ASEAN PROJECT ON DISASTER RISK REDUCTION BY INTEGRATING CLIMATE CHANGE PROJECTION INTO FLOOD AND LANDSLIDE RISK ASSESSMENT

# Case Study of Flood Hazard and Risk Assessment for the Xedon River Basin

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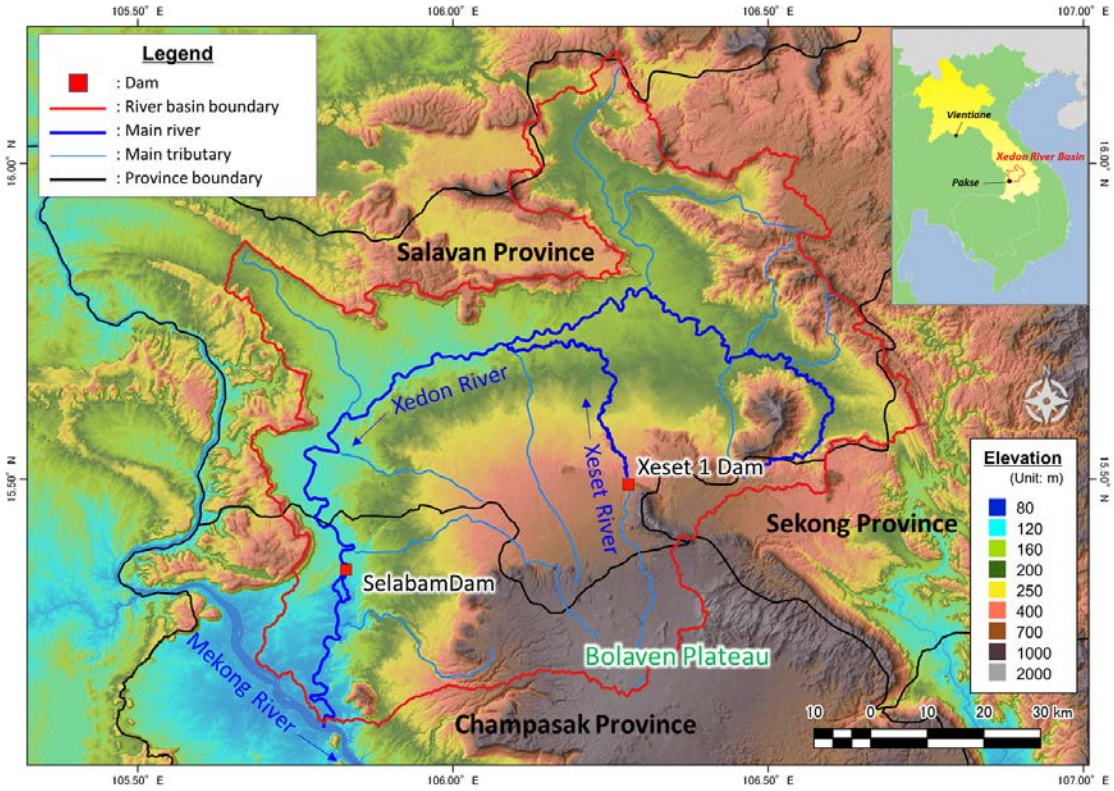
# 1. Target River and its Flood Characteristics

# Target River: the Xedon River

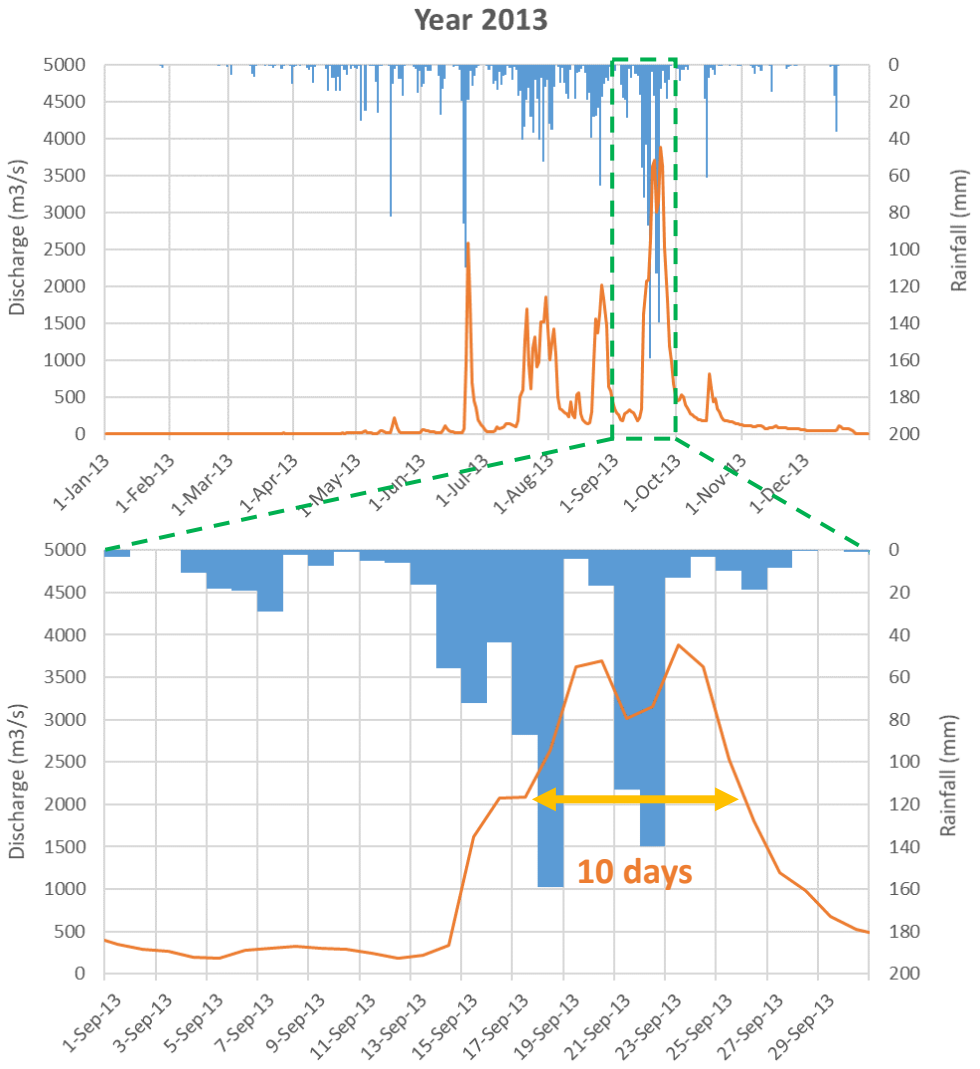
**Table. Basic information of the Xedon River**

| | |
|---|---|
| Main river length | About 260 km |
| Catchment area | About 7,300 km$^2$ |
| Main river structures | Dams, Dikes (under construction) |




- The Xedon River originates on the northeast Bolaven Plateau and flows around the plateau joining tributaries and flows into the Mekong River.
- The Xedon River Basin has annual monsoon cycles which produce a dry and wet monsoon climate. Rainfall concentrates from May to October (rainy season), and the annual rainfall is about 2,000-2,500 mm.
- There are several hydropower dams (one on the Xedon River, three or more on the Xeset River)

# Flood Characteristics



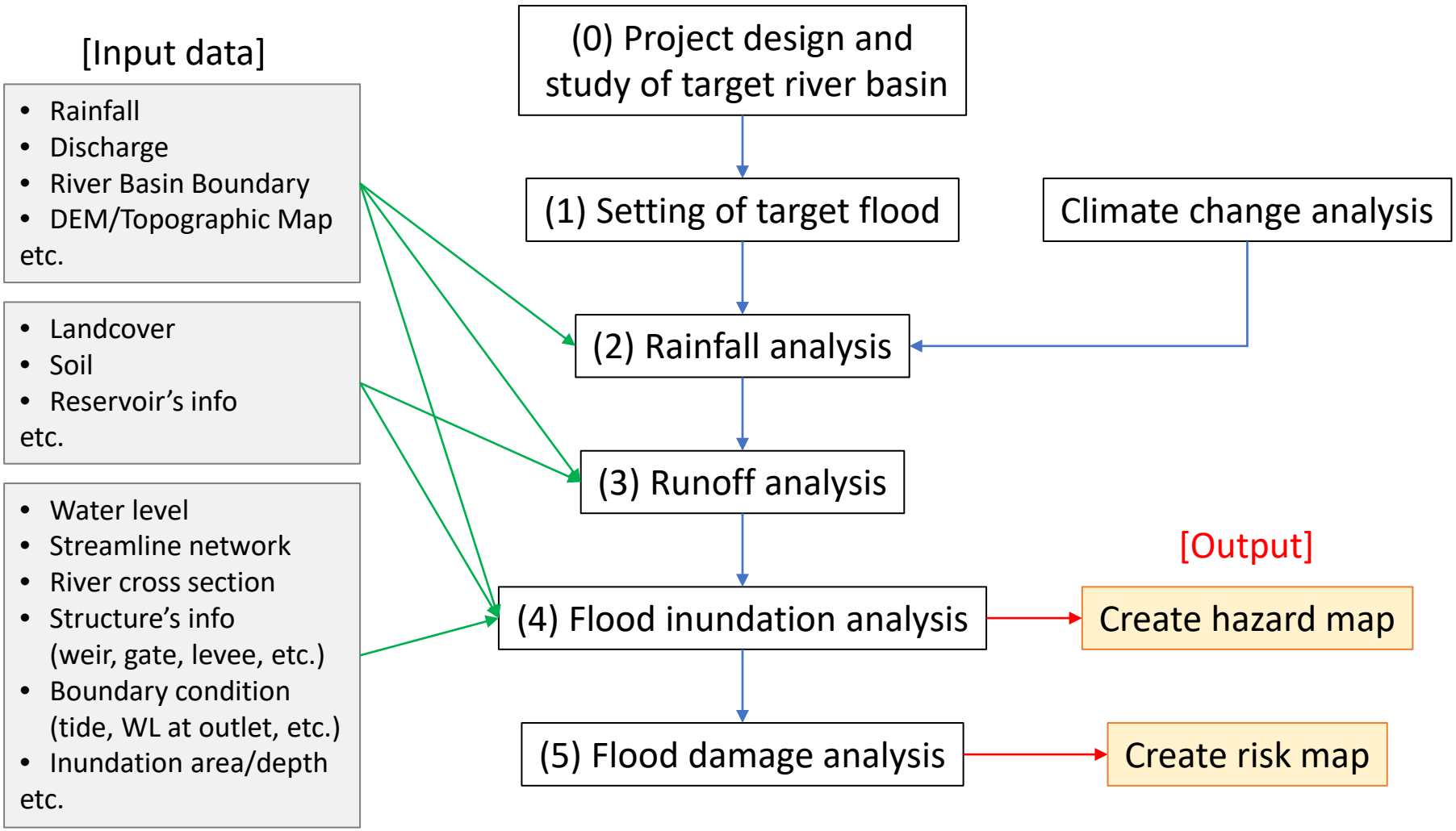

*Rainfall: Mean areal rainfall of the Xedon River Basin, Discharge: Observed data of Khongsedon Station

**Fig. The hyetograph & hydrograph in the 2013 flood**

- The 2013 flood was the biggest flood in the last 15 years (2003-2018).
- The both hyetograph and hydrograph have two peaks.
- The flood duration is about 10 days.
- Antecedent soil moisture condition must be very wet because of continuous rains before the flood.

# 2. Overview of Flood Hazard and Risk Analysis

# Overview of the procedure of flood risk analysis



# Framework of modeling for flood hazard analysis and risk analysis

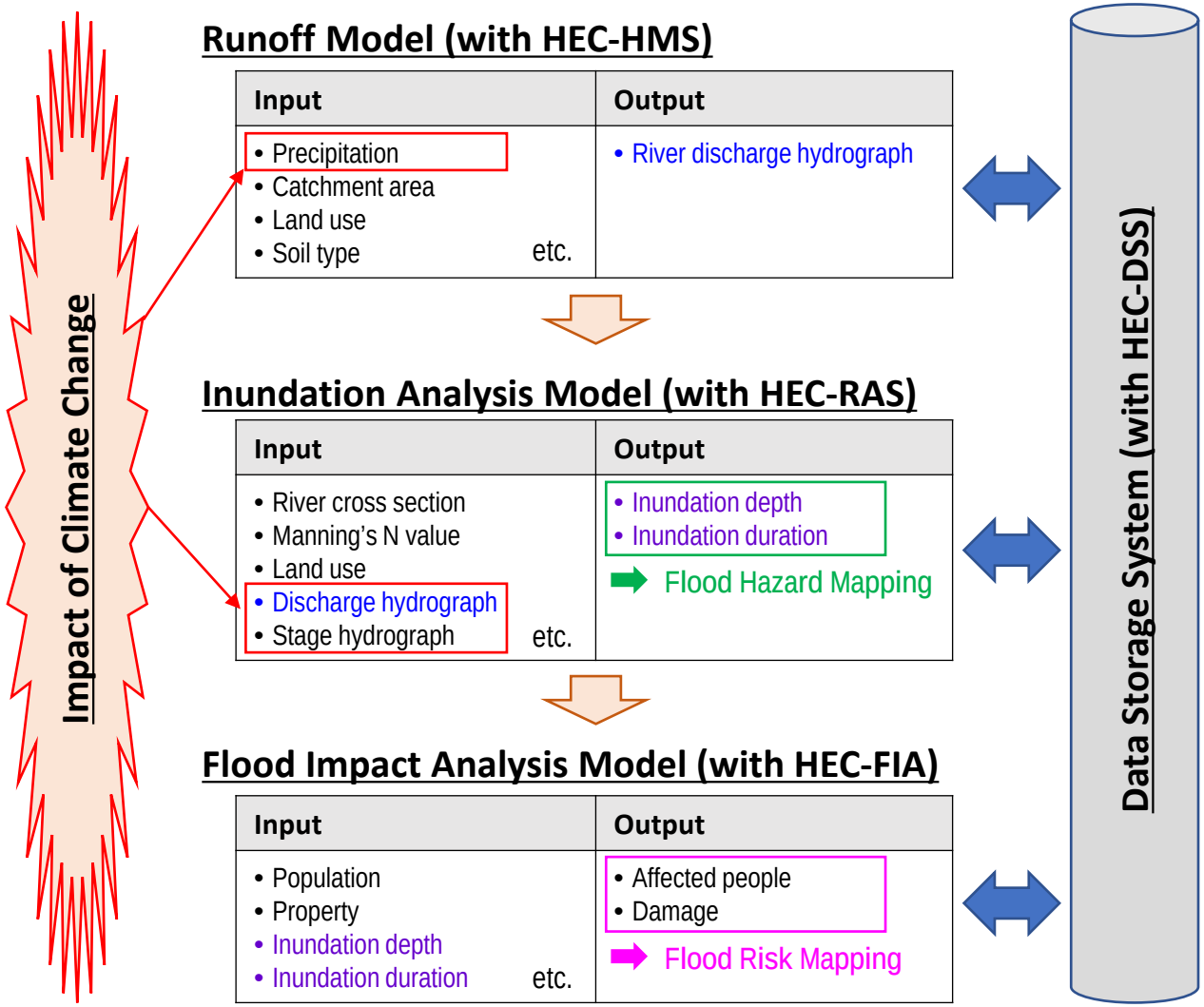
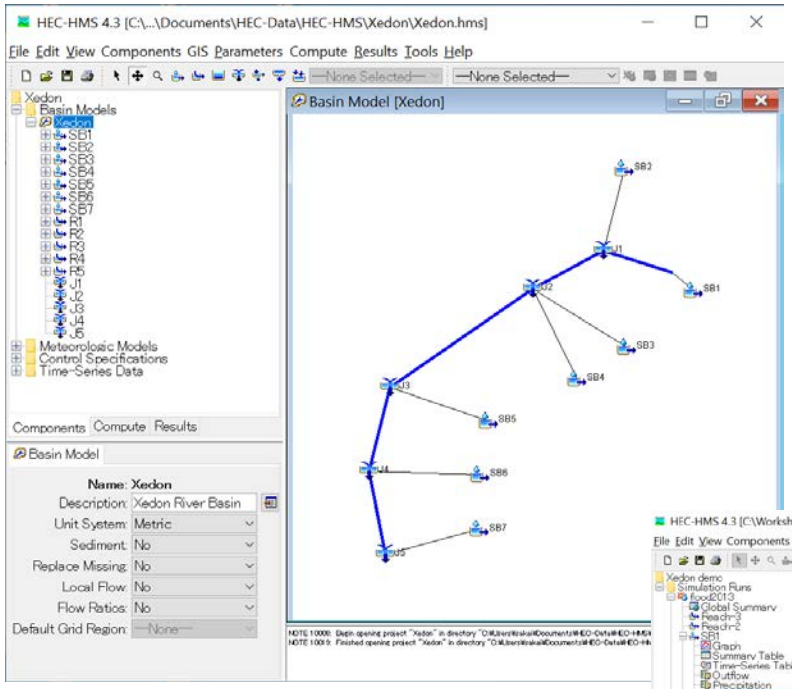



**Figure. Framework of flood hazard assessment and risk assessment**

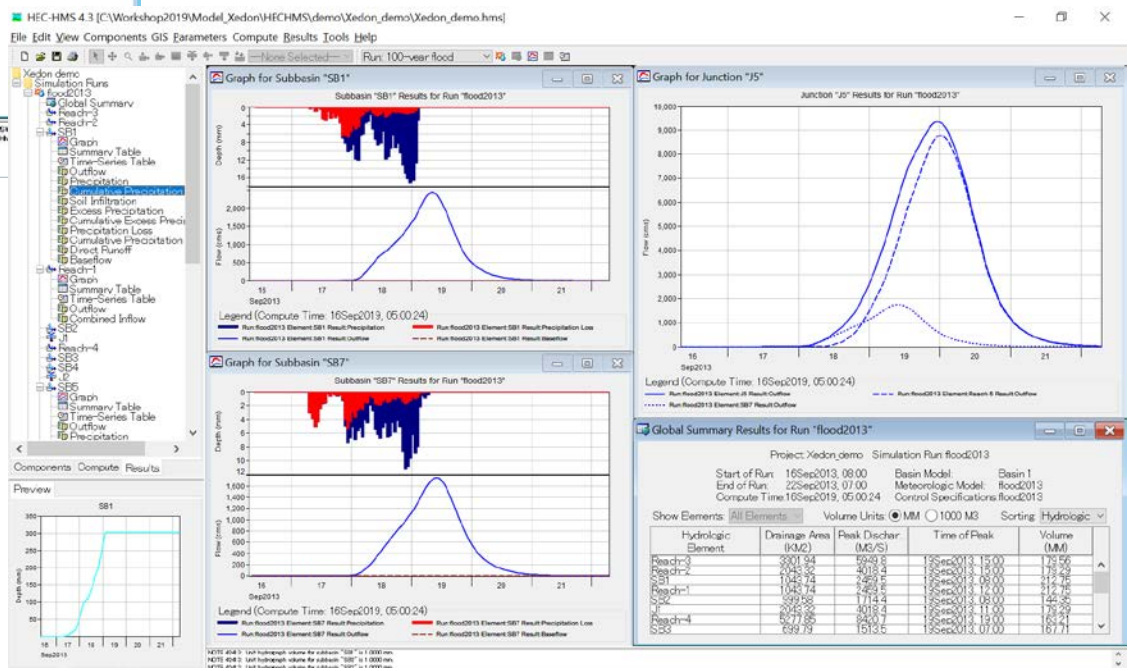
# 3. Results and Discussion

# Created runoff model and results

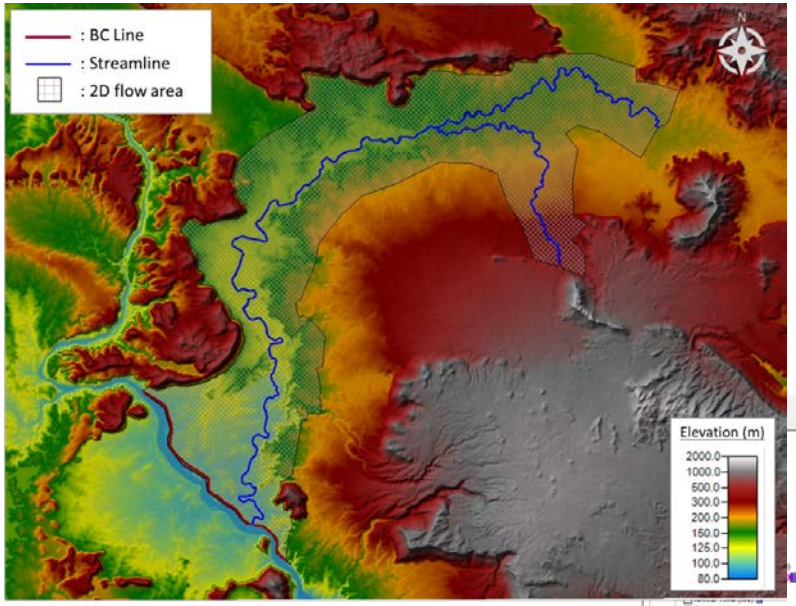



***Example of basin model***

***Example of results***



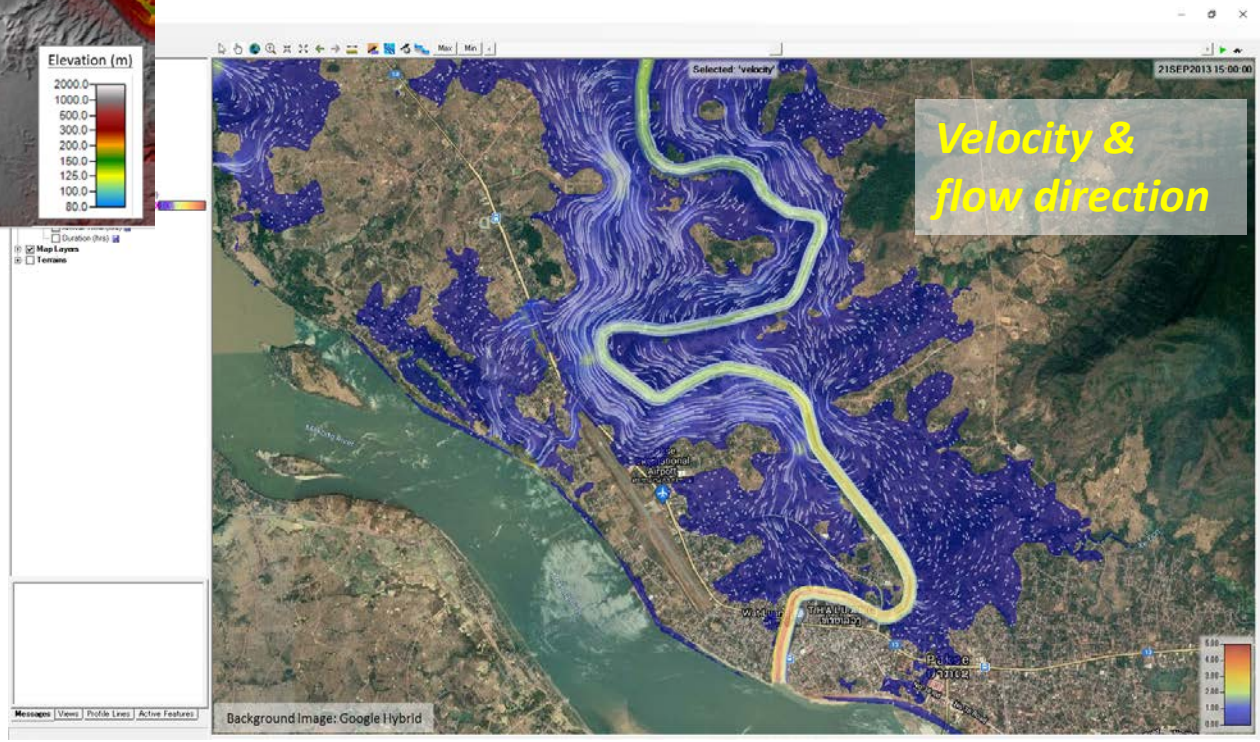
# Created flood inundation model and results



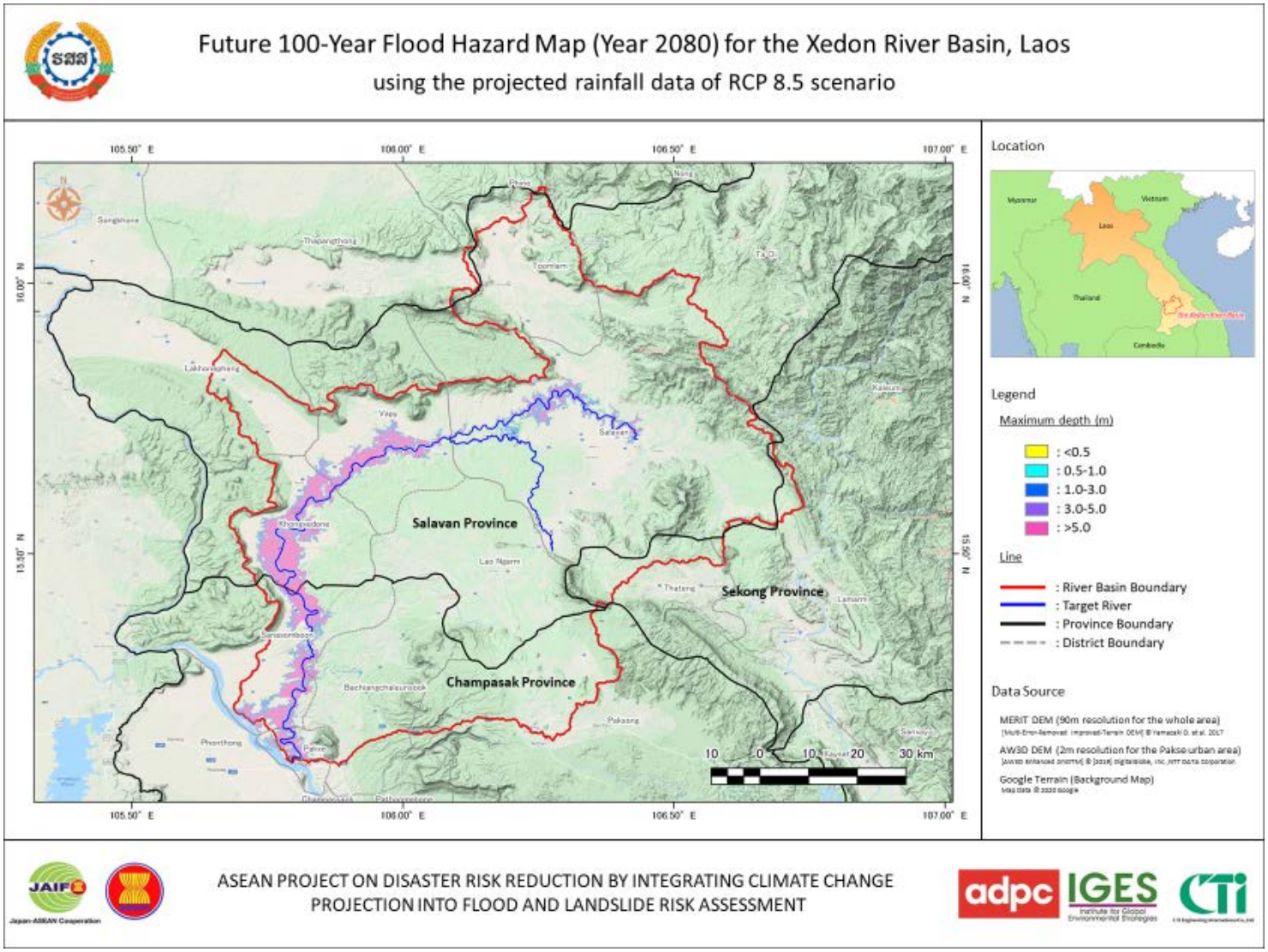

*BC Line: External 2D flow area Boundary Conditions Line

***Example of geometry model***

***Example of results (Flow velocity)***



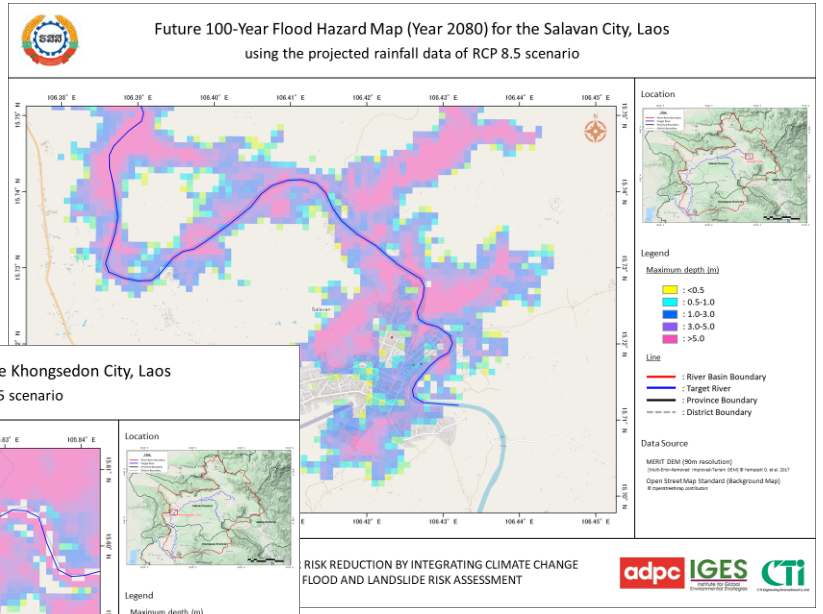
# Examples of created Flood Hazard Maps (HM)



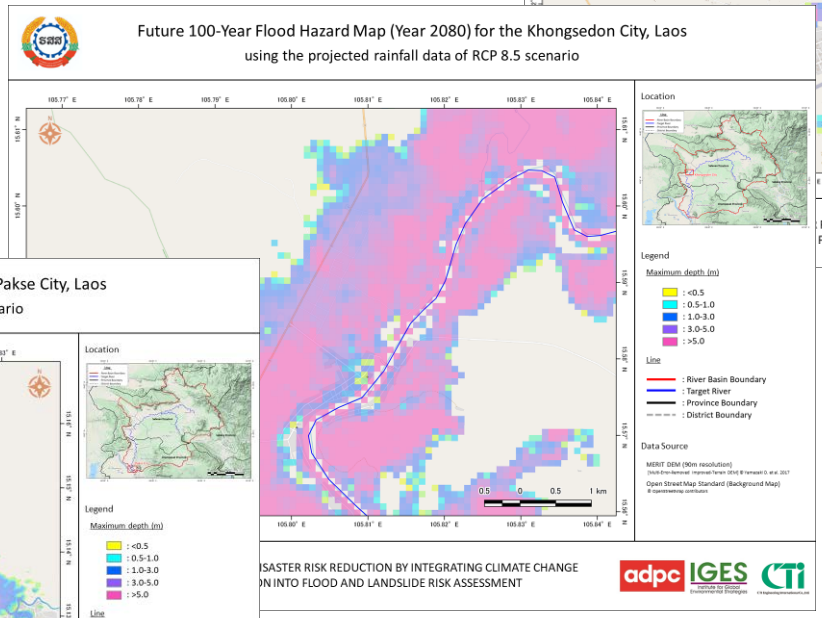

***HM in river basin scale***

# Examples of created Flood Hazard Maps (HM)

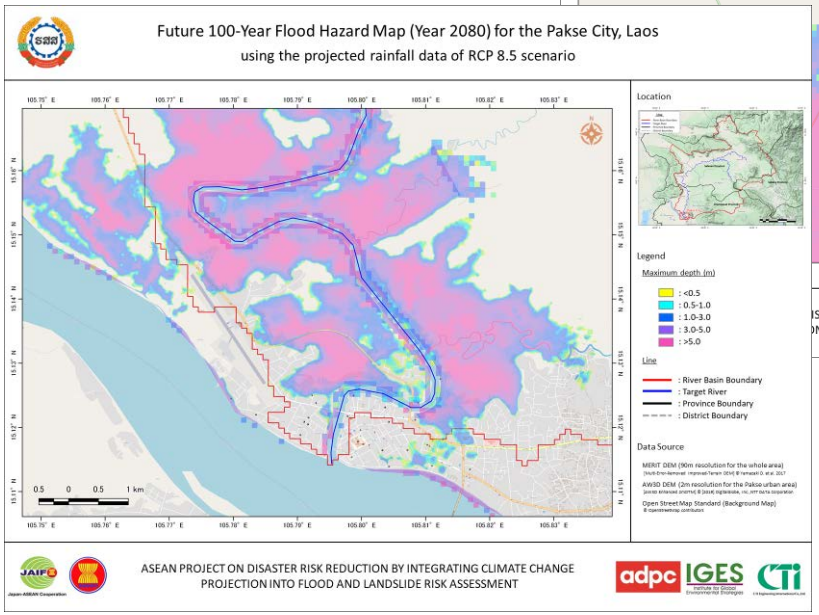
***HM in local scale***




***Salavan City***

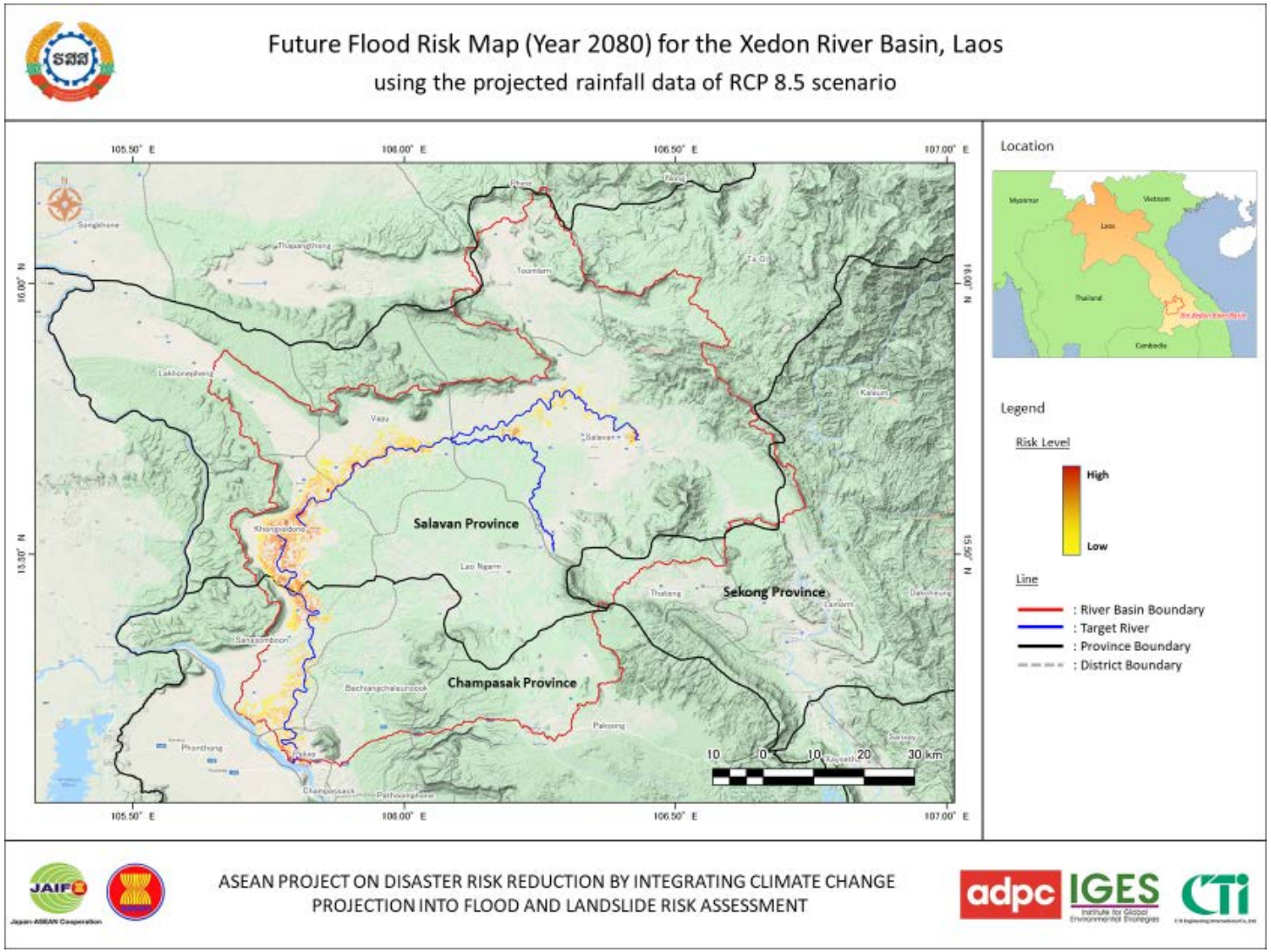



***Khongsedon City***




***Pakse City***

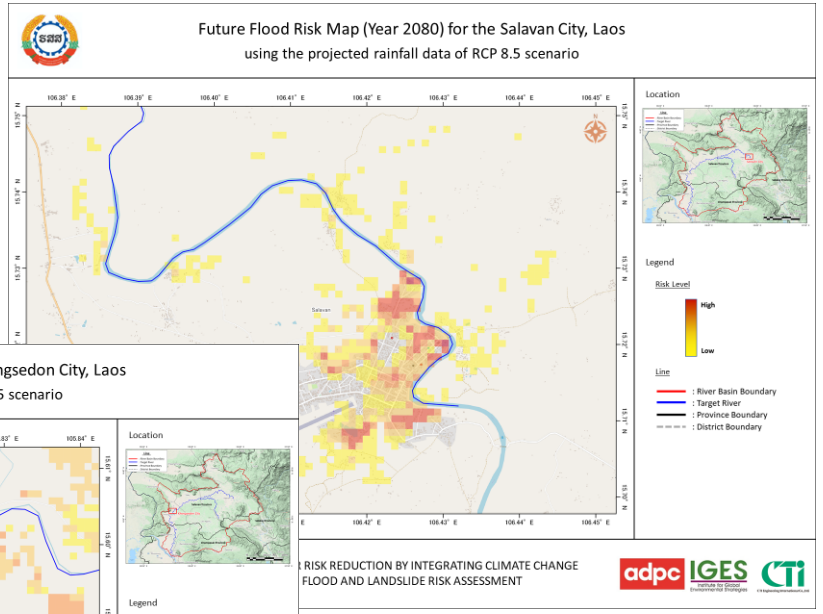
# Examples of created Flood Risk Maps (HM)



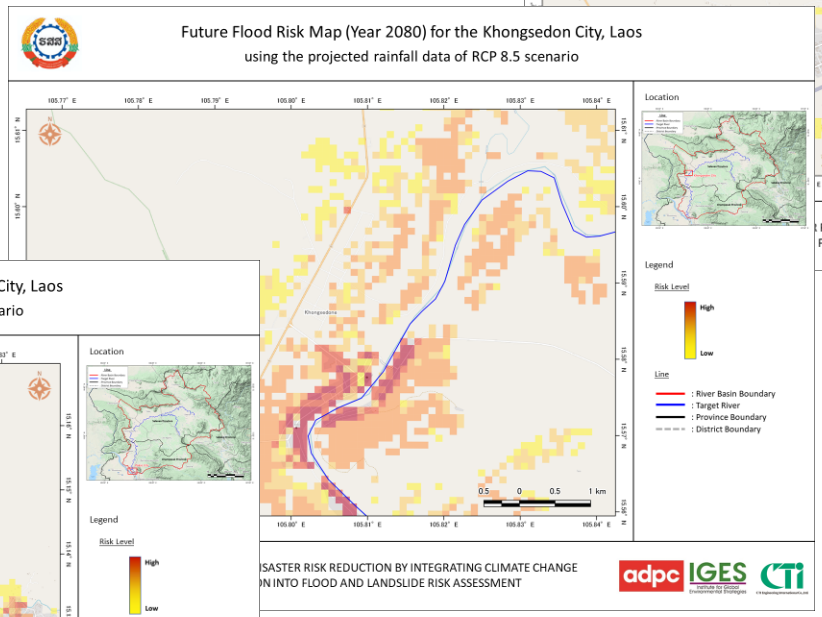

***RM in river basin scale***

# Examples of created Flood Risk Maps (RM)

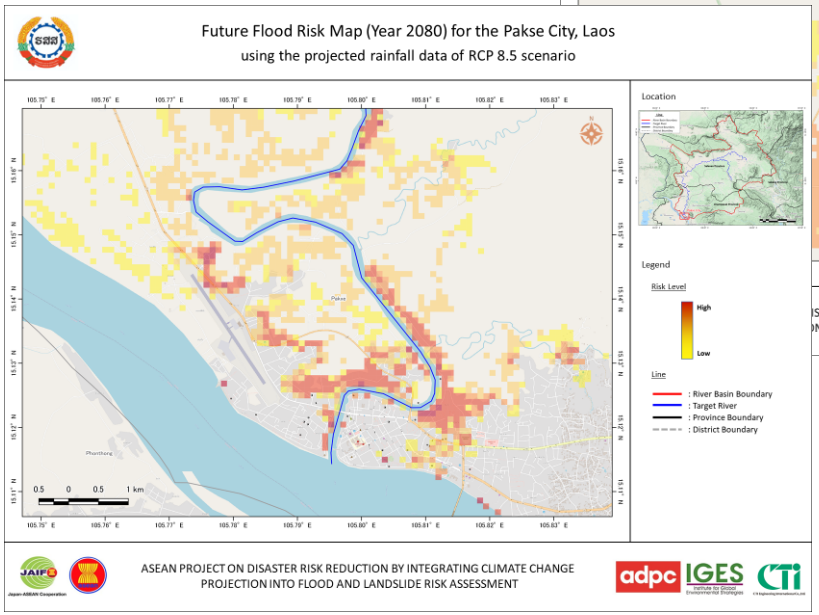
***RM in local scale***




***Salavan City***




***Khongsedon City***




***Pakse City***

# Limitation of the hazard maps and risk maps

***for Flood Hazard Maps***

- ✓ The target flood is fluvial flood (river flood) and exclude pluvial flood (inland flood due to poor drainage).
- ✓ Data limitation (not high accuracy of the digital terrain model, limited hydrometeorological observed data, limited river cross section, etc.)
- ✓ Operation of the Xeset dams are not considered in the models.

***For Flood Risk Maps***

- ✓ Risk maps have the same limitation of the derived hazard map.
- ✓ The target risk was focused on the direct damage on structure, structure content (assets), and crops. Accordingly, the other direct damage and indirect damages are not considered.
- ✓ Risk maps have errors derived from how to estimate the unit values of structures (houses), structure content (assets), and agricultural products.

# Findings of the Case Study

- ✓ Flood Risk Map
- ✓ Hazard Map
- ✓ Vulnerability and exposure analysis result
- ✓ Identification of the data source, data availability
- ✓ Identification of participants/organization
- ✓ Hydrological modeling

# 4. Way Forward

# Draft Road Map1 on Flood Hazard Risk Assessment

## Participants for Flood Risk Mapping and Utilizing?

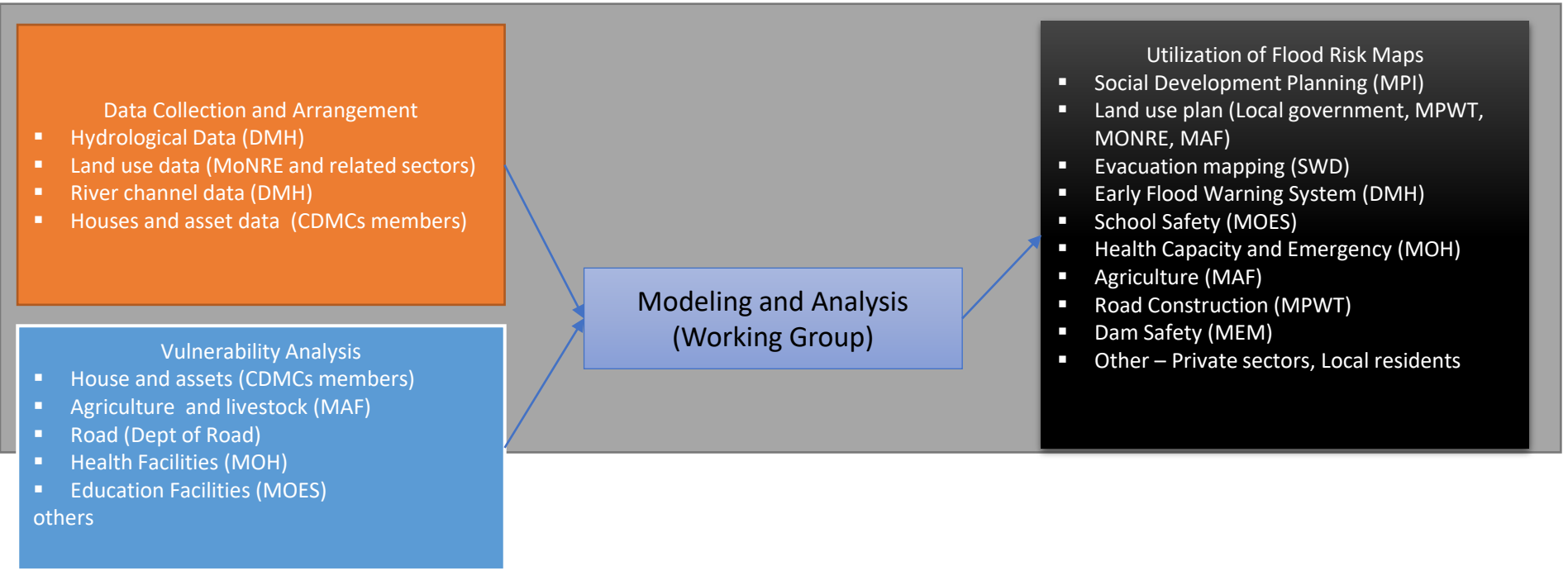
1. To whom (related organizations) the guideline should be distributed (seeing the contents of Guideline)
- SWD, DCC, LNMCs, DWR, DMH, NREI, Land Dept, MPWT, MEM, NUOL (Faculty of WR, FSS, Engineering), MoST, MAF, Ministry of Interior (Dept of Map)

2. How you will collaborate among related organizations in terms of data collection/arrangement, vulnerability analysis, basic hydrological analysis, hydrological modeling and hazard mapping, flood risk mapping, DRRM planning based on the maps?
- Introduce Flood hazard risk assessment guideline
- Establishment technical working group and implementation unit of each organization (DMCs and Non DMCs member) at all level
- Letter of Agreement on technical cooperation and data sharing among those organization
- Team practice or project based approach
- DRRM planning based on Assessment outputs and mainstreaming into sectoral and socio-economic development plan at all level

# Draft Road Map2 on Flood Hazard Risk Assessment

## Workflow Chart for Formulation and Utilization of the Maps

3. Formulate the concept figure/chart to make and utilize Flood Risk map



# Draft Road Map3 on Flood Hazard Risk Assessment

## Action/Enhance and improve your skill/your organization's function to implement/contribute to the Integration by the related organization.

RBP Team/Respective organizations

- Downscale modeling for Climate Change Impact and vulnerability analysis at river basin scale
- Improve hydrological and meteorological monitoring station network for hourly rainfall and water level data
- Extreme rainfall, water level analysis practices (example: from satellite VS Observe data)
- Flood DRRM planning in consideration of the integration
- Data sharing platform/Web map service (Example: Lao Decide info – www.decide.la)
- Evacuation mapping for community
- Input to draft NSDRR
- Risk comparation with the water level

# Draft Road Map3 on Flood Hazard Risk Assessment (Cont')

Action/Enhance and improve your skill/your organization's function to implement/contribute to the Integration by the related organization.

RBP Team/Respective organizations

- Introduce Flood hazard risk assessment guideline
- Establishment technical working group and implementation unit of each organization (DMCs and Non DMCs member) at all level
- Letter of Agreement on technical cooperation and data sharing among those organization
- etc.

# Draft Road Map on Flood Hazard Risk Assessment

Timeline to Enhance and Improve your/your organization skills and functions.

| Activity/Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Introduce Flood hazard risk assessment guideline/Result dessimination | | | | | | | | | | | | |
| Establishment technical working group and implementation unit of each organization (DMCs and Non DMCs member) at all level | | | | | | | | | | | | |
| Letter of Agreement on technical cooperation and data sharing among those organization | | | | | | | | | | | | |
| Evacuation mapping for community | | | | | | | | | | | | |
| Input to draft NSDRR | | | | | | | | | | | | |

# Draft Road Map on Flood Hazard Risk Assessment (Cont')

Timeline to Enhance and Improve your/your organization skills and functions.

| Activity/Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Downscale modeling for Climate Change Impact and vulnerability analysis at river basin scale | | | | | | | | | | | | |
| Improve hydrological and meteorological monitoring station network for hourly rainfall and water level data | | | | | | | | | | | | |
| Extreme rainfall, water level analysis practices (example: from satellite VS Observe data) | | | | | | | | | | | | |
| Flood DRRM planning in consideration of the integration | | | | | | | | | | | | |

# Draft Road Map on Flood Hazard Risk Assessment (Cont')

| Activity/Year – Year X |
| --- |
| Apply/scaleup to the other river basin (Nam Ngum, Xe Bang Fai, Xe Bang Hieng, Sekong) |