

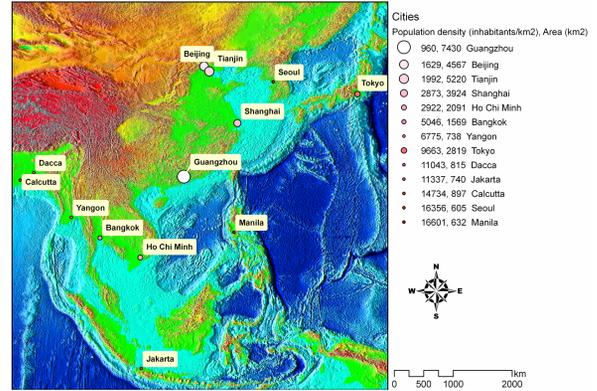
Fill development in practice in Asian low-lying urban-rural areas

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Project outline

In low-lying monsoonal areas of Asia, people traditionally settled on natural levees or upland landforms, which are relatively safe from natural disasters such as extreme floods and large earthquakes. As populations have grown and become concentrated in cities, urban land uses have gradually expanded into more vulnerable natural landforms, such as floodplains and back marshes in which were treated as rice fields. Such an urban land development in low-lying flood-prone areas has been materialized by landfill techniques. Fill practice for development has various forms in its quantitative and qualitative methods, which is also subject to availability of material. Investigation into spatial patterns, process and driving forces of fill development is necessary to consider land-use planning.



Ongoing case study cities	Onsite fill development	Offsite aggregate/soil mining	Mineral flow characteristics	Planning issues/problems
Tokyo Metropolitan Area (insular alluvial plain)	Average material input: $3.3 \times 10^4 \text{ m}^3 \text{ km}^{-2} \text{ y}^{-1}$ (Takeuchi and Yoshioka 1982)	Average material output: $3.8 \times 10^7 \text{ m}^3 \text{ y}^{-1}$ (sand only) (Asani et al. 1993)	Aggregate flow: 20-30km Soil flow: from underground construction site into adjoining fill sites (Sudo 2001)	Illegal waste flow and dumping Exhaustion of aggregate resources Weak linkage between fill material flow control and land-use planning
Bangkok Metropolitan Region (continental delta)	Average material input: $5.7 \times 10^3 \text{ m}^3 \text{ km}^{-2} \text{ y}^{-1}$ (Hara et al. 2008)	Average material output: $5.5 \times 10^7 \text{ m}^3 \text{ y}^{-1}$ (sand only) (Hara et al. 2008)	Aggregate flow: 100< km Soil flow: between adjoining parcels (fill-pond combination) (Hara et al. 2008)	Poorly environmentally managed sand mining Almost no control at the nodes of fill flow network Weak linkage between fill development and zoning in consideration of floods
Metro Manila and its vicinity (insular alluvial plain)	Average material input: $5.0 \times 10^3 \text{ m}^3 \text{ km}^{-2} \text{ y}^{-1}$ (Hara et al. 2007)	Average material output: $6.6 \times 10^6 \text{ m}^3 \text{ y}^{-1}$ (lahar only) (Hara et al. 2007)	Aggregate flow: 10-60km Bulk material: from renewal site into fill development sites (Hara et al. 2007)	Unsanitary landfilling Case-by-case basis bulk material flow Emergent poor-drainage district surrounded with fill corridor

Future outlook

There is still a gap between spatial planning and practice in our daily living space. How should we implement science-basis "beautiful" masterplan in practice? This is frequently asked in Asian low-lying urban-rural fringe area where strong private landholding is longstanding. Field investigation into lateral land uses and inherent vertical landform transformation can help to bridge such a gap. The accumulation of case studies from this perspective among Asian low-lying urban regions enables us to categorize fill development process and patterns, and to develop effective land-use planning strategy in consideration of control on fill practice. This study might be also significant in the context of sea level rise due to global warming.

List of publications in international journals

- Hara, Y., Takeuchi, K., Paljon, A.M. & Murakami, A. (2007): Landfill development in the urban fringe of Metro Manila. *GeoJournal* (under revision).
- Hara, Y., Thaitakoo, D. & Takeuchi, K. (2008): Landform transformation on the urban fringe of Bangkok: The need to review land-use planning processes with consideration of the flow of fill materials to developing areas. *Landscape and Urban Planning* 84, 74-91.
- Hara, Y., Takeuchi, K. & Okubo, S. (2005): Urbanization linked with past agricultural landuse patterns in the urban fringe of a deltaic Asian mega-city: A case study in Bangkok. *Landscape and Urban Planning* 73, 16-28.