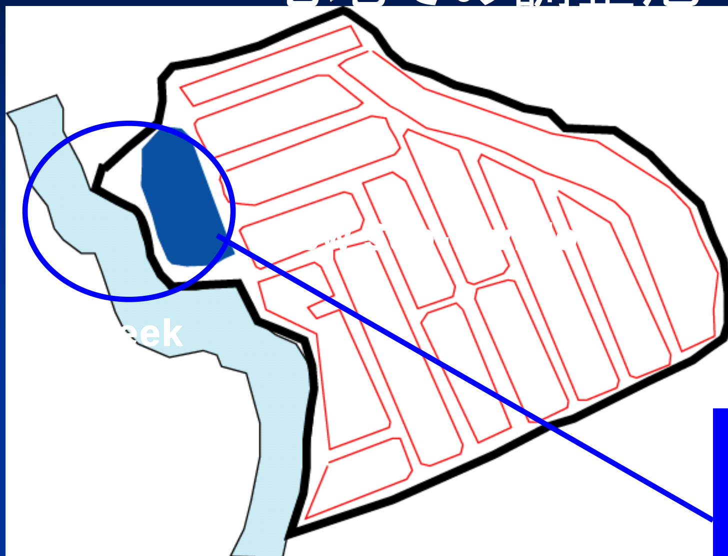


適応策 Climate Change Adaptation
土地利用規制　Land Use Control



Description	Peak River Discharge before Retarding	Peak River Discharge after Retarding	Reduction of Peak Discharge	Storage Volume	Area
Proposed in the Study	430 m^3/s	245 m^3/s	185 m^3/s	1.87 ($10^6 m^3$)	45ha
Required in 2050 B1 Scenario	550 m^3/s	245 m^3/s	305 m^3/s	3.01 ($10^6 m^3$)	75ha
Required in 2050 A1FI scenario	690 m^3/s	245 m^3/s	445 m^3/s	4.06 ($10^6 m^3$)	100ha

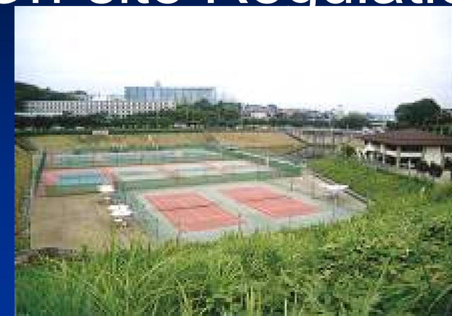
気候変動適応　Climate Change Adaptation
宅地での調整池　On-site Regulation ponds



- Offset increment of peak runoff discharge
- Control sediment runoff

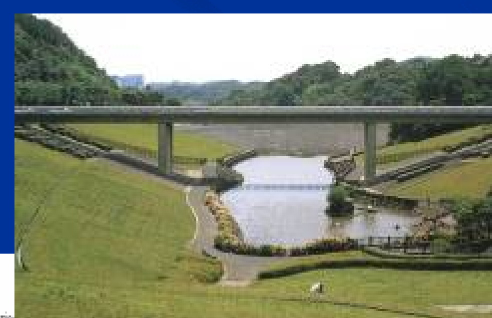
On-site Flood Regulation Pond

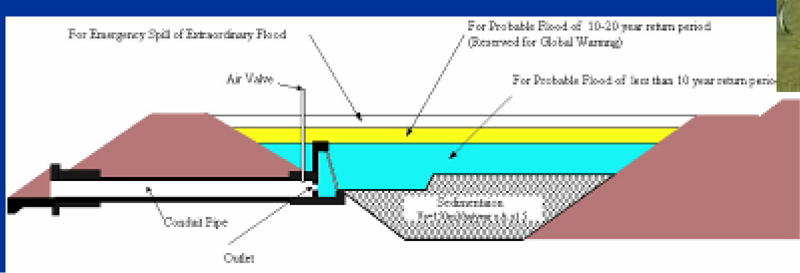
(3% of Sub-Division)



Dry Type

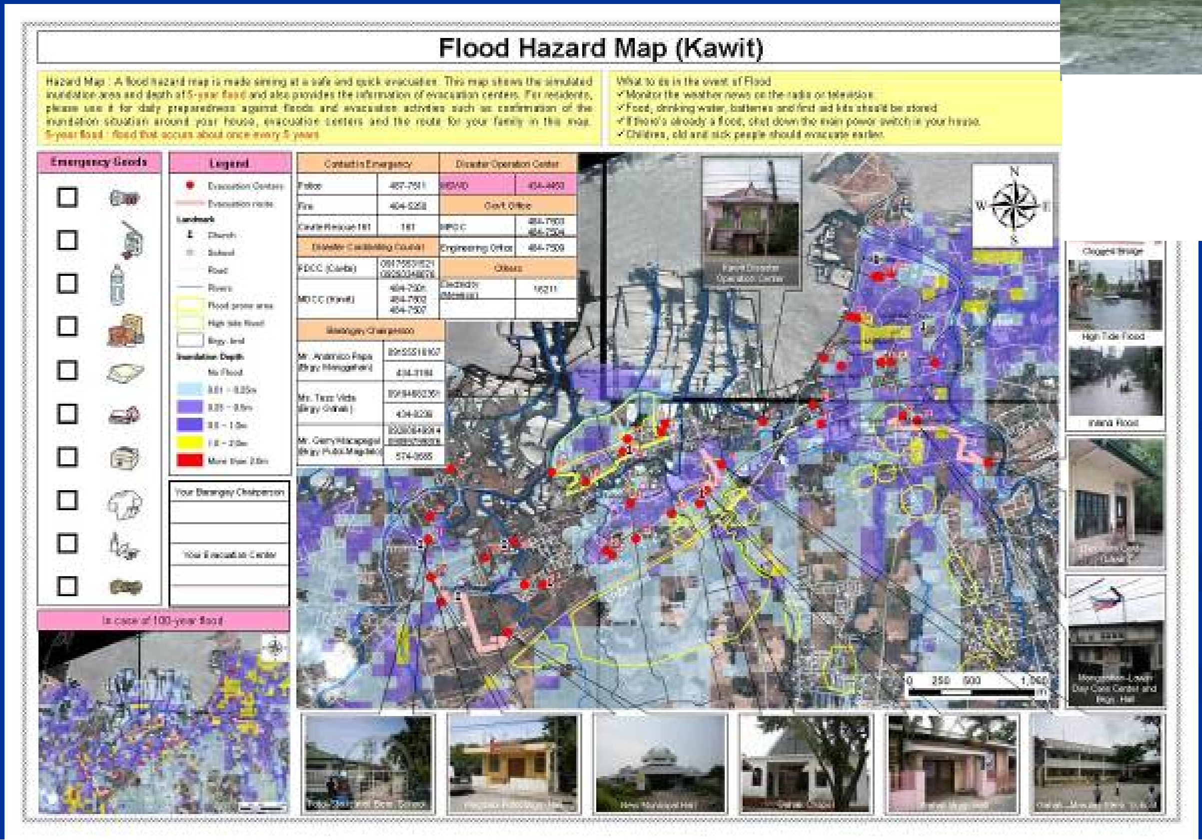
Wet Type





適応策　Climate Change Adaptation
ソフト対策　Software measures

ハザードマップ



適応策　Climate Change Adaptation

コミュニティ防災　Community based disaster management

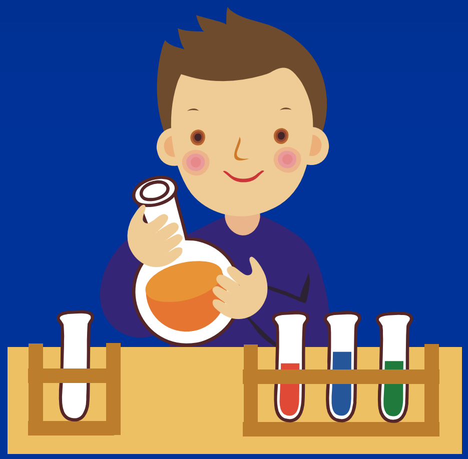
適応策　Climate Change Adaptation
コミュニティ防災　Community based disaster management

5. conclusion

- Climate is changing in Japan, and new policy is reported.
- Startionarity is dead, flood control philosophy either?
- JICA's Handbook for Climate Change Adaptation in Water
- Proposed method of CCA in flood risk management is applied in the Philippines

JICA handbook

Ver.0 was produced



Ver.1 will be issued at the end of FY2010

Comments are welcomed

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