Linkages of boundaries between surface/subsurface and land /ocean for better management of environment in Asia

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Change in reliable water resources between groundwater and surface water occurred in many Asian cities depending on the development stage of urbanization. Although the subsurface water is connected with surface water in hydrological cycle, both waters were treated separately for both natural and social sciences. In RIHN's project of "Human impacts on subsurface environment", one surface environment: urban, and three subsurface environments; groundwater, heat, and contamination, have been chosen. Intensive field observations and data collections had been made in the basins including Tokyo, Osaka, Bangkok, Jakarta, Manila, Seoul, and Taipei, to evaluate the relationship between development stage of the city and various subsurface environments in Asia beyond the boundary between surface and subsurface environment.

As a factor of separating water, energy and material at the earth surface into above and below the surface, land use/cover changes at three ages (1940's, 1970's and 2000's) in Asian 7 cities (Tokyo, Osaka, Bangkok, Jakarta, manila, Seoul and Taipei) have been analyzed based on GIS with 0.5 km grid at seven targeted cities. Urbanization causes the decease in groundwater recharge rate and increase thermal energy transport into the subsurface.

Another boundary for water and material transports exists between land and ocean. Regarding material (contaminant) transports to the coast, direct groundwater discharge is recently recognized as a significant water and material pathway from land to ocean. Many Asian major cities are located in the coastal zone so material and contaminant transport by groundwater is a key to understanding the coastal water pollution and the effects on associated ecosystems.

In this paper, the importance of integrated treatments between surface/subsurface and land/ocean will be shown for better understanding and management of environment.