

Water demand change with urbanization and land subsidence in Asian megacities: Stage model with DPSIR framework

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Water demand structure changes by changing industrial structure and life style along with urbanization. This study analyzed the water demand structure change and land subsidence caused by excessive groundwater use by urbanization in six Asian megacities which are Tokyo, Osaka, Taipei, Bangkok, Jakarta and Manila from 1900 to 2005.

In Asian megacities, land subsidence has been taking place from one place to another historically from Tokyo and Osaka, Taipei, Bangkok and to recently Manila and Jakarta. The objective of this study is to clarify the relationship between urban development, water demand structural change, and land subsidence applying DPSIR framework.

- 1) We first collect Asian six cities annual indicators on urbanization, water resource, and land subsidence from 1900 to 2005.
- 2) To clarified the relation between urban development and water demand structure by using collected indicators.
- 3) The indicators are categorized into five groups according to DPSIR framework, and we divide the stages into five while judging dynamic changes of the DPSIR causal relations. That is stage I as earlier stage of urbanization, stage II as recognition of land subsidence, stage III as acute land subsidence, stage IV as control of land subsidence, and stage V as transition to other subsurface environmental issues.
- 4) Finally various indicators in the DPISR framework at the year of stage transitions are compared for six cities.

The result is followings,

Tokyo, Osaka and Taipei have already reached at the stage V, while Bangkok is very close to the stage V but still in the stage IV. Manila and Jakarta are still stuck in the stage III. The scale and speed of land subsidence of Manila and Jakarta are larger than the situation of the stage III in Tokyo.

Because of these cities of driving force has large impact such as rapid economic growth and industrialization and large population. DPSIR framework that arranges the problem by the stage and the factor may take effective measure against water use, environmental impact and land subsidence.

Keywords: Urbanization, water demand change, industrial transformation, DPSIR