E201

Integrated Flood and Sediment Management at River Basin Scale for Sustainable Development

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Climate change poses a great threat from devastating floods and droughts to the world, of which Japan, Vietnam and Philippines are among the most affected countries. **Figure 1** shows the impacts of human interventions such as deforestation, dam constructions, and expansion of irrigation system on river basin management. Climate change causes alteration in hydrological patterns, which results in accelerated rates of reservoir siltation and loss of reservoir function. Therefore, optimizing dam operation and reservoir sediment management is highly essential for the sustainability of a river basin.

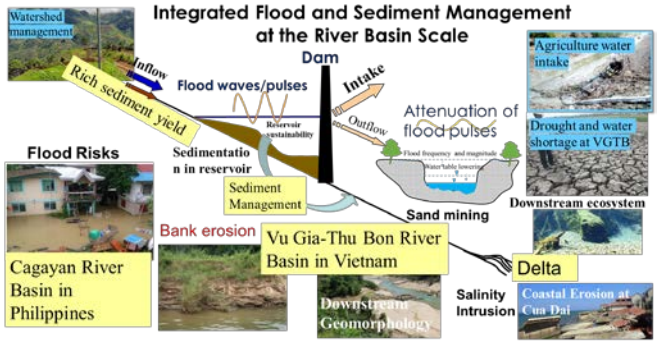

Fig. 1 Challenges affect the river basin system as a consequence of anthropogenic effects due to hydraulic infrastructures as dams

Objectives of APN Research Project

The proposed project aims at assessing the impacts of climate change and human interventions on watershed, reservoir sedimentation, dam operation, flood inundation, agricultural practices, and river and coastal erosion in the Vu Gia-Thu Bon and Cagayan river basins. Then, we establish integrated flood and sediment management schemes for sustainable development with potential technical solutions. The ultimate goal of the proposed project is to transfer the projects results to the stakeholders and policy-decision makers to implement into the national laws.

Methodologies

The general methodology of the proposed research starts with data collection of various data types. Then, data analyses are performed to understand the fundamentals of the study areas and preparation of inputs for modelling. Next, numerical models are established to predict the future changes of the concerned problems so that countermeasures can be proposed. The flow-chart for flood management methodology is given in **Figure 2**.

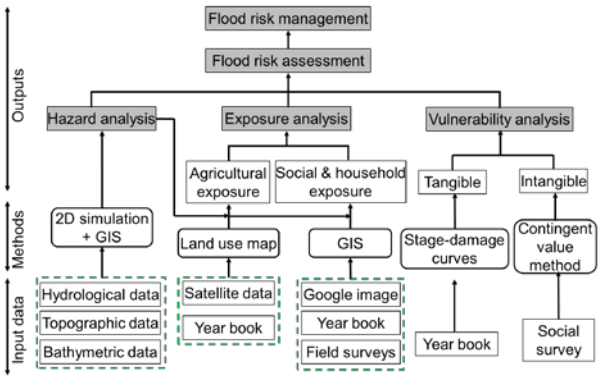

Fig. 2 Methodology for flood management components

Research Groups and Members

The chart in **Fig. 3** gives the details of the members who compromise the appropriate interdisciplinary team from Kyoto University, Philippines and Vietnam, clarify the theme of each research group.

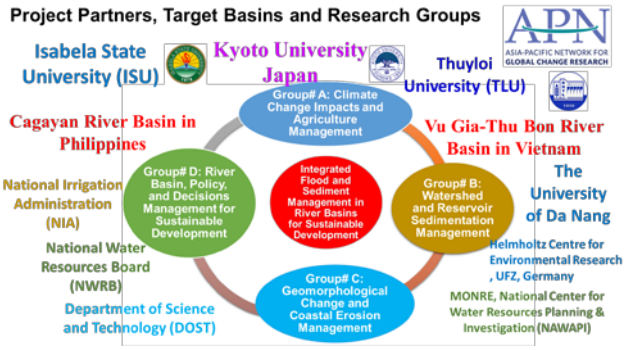

Fig. 3 Methodology for flood management components

Results

Both target basins in Vietnam (Vu Gia-Thu Bon River basin (VGTB-RB) and Philippines (Cagayan River Basin (C-RB)) witnessed an extraordinary flood inundation during October to November 2020 as shown in **Figure 4**.

Fig. 4 Inundation and damages caused by successive typhoons on Oct.-Nov. 2020 in VGTB-RB and C-RB

In Vietnam nine typhoons hit the central part where VGTB-RB is located, with a prolonged heavy rain since 6 Oct. to 1 Dec. 2020 (Linfa brought 852 mm/day, total 3300 mm from 5-20 Oct. 2020). In Philippines, five typhoons in **Figure 5** occurred consecutively before Vamco/Ulysses lashing the main island of Luzon on 11-12 November 2020 triggering extensive flooding in C-RB. One of the main causes of such extreme flooding is the successive rainfall events accompanied by heavy rainfall separated with short intervals. As a result, the soil moisture within the catchment increased and surface runoff increased.

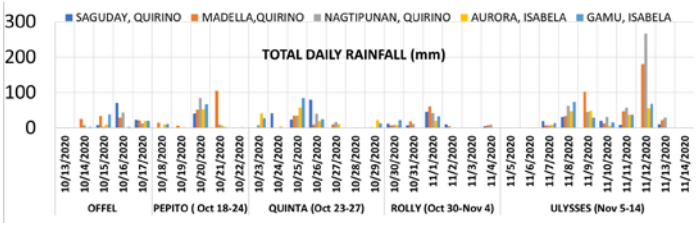

Fig. 5 Total daily rainfall during five successive typhoons hit Cagayan River Basin (C-RB) in Philippines.

The photo of the Magat Dam is shown in **Fig. 6**. Based on **Figure 7**, there is an urgent need to optimize dam pre-release to balance between required storage for droughts and management strategy in reducing flood impact. Furthermore, optimizing the sediment management to recover the reservoir volume and restore the original functions will be proposed.

Fig. 6 Photo of the Magat Dam completed on 1982

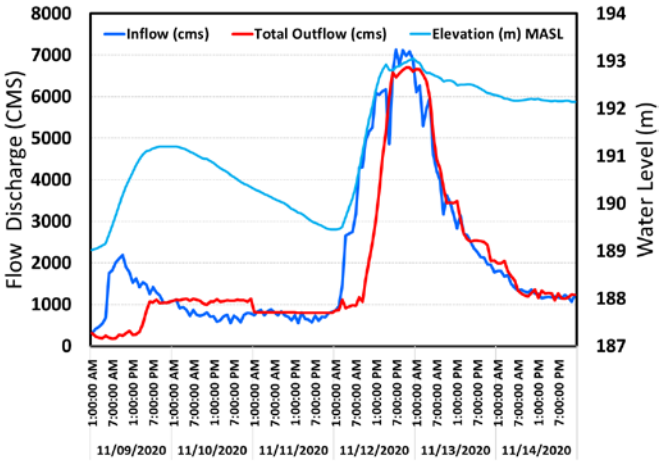

Fig. 7 Magat dam operation during typhoon Ulysses 2020

Acknowledgment

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