

Sustainable Groundwater Management in Asian Cities

a summary report of Research on Sustainable Water Management in Asia



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Freshwater Resources Management Project
Institute for Global Environmental Strategies

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Preface

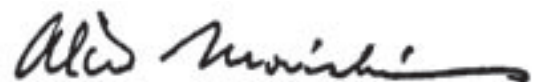
Groundwater is a fundamental and precious resource, providing reliable, good-quality and low-cost water for domestic, industrial and agricultural purposes. Many Asian cities depend on groundwater for sustenance and take advantage of the resource to facilitate economic activity. The rapid industrialization and urbanization taking place in Asian cities, however, have intensified the stress placed on this precious resource. In response to the growing demand for water, groundwater has been depleted due to excessive abstraction, and resultant land subsidence has been observed in some cities. Aquifer contamination with various types of pollutants is also a serious concern. Appropriate policy measures are urgently required to cope with the emerging problems and to manage groundwater in a sustainable manner.

With the significance of sound groundwater management in Asian cities in mind, the Freshwater Resources Management Project, led by Prof. Shinichiro Ohgaki, at the Institute for Global Environmental Strategies placed immediate research focus on groundwater management, particularly in the urban and peri-urban areas of Asian cities. Our research is intended to formulate better policy options for sustainable water management, taking into account the socio-economic and physical conditions. To facilitate our research and produce practical recommendations, case studies were carried out in Bangkok, Thailand; Ho Chi Minh City, Vietnam; Bandung, Indonesia; Tianjin, China; Colombo and Kandy, Sri Lanka; and Osaka, Japan.

The report entitled “Sustainable Groundwater Management in Asian Cities” is a summary of our research for these two years. This report consists of three main parts: 1) Recommendations for Sustainable Groundwater Management in Asian Cities, 2) Situation Analysis and 3) Summary of Case Studies. The first part highlights the recommendations for better groundwater management. The recommendations included were designed to address the most critical and timely problems associated with groundwater, which are now being observed in the rapidly industrializing and urbanizing Asian cities. The recommendations target various stakeholders, such as policymakers, who are involved in groundwater management. The second part, Situation Analysis summarises the background information of groundwater resources and its management in the cities where the case studies were conducted. This constitutes the basis of our recommendations. The third part compiles summaries of each case study conducted, which gives readers more detailed information of the groundwater management and recommended actions to improve current challenges in each of the case study cities.

Finally, I would like to offer my sincere gratitude to the research partners who directed the case studies in each country for their contribution to the research. It is my sincere wish that this report will help Asian cities pursue a sustainable path for groundwater use, thereby contributing to sustainable development.

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Akio Morishima
Chair of the Board of Directors, President,
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List of Abbreviations

ADA	Agricultural Development Authority, Sri Lanka
AWLR	Automatic Water Table Recorder
Bt	Thai Baht
COD	Chemical Oxygen Demand
DARD	Department of Agriculture and Rural Development, Viet Nam
MARD	Ministry of Agriculture and Rural Development, Viet Nam
DGR	Department of Groundwater Resources, Thailand
DI	Department of Industry, Vietnam
DONRE	Department of Natural Resource and Environment
DOSTE	Department of Science, Technology and Environment
DTPW	Department of Transportation and Public Works, Viet Nam
EC	Electric Conductivity
EIA	Environmental Impact Assessment
GDF	Groundwater Development Fund
GDP	Gross Domestic Product
GPP	Gross Provincial Product
GPS	Global Positioning System
GW	Groundwater
HCMC	Ho Chi Minh City
IWMI	International Water Management Institute, Sri Lanka
IWSW	Industrial Water Supply Works
MI	Ministry of Industry, Thailand
MONRE	Ministry of Natural Resources and Environment, Thailand/Viet Nam
MWA	Metropolitan Water Works Authority, Thailand
NCWR	National Water Resources Council
NEB	National Environment Board, Thailand
NGO	Non-governmental Organisation
NPA	
NWS & DB	National Water Supply and Drainage Board
OMWRM	Office of Minerals and Water Resources Management
PC	People's Committee, Viet Nam
PDAM	Regional Water Company, Indonesia
PWA	Provincial Waterworks Authority, Thailand
RGDP	Regional Gross Domestic Product
RID	Royal Irrigation Department, Thailand
Rp	Indonesian Rupiah
RTSD	Royal Thai Survey Department
SEA	Strategic Environmental Assessment
UNICEF	United Nations Educational, Scientific and Cultural Organisation
WHO	World Health Organisation
WRB	Water Resources Board, Sri Lanka
WSE	Water Supply Enterprise

[Symbols]

μ	Micro
Ag	Silver
Al	Aluminum
As	Arsenic
Cd	Cadmium
Co	Cobalt
Cr	Chromium
Cu	Copper
F	Fluorine
Fe	Iron
Hg	Mercury
Mn	Manganese
Ni	Nickel
P	Phosphorous
Pb	Lead
Se	Selenium
Zn	Zinc

Editorial Notes

The name of the city and what we called “case study cities” described in the report do not necessarily correspond with the administrative boundary of the respective cities. The following is the description of the actual coverage area of each case study city.

[Coverage area of each case study city]

Bangkok (2,844 km²): 7 Provinces namely, Bangkok, Nonthaburi, Samut Prakan, Pathumthani, Samut Sakhon, Nakhon Pathom, and Ayutthaya

Ho Chi Minh (2,095 km²): Ho Chi Minh City

Bandung (2,341 km²): Bandung Basin which includes a part of Bandung regency, Sumedang regency, Bandung city and Cimahi city

Tianjin (11,919 km²): Tianjin municipality

Colombo (1,575 km²): Twenty one divisional secretariat divisions*, namely Aththanagalla, Biyagama, Colombo, Divulapitiya, Dompe, Gampaha, Hanwella, Homagama, Ja Ela, Kaduwela, Katana, Kelanlya, Kollonnawa, Negombo, Mahara, Maharagama, Minuwangoda, Meerigama, Padukka, Wattala, and Sri Jayawardanapura Kotte

Kandy (322 km²): Five divisional secretariat divisions*, namely Gangawata Korale, Harispattuwa, Kundasale, Udunuwara, and Yatinuwara

Osaka (222 km²): Osaka city

** Sri Lanka has nine provinces which are subdivided into districts. The districts are further divided into the divisional secretariat areas.*

It should be also noted that there was a limitation in data availability and reliability in the case studies, although all the efforts have been made to obtain necessary and the most reliable data, and to appropriately interpret the data into the analysis conducted.