

Temporal change of groundwater-related problems in urban geosphere

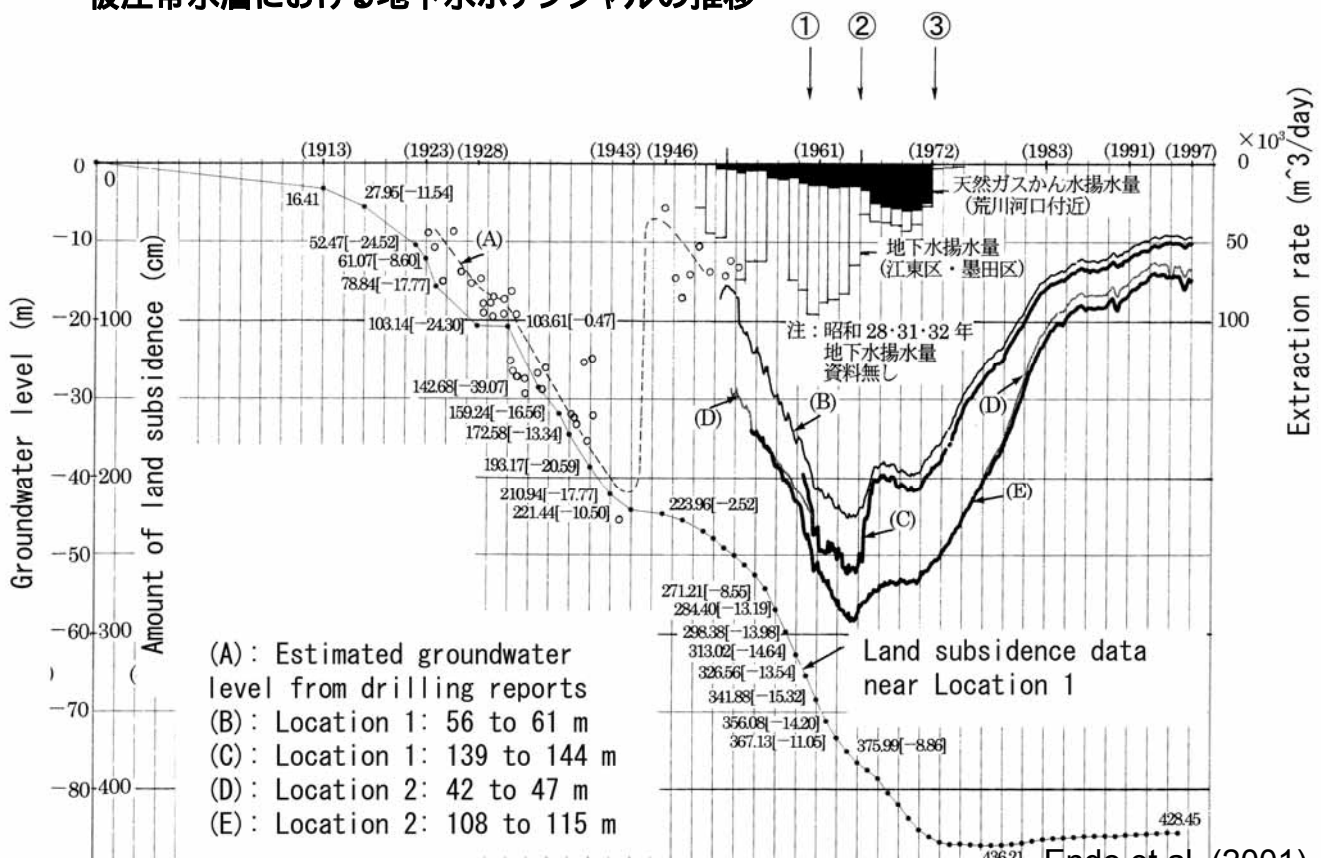
A case example from Tokyo

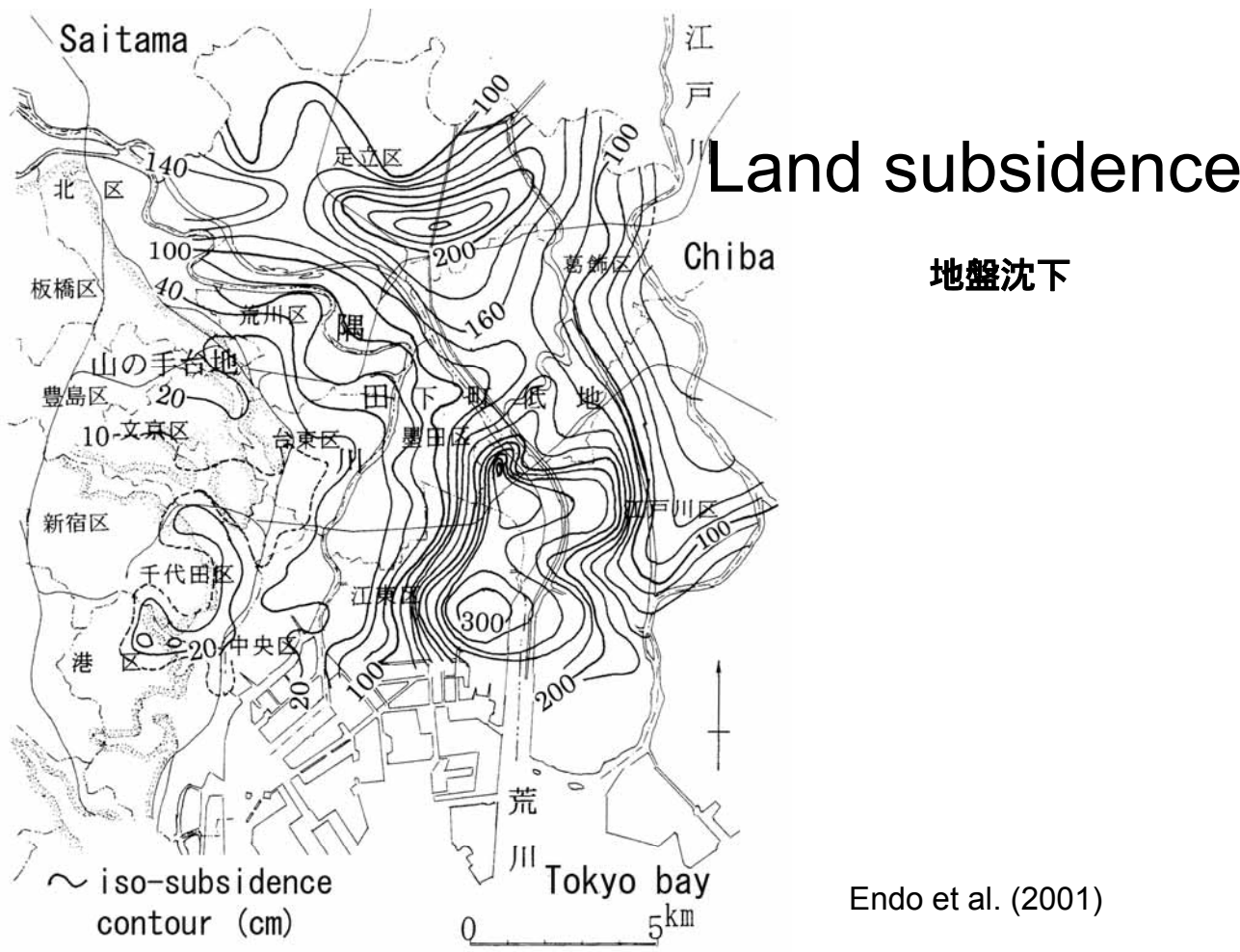
都市地圏における地下水問題の推移: 東京の例

- Problems due to over-abstraction of groundwater
 - Land subsidence
 - Oxygen deficient air accidents, etc.
- Countermeasures (regulation of groundwater use)
- Appearance of new types of problems due to the recovery of groundwater potential
 - Upward water pressure (buoyant force) to underground infrastructures
 - Seepage of groundwater into underground structures
- How can we appropriately manage groundwater resources?
 - Integration of monitoring and modeling approaches
 - Provide information to stakeholders
- Possible contribution to presently developing urban cities not to experience the same problems suffered in Tokyo

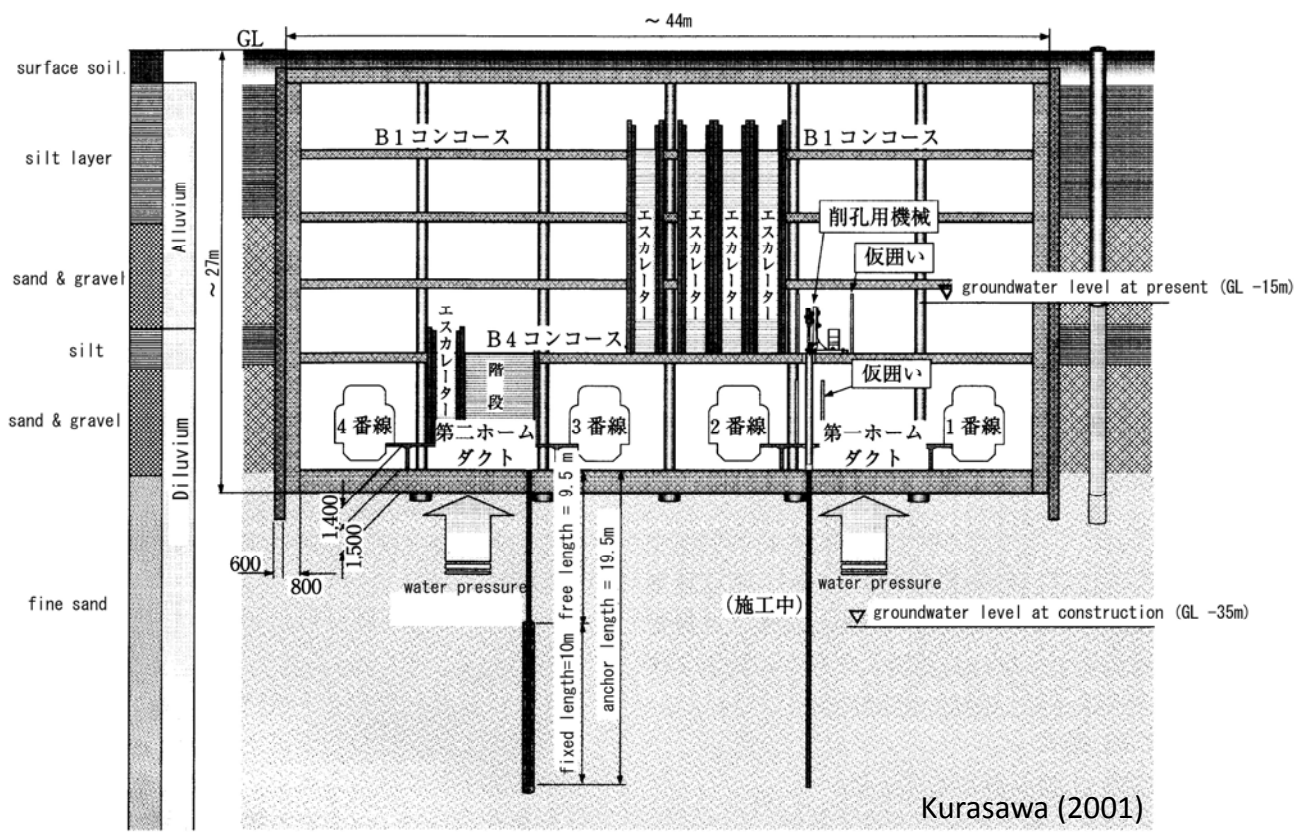
Temporal change of groundwater potentials in confined aquifers

被圧帯水層における地下水ポテンシャルの推移





Problems of underground infrastructures (Tokyo station)



Issues at present 現在の問題 (Multi-stakeholder's problem)

Conservation

Groundwater abstraction can cause land subsidence
Present situation is achieved by appropriate regulation

Effective usage

Improve surface environment

Water resources at emergency situation

Maintenance



Unnecessary discharge to subsurface infrastructures (Nikkei Const., 2004)
→ increase the maintenance cost



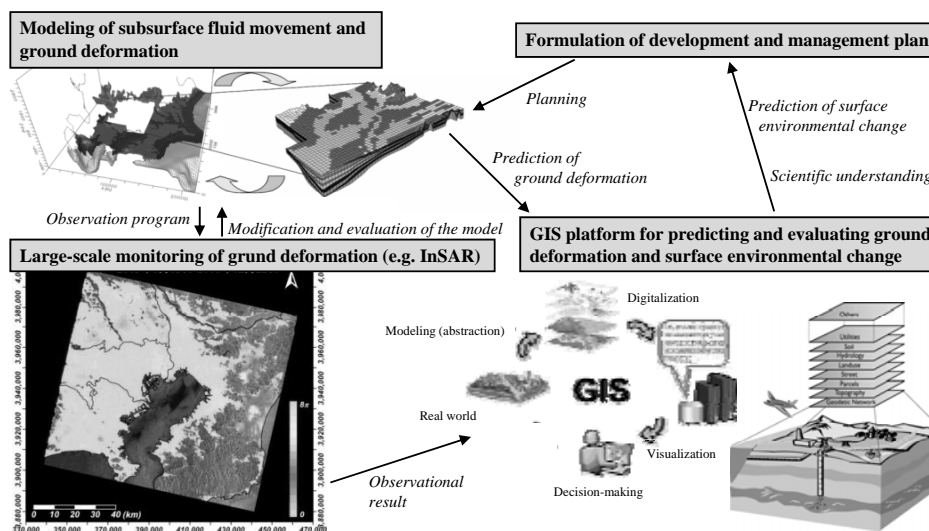
Should resume abstraction

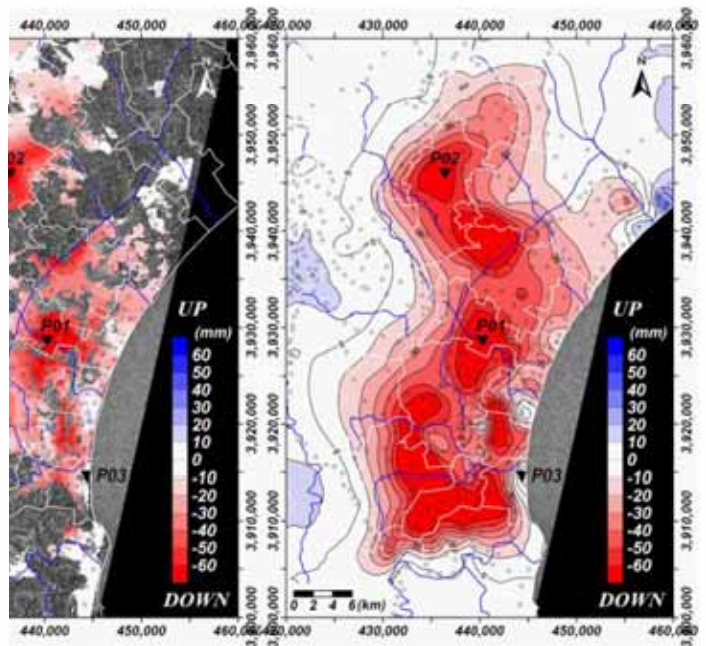
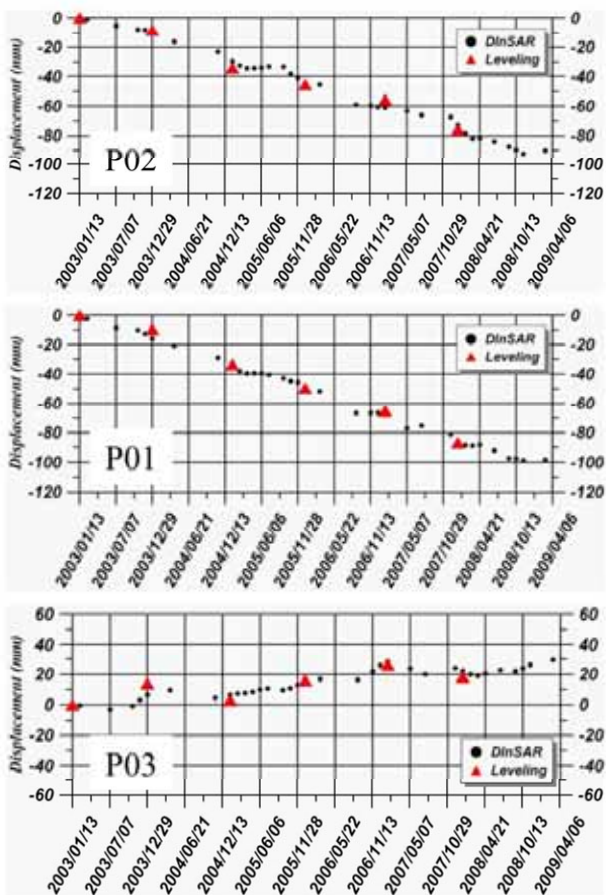
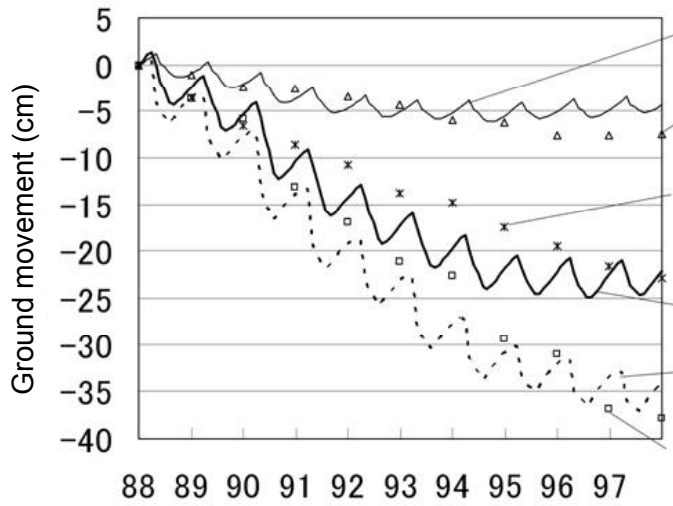
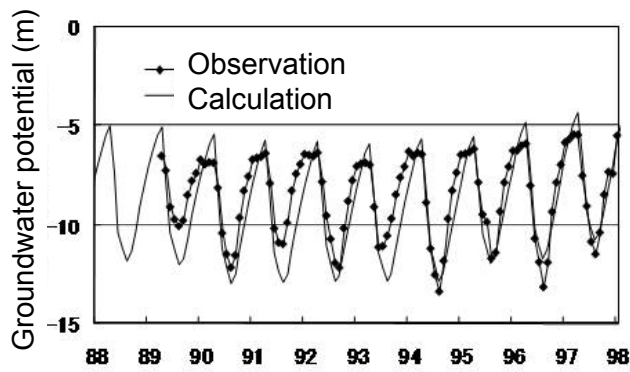
(Ministry of environment, 2007)

How can we tackle this problem? Technical/social approach?

Integrated approach for groundwater resources management

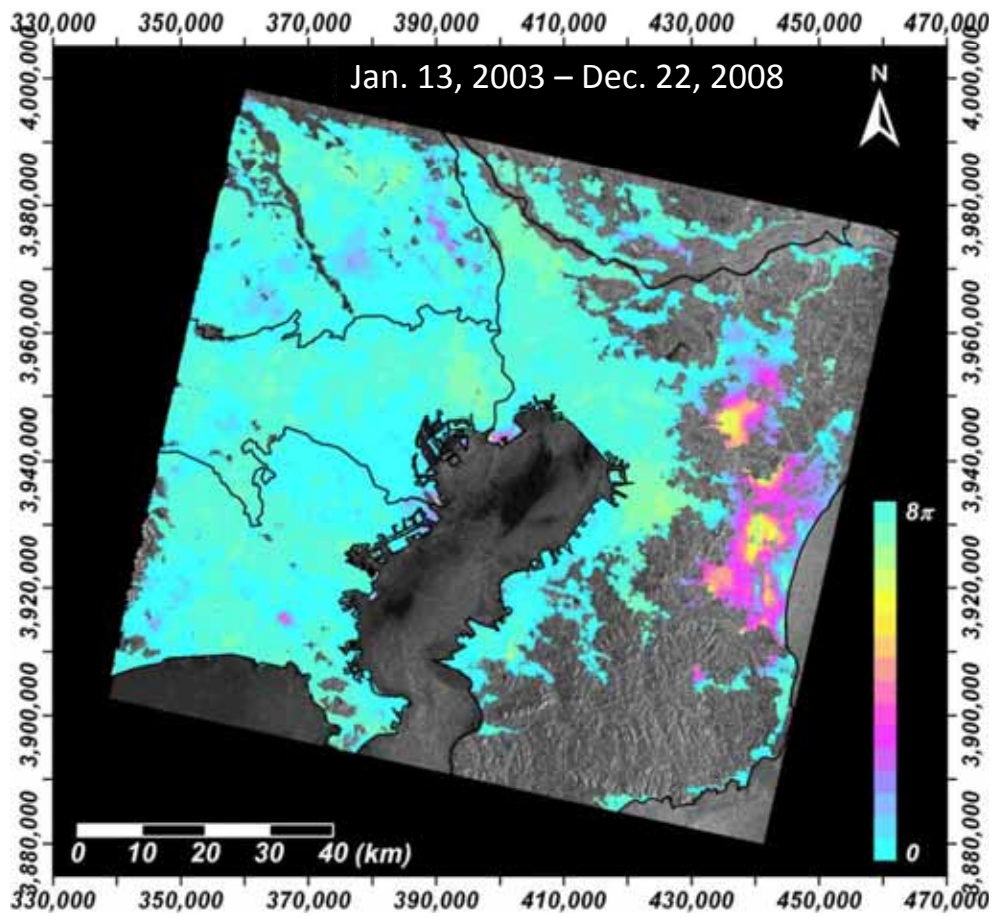
地下水資源管理のための統合的なアプローチ



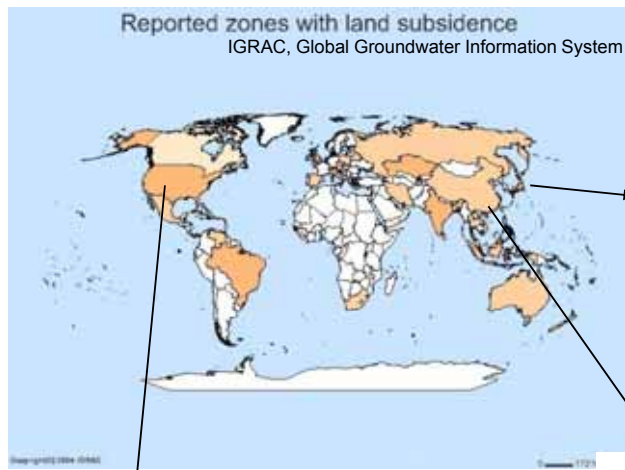


InSAR

(c) Leveling data



Land subsidence has been reported from many places in the world

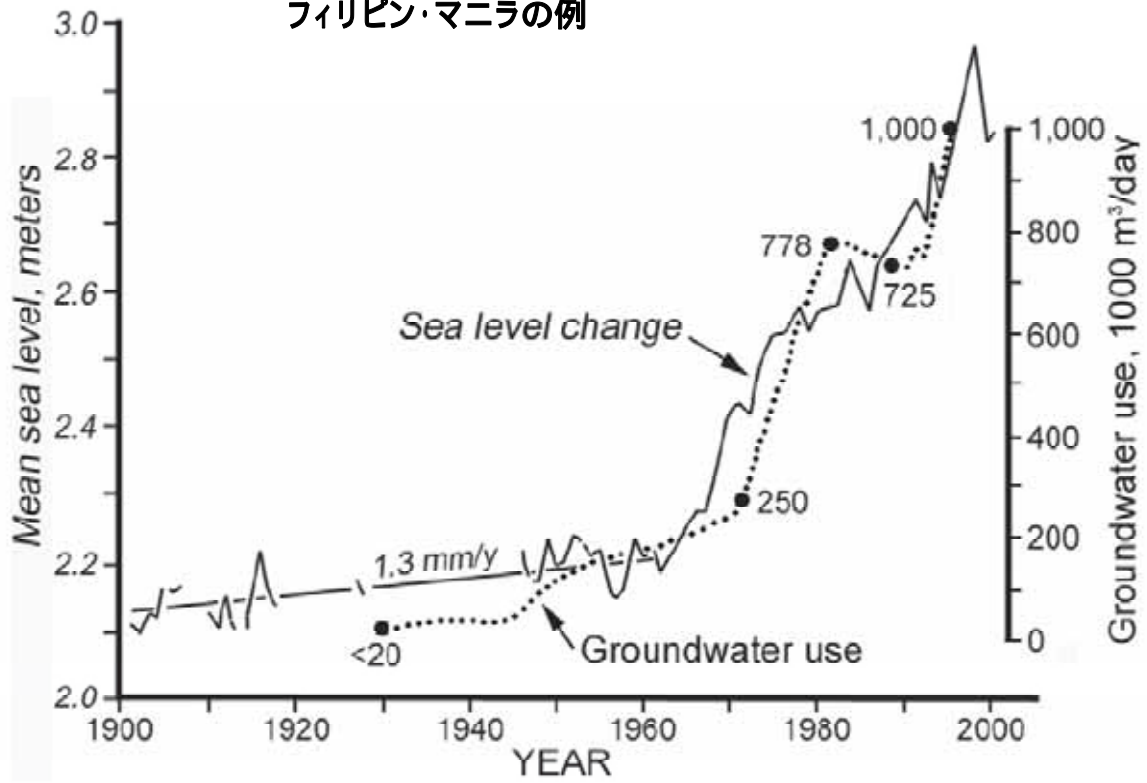


世界各地で起こっている地盤沈下



An example from Manila, Philippines

フィリピン・マニラの例



Rodolfo and Siringan (2006)