

## **Sustainable Urban Region – water management for Asian cities**

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### **Introduction**

Numbers of Asian cities have undergone rapid economic growth and an often disorderly exposition of the built-up area. The continued growth of a city is economically necessary both for Asia. However, there are serious concerns that the excessive disorderly sprawl of the built-up area may result in an unbearable urban load on the environment, if the growth and the development are not properly controlled. The situation in many Asian cities is critical, but it can be remedied.

Basically, many Asian cities have strong potential for sustainable development since they are endowed with favorable natural conditions: the river or lake system in the city region; and an attractive agro-landscape. In many cases, they also have rich historical and cultural heritages. Therefore, if we pay careful and immediate attention to the development of the city in a controlled manner and from the view point of sustainability, any city could become the Asian model for urban development and management.

For example, Hanoi in Vietnam, which means “in the river,” is located in the midst of the Red river system with many large and small ponds which provide a high-amenity environment and very attractive landscape of rice-field, and the city is endowed with traditional and characteristic agro-culture fostered by the geographical conditions. It is natural and essential to regard Hanoi wide-area, to respect her geographical and historical conditions in planning and implementing urban developments, and to establish relevant management systems for suitable growth control of the city. Especially, proper water management system is vital in order to control flood and safe and stable water supply to satisfy urban and agricultural demands over maintaining identity of Hanoi.

In this presentation, the author proposes novel water management system that may be

suitable for Asian developing urban region.

### **Sustainable water management in developing Asian cities**

In developed countries, the sewer system, pipe collection and activated sludge process, plays major role in to save water environment from pollution or restore form decay. Wastewater from household and factories is collected by pipe and treated with activated sludge process which consume large amount of energy. Such energy-consuming system may not suitable to apply for all developing countries. Such process should be applied for limited area: densely populated urban area. In the past, the activated sludge process, or trickling filter, is the only available technology to treat large amount of wastewater in urban area. Wastewater has to be collected through sewer to centralized treatment plant located, in case of Japan, at coastal area. This created problem of lack on water in river in urban area due to large amount of water withdrawal from river at upper stream, and delivering water (wastewater) directly to the coast. From the view point of water reuse and recycle, centralized water management, such as sewer system, is not ideal. Utilization of water by household is decentralized, therefore, it is ideal that the water management system is decentralized. In the past, such proposal is unacceptable since small-scale wastewater purification process was, usually, not effective and uneconomical. However, significant development of wastewater purification process technology enables to establish small-scale water management system with very efficient treatment ability. Membrane technology is one of the most promising technologies to treat wastewater or water for such application. This technology has been applied for wastewater and water purification since 1960's, and widely used for many application nowadays.

The author would like to propose decentralized water management system as a water management system in Hanoi. Advantages of the decentralized system are 1) easy to employ water reuse and recycle system, 2) management of water by community, 3) promote proper management of groundwater, and 4) no need of skilled engineer for maintenance. Disadvantages are 1) more production of GHG, 2) maintenance need to be done by the community, and 3) difficult to introduce for developed countries. Developing countries without sewer system have some advantages to introduce the proposed system comparing to developed countries. They can start from small amount of fund with small-module and enhance it to a large-scale. They do not need to experience mediocre performance system (activated sludge), they can start from super efficient process (membrane process). Similar phenomena can be observed in the field

of telecommunication. It took many years to develop dependable metal telephone network in most of developed countries. However, in many developing countries, mobile phone contributed significantly to provide telephone, and internet, services. Developing country is not always experience the same path of technology development of developed country.

Figures 1 and 2 show conceptual illustrations of decentralized water management system. The most difficult issue in order to develop decentralized system is to allocate appropriate water stock near treatment facility. In Asia, this author proposes to utilize groundwater as a stock of water in urban area. Groundwater is the available water resources at most of Asian urban area, which is evidenced by the fact that approximately 80% of population in Asia utilizes groundwater as drinking water. However, groundwater is difficult to cleanup if once polluted. In addition, misuse of groundwater would create serious environmental problems of sea water intrusion, land subsidence etc. Groundwater ought to be utilized carefully. Unfortunately, most of developed countries do not have accumulation of experience of sustainable management of groundwater as urban water stock.

Membrane technology is widely utilized for wastewater and water treatments. Especially, in water treatment, water works in many countries apply membrane technology since its dependability and high performance. In wastewater treatment, membrane bioreactor (MBR) is gradually introduces for domestic and industrial wastewater treatment. Introducing membrane technology would be effective and easy solution in order to develop decentralized water management system.

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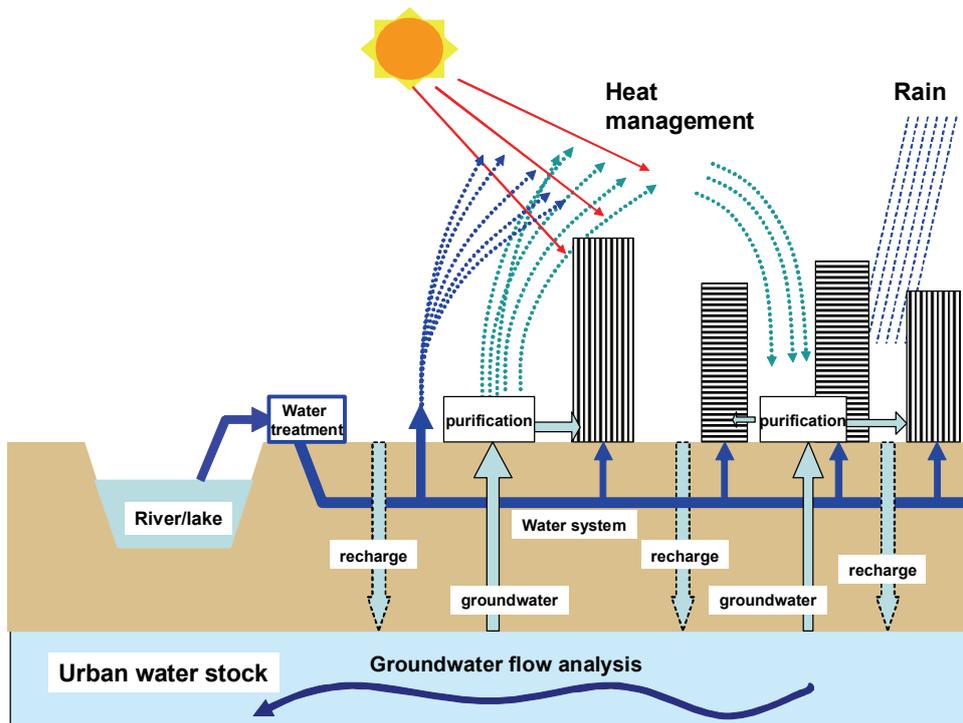


Figure 1. Decentralized water management system (example)

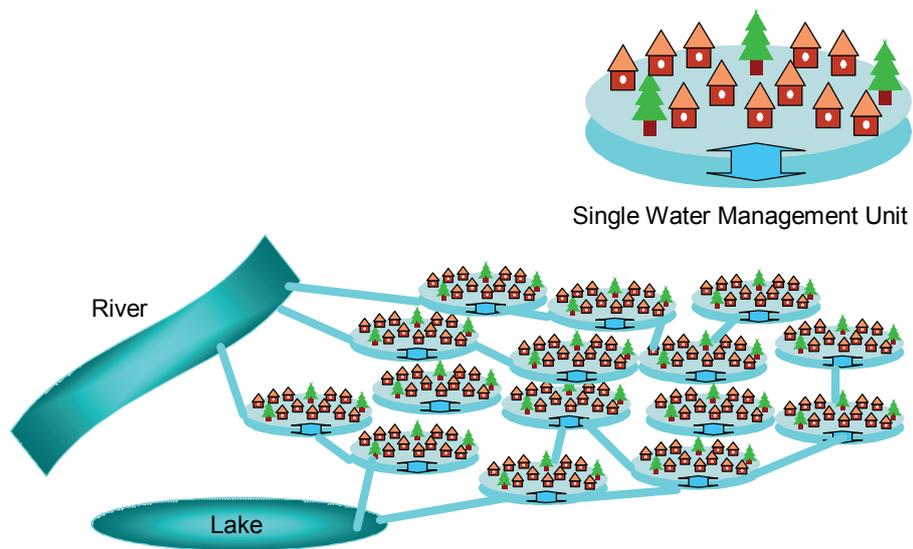


Figure 2. Decentralized water management system. Enhancement of the system from small-module to large area.