NEW CONTRIBUTIONS OF THE THESIS

- Subject of Thesis: Management of drainage planning to mitigate inundation in the northern coastal urban areas and adapt to climate change.
- Major: Urban and construction management - Code: 62.58.01.06
- Full name of PhD candidate: Ngo Huy Thanh
- Academic Advisor: Associate Professor. PhD. Mai Thi Lien Huong
- Training Institution: Hanoi Architectural University

SUMMARY OF NEW CONTRIBUTIONS OF THE THESIS

The thesis has reviewed and provided scientific foundations for the management of drainage planning to mitigate inundation for the Northern Coastal urban areas and to adapt to climate change. Analyzing the characteristics of natural topography and the impacts of climate change, the thesis clarifies some points as follows:

- The Northern Coastal Region is the most affected area in terms of increasing precipitation (ranking at number 1 position of the whole nation in the 2016 Climate Change Scenario), which is the main cause of urban inundation. Therefore, it is proposed to apply a sustainable drainage model for this area to help solving the hydrological impacts due to highly increasing precipitation.

- In the North of Northern Coastal Region, including the urban areas of Mong Cai, Uong Bi, Cam Pha and Ha Long with steep terrain, large proportion of forest land, flash floods often occur on the occasion of heavy rain. It is proposed to manage the development of buffer zones to protect coastal and riverside urban areas, especially cooperating with the Ministry of Natural Resources and Environment to develop a plan to protect and plant watershed forest systems in order to prevent flash floods and landslides from affecting drainage systems in downstream urban areas.

- In the South of Northern Coastal Region, including the urban areas of Thai Binh, Nam Dinh, Ninh Binh and Tam Diep with steep terrain, a large proportion of

green trees and water surfaces (detention reservoirs) with the role of retaining and absorbing water in case of rain, which help reducing inundation. It is proposed to manage and develop a system of detention reservoirs in the region, sub-regions and urban areas.

In addition, the thesis also mentions climate change, which is necessary to be supplemented in the management of drainage planning such as: the process from establishing and publishing the drainage planning; GIS and application in planning management; organization of management activities, community participation. The proposed content considered to be new contributions including:

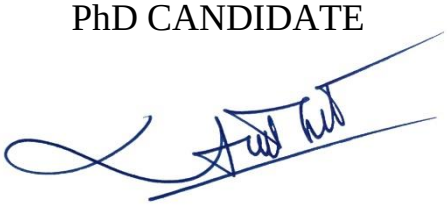
1. Proposing solutions related to the management of drainage planning to mitigate inundation and adapt to climate change: Compared to previous research, the thesis does not only study water management at the scale of individual urban area but also at large-scale with connection features, such as drainage by regions and river basins, including the proposal of establishing *"Committee on Drainage Planning Management and Inundation Mitigation for the Northern Coastal Region"* to help improving management capacity; Managing the development of buffer zones to protect coastal and riverside urban areas; Managing and developing the system of detention reservoirs; Controlling ground level; Using new construction materials.

2. Applying and operating GIS systems, flood mapping: Based on evaluating pros and cons of some simulation tools applied in management of water drainage planning and selection of software, the thesis has applied geographic information system - GIS to flood mapping with taking climate change factors for Cam Pha City in the climate change scenario (2016) RPC 4.5 toward 2050 into consideration. Then, the percentage of inundation for wards and communes will be identified. Based on the method of topographic map overlaying and spatial development orientation diagrams, it is reasonable to reaffirm that the development of sea encroachment urban toward the South. It is proposed to raise the minimum level of polder in Cam Pha City from +3.5m to +3.9m to mitigate inundation and to develop mechanism for organizing, managing and sharing GIS data among stakeholders.

3. Supplementing and completing the process from establishing missions to publishing the planning proposal for drainage plan to mitigate inundation and to adapt to climate change: Based on the overall evaluation, the thesis presents theoretical and legal issues related to the process of developing drainage plan. Accordingly, the specific proposals will be delivered and integrated with climate change, as well as clearly indicated time and missions, functions, responsibilities of executing and implementing agencies and of review and approval agencies.

4. Concretizing the sustainable rainwater management solutions, locating the study area in New urban area in Cam Trung ward, Cam Pha city: Based on the scientific basis of sustainable rainwater drainage model, the thesis proposes to supplement the sustainable drainage model following road network and the functions of using civil land. This model will be applied specifically to the New urban area in Cam Trung ward, Cam Pha city, such as controlling rainwater at households applied to semi-detached houses, villas, apartments, complex buildings, public gardens and green corridor areas.

PhD CANDIDATE



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