

Transformations of River Zones in Hanoi, Vietnam: Problems of Urban Drainage and Environmental Pollution

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Abstract : In many cities the entire world, the relationship between cities and rivers is always considered as a fundament of urban history research because of their profound interactions. This kind of relationship makes the river zones become extremely sensitive in many aspects. One of the most important aspect is their roles in the drainage of cities. In this paper we will examine an extraordinary case of Hanoi, the capital of Vietnam and Red river zones. This river has contradictory impacts to this city: It is considered as a source of life of the inhabitants who live along its two banks, however, the risk of inundation caused by the complicated hydrology system of this river is always a real threat to the cities that it flows through. Morphologically, Red river was connected to the inner rivers system that made Hanoi a complete form of a river city. This structure combined with the topography of Hanoi helps this city to assure a stable drainage system in which the river zones in the north of Hanoi play some extreme important roles. Nevertheless, in the late 20 years, Hanoi's strong urbanization and the instability of Red river's complicated hydrology make the very remarkable transformations in the relationship river-city and in the river zones: The connection between the river and the city declines; the system of inner lakes are progressively replaced by habitat land; in the river zones, the infrastructure system can't adapt to the transformations of the new quarters which have the origin of the agricultural villages. These changes bring out many chances for the urban development, but also many risks and problems, particularly in the environment and technical sides. Among these, pluvial and used water evacuation is one of the most severe problems. The disappear of inner-city lakes, the high dike and the topographical changes of Hanoi blow up the risk of inundation of this city. In consequences, the riverine zones, particularly in the north of Hanoi, where the two most important water evacuation rivers of Hanoi meet each other, are burdened with the drainage pressure. The unique water treatment plant in this zone seems to be overcharged in receiving each day about 40000m³ of used water (not include pluvial water). This kind of problem leads also to another risk related to the environmental pollution (water pollution and air pollution). So, in order to better understand the situation and to propose the solutions to resolve the problems, an interdisciplinary research covering many different fields such urban planning, architecture, geography, and especially drainage and environment has been carried out. In general, this paper will analyze an important part of the research : the process of urban transformation of Hanoi (changes in urban morphology, infrastructure system, evolution of the dike system, ...) and the hydrological changes of Red river which cause the drainage and environmental problems. The conclusions of these analyses will be the solid base of the following researches focusing on the solutions of a sustainable development.

Keywords : drainage, environment, Hanoi, infrastructure, red rivers, urbanization

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