Reproduced from Water Issues in Southeast Asia: Present Trends and Future Directions, edited by Lee Poh Onn (Singapore: Institute of Southeast Asian Studies, 2013). This version was obtained electronically direct from the publisher on condition that copyright is not infringed. No part of this publication may be reproduced without the prior permission of the Institute of Southeast Asian Studies. Individual articles are available at http://bookshop.iseas.edu.sg

INDEX

A

Actiflo system in Malaysia, 171 ADB. See Asian Development Bank (ADB) agriculture growth rate in Indonesia, 116 surface water pollution in, 301 in Thailand, 266-67 water demand in, 105 water usage in, 13, 259 air pollution, 178 Amur River, 28, 46 water pollution in, 47-48 Aral Sea Basin, 65-68, 71-73 ASEAN, water quality in, 258 Asian Development Bank (ADB), 22-23, 38, 50, 174, 187, 194, 203n1 Asian financial crisis, privatization, 21, 77, 230, 232 Atienza, Lito, 189 Ayala Corporation, 225, 227, 228

B

Badawi, Abdullah, 95 Bakrie, Aburizal, 94

Bali, irrigation water in, 106 Bang Giang River, 290 Bangkok, urban areas in, 265 Bang Pakong Dialogue, 278, 279-80 Bang Pakong River Basin, 275-78 Bang Pakong River Basin Committee (BP-RBC), 278, 281 - 82Ba River, 290, 305 Basin Development Programme (BDP), 296 basin's fishery resources, 275 Bedok project, 246 bidding participants, 224-27 procedure, 21, 212, 215, 221, 225 requirements, 224-25 BOD, 186, 194, 196 Bonn International Freshwater Conference, 79 BOO contracts. See build-operateown (BOO) contracts BOOT. See build-operate-owntransfer (BOOT)

BOT. See build-operate-transfer (BOT) BP-RBC. See Bang Pakong River Basin Committee (BP-RBC) Brahamaputra River, 49 Brunei Darussalam surface water in, 4 water resources in, 2 build-operate-own (BOO) contracts, 20, 89, 139, 216 build-operate-own-transfer (BOOT), 214 contracts, 216 build-operate-transfer (BOT) contracts, 20, 89, 139, 216 project, 150 bumiputra, Malaysia, 138, 142

С

Cai Nha Trang River, 303, 304 Cai Phan Rang River, 303, 304 Cambodia freshwater usage in, 4 Mekong River Basin flows across, 287 tributaries of Mekong River flow to, 290 capacity-building programmes in Malaysia, 131, 132 in Thailand, 271, 280 capital expenditures (CAPEX), 137, 172n3 wrong planning on, 157-58 capitalism pure, 77 unbridled, 18, 77

Ca river basin, 289 Cau river basin, water quality in, 302 Central Asia, 43-46 damming rivers in, 36 environmental crisis, 43 geography of, 28 Lake Balkhash in, 28 central coastal plains, flood control measures in, 310-11 Central Java, floods and landslides in, 104 Central Vietnam estuary regions of, 303 floods in, 297 river basins of, 289 Chay River, Thac Ba on, 295 China climate change in, 32, 34 coal-fired plant in, 51 cultural force in, 27 damming rivers in, 36 dams construction in, 4, 10, 41, 42, 44 electricity in, 29, 41, 51 freshwater rivers in, 27, 35 hydropower plants in, 37, 49 irrigation systems in, 33, 48 Mekong River Basin flows across, 287 melting glaciers in, 31-34 population in, 35 power station in, 51 soil erosion in, 34 toxic spills in, 46 water conflict in, 9-11

water crisis in, 35-36 water sharing systems in, 4 cholera, 185, 219 civilization, 56, 119 civil society groups, 231 and Pasig, 196-200 climate change in China, 32, 34 in Southeast Asia, 256, 257 in Vietnam, 293 coal-fired plant in China, 51 coastal Central Vietnam, estuaries of. 303 coastal line, Vietnam's, 289 coastal plains, flood control measures in central, 310-11 coastal waters, coliform bacteria in, 183 community empowerment, dealing with environmental pollution, 201 community mobilization, 197 competitive bidding procedure, 21, 221, 225 Concession Agreement and privatization programme, 149, 166, 167 concessionaire Manila Water Company, 227-28 Maynilad Water Services Incorporated, 228-30 concessions method, PSP, 216 Construction cum Concession Agreement (CCOA), 149

consumer price index (CPI), 223 coordinated management of resources, 121 corporate agreement in Metro Manila, 216 cronyism, 88, 95 Czarist Russia, irrigated agriculture in, 66

D

DAF System. See Dissolve Air Flotation (DAF) System Dai Estuary, 303 dams construction in China, 4, 10, 41, 42, 44 diversion, 276 in Indonesia, 103, 114 in Malaysia, 137, 167 Mekong River, 37 Da Nang estuary parts of, 303 solid waste from, 304 Da Nhim hydropower plant, 303 Da River Hoa Binh on, 295 Huong Quang on, 295 decentralization, 77 and environmental policy, 15 - 16in Indonesia, 95 in Philippines, 179-82 Deep Tunnel Sewerage System (DTSS), 251-52 degradation, environmental, 22, 129.176 democratization, 78

DENR. See Department of Environment and Natural Resources (DENR) Department of Environment (DOE), 124, 130, 168 Department of Environment and Natural Resources (DENR), 176, 180, 181, 189, 207n50 estimated pollution sources, 185 Department of Irrigation and Drainage, 168 Department of Mineral and Geosciences, 168 Department of Public Works and Highways (DPWH), 189 Department of Water Resources (DWR), 16, 264, 266, 274, 277-78 Department of Water Resources Management, 307 Department of Water Supply (DWS), 129 deregulation, 87, 282 desalination membrane-based, 244 water in Singapore, 17, 23 dispute settlement mechanism, 223 - 24Dissolve Air Flotation (DAF) System, 171 Dissolved Oxygen (DO), 183, 186, 194 distribution supply system contracts project, 150 diversion dam in Thailand, 276 divestiture method, PSP, 216

Dong Nai River, 290, 305 Tri An on, 295 Dong Nai-Saigon River Basin, 302-3 drought in Thailand, 257 in Vietnam, 311 dry season, 288, 296 freshwater shortage during, 303 DTSS. See Deep Tunnel Sewerage System (DTSS) Dublin principles, 1, 58–61 Duerkop, Colin, 8 DWR. See Department of Water Resources (DWR)

Ε

eastern seaboard of Indochinese peninsula, 288 East Java, floods and landslides in, 104 ECAFE. See Economic Commission for Asia and the Far East (ECAFE) eco-innovations, 176 Economic and Social Commission for Asia and the Pacific (ESCAP), 69 Economic Commission for Asia and the Far East (ECAFE), 69 economic resource, water as, 109, 110 ecosystem integrity, 183 ecosystem services, water resources for, 258

Eighth Malaysia Plan (8MP) (2001-2005), 139, 144, 145-46 key strategies of, 129 electricity in China, 29, 41, 51 in Thailand, 268 El Nino, 257 phenomenon, 230 and river basin damage, 101 enabling environment, 127, 132 Enron-Arthur Andersen, 79 fiasco, 82 saga, 82 environmental awareness in Southeast Asia, 23 environmental degradation, 22, 129, 176 environmental disasters in Java, 104 Environmental Impact Assessement Law, 40 environmental impacts of PRRP, 194-96 environmental legislation in Philippines, 179, 182 environmental pollution. See also water pollution community empowerment dealing with, 201 **Environmental Preservation Areas** (EPAs), 190–92 Environmental Programme (EP), 201, 296 Environmental Protection Law, 309 environment policy in Philippines, 175, 180

ESCAP. *See* Economic and Social Commission for Asia and the Pacific (ESCAP) *esteros* in Pasig River, 176, 183, 188, 196, 202 Estrada, Joseph, 96, 187 estuaries of coastal Central Vietnam, 303 Dai, 303 Han, 303 water pollution in, 303–4 evapo-transpiration process, 122 extraordinary price adjustment (EPA), 223

F

FDIs, 94-96 Federations of Water User Associations (WUAFs), 115 flash floods in Thailand, 256 Flood and Typhoon Prevention and Control Boards (FTPCB), 297 floods control in Vietnam, 310 frequency of, 257 in Indonesia, 100, 104 in Java, 104, 118n3 in Malaysia, 13, 124 in Mekong Delta, 298-99 in Red River Delta, 297 in Thailand, 256 in Vietnam, 288 warning systems, 104 foreign currency differential adjustment (FCDA), 230 forest and river basin, 101

Four Taps of Singapore, 16, 250 freshwater resources, 286, 290 availability of, 1, 24n1 demand for, 7 largest volume of, 2 shortage of, 303 in Southeast Asia, 2, 5, 24n2 freshwater rivers in China, 27, 35

G

General Comment on the Right to Water, 213 geographic information system (GIS), 269 glacial lake outburst floods (GLOFs), 34 globalization, 80 harsh realities of, 83 global warming, 9, 29, 31, 32, 34 Global Water Awards 2008, 244Global Water Partnership (GWP), 61, 120 global water resources, 33 GLOFs. See glacial lake outburst floods (GLOFs) GMS. See Greater Mekong Subregion (GMS) Government of Indonesia (GOI), 107authority and responsibility of, 111-12 Greater Mekong Sub-region (GMS), 38, 50 groundwater, 258, 286, 301 exploitable, 293

resources, 168, 260–61 in Southeast Asia, 4 in Thailand, 260 Gulf Coastal Plain, 261 GWP. *See* Global Water Partnership (GWP)

Η

Han Estuary, 303 harness water, 10 Highland Towers event, 125 Himalayan region, 33, 34 Hoa Binh on Da River, 295 Ho Chih Minh City, 97 Hoi An, 303 human communities, infrastructure and utilities provision, 84-86 human development, water resource for, 286 Huong Quang on Da River system, 295 Huong River Basin, 298 hydrological cycle, 119 hydropower plant in China, 29, 37, 38, 49, 52 Da Nhim, 303 in Vietnam, 295 Hyflux, Singapore water company, 243

Ι

IACEP. See Inter-Agency Committee on Environmental Protection (IACEP) IFC. See International Finance Corporation (IFC) Ili River, 43 Indochina, hydropower projects in, 268 Indochinese peninsula, eastern seaboard of, 288 Indonesia agriculture growth rate in, 116 dams in, 103, 114 decentralization in, 95 economy, 116 Medium Term Development Plan, 116 municipal water system in, 108 provincial government of, 111 river basins deterioration in, 100 - 6sustainable water sector development programme in, 112-13 water demand rising in, 12-13 water resources in, 2 water scarcity in, 100 water sector development and programme in, 113-14 water sector road map in, 116-17 WRL, 109-12 Indus Basin, 63-65, 71-73 Indus River basin, 11 Indus River Commission, 30 industry, water demand in, 105 Inland Vietnam, river basins in, 291 Institute of Water Resources Planning, 307 integrated river basin management (IRBM), 121

coordinated management of, 121 Master Plan, 168 integrated water resources management (IWRM), 61, 120, 121, 131, 271-72 definition of, 59 principles, 110 processes of, 272 water governance and implications, 272-73 Inter-Agency Committee on **Environmental Protection** (IACEP), 178 International Chamber of Commerce (ICC), 224, 231 International Finance Corporation (IFC), 21, 220, 221 International Law Commission, 64 international river basin, 290 International Water Management Institute (IWMI), 278, 280-82 inter-state agreements, 66 investment, in wastewater treatment, 268-70 IRBM. See integrated river basin management (IRBM) irrigated agriculture in Czarist Russia, 66 irrigated paddy field in Indonesia, 114 in Java, 105 irrigation in China, 33, 48 condition of, 106 in Indonesia, 105-6 infrastructure, 114

in Java, 103 in Malaysia, 124 water demand for, 294 water in Bali, 106 water used for, 108 Irtysh-Ob River in Russia, 45 Irtysh River, 48 in Russia, 45 IWMI. *See* International Water Management Institute (IWMI) IWRM. *See* integrated water resources management (IWRM)

J

Jakarta water availability in, 102–3 water supply in, 102 Java environmental disasters in, 104 irrigation water in, 106 rainfall in, 101 water potency in, 103 Johannesburg Plan of Implementation (2002), water supply, 1 Johor privatization in, 20 water revenues in, 144

K

Kazakhstan, environmental activists in, 45 Khorat Plateau, rainfall in, 261 Kien Giang province, shortage of water in, 298 Klang Valley water crisis (1998), 144, 158 Konsortium ABASS, 148 Ky Cung River in Lang Son, 290

L

Lake Balkhash, 43, 44 water problem in, 48 Lancang, 37 Lancang Jiang river, 10 land, management of, 120, 133 landslides, 125, 256, 257 in Java, 104, 118n3 land use planning, 133 Lang Son, Ky Cung River in, 290 La Nina, 257 Lao People's Democratic Republic (Lao PDR), 256, 258-59 Laos Mekong River Basin flows across, 287 tributaries of Mekong River flow to, 290 Law on Water Resources of Vietnam, 305, 307 leases method, PSP, 215 Lee Kuan Yew, 246 LGC. See Local Government Code (LGC) LGUs. See Local Government Units (LGUs) LMB. See Lower Mekong Basin (LMB) Local Government Code (LGC), 180, 205n20 Local Government Units (LGUs), 15, 180, 181, 264

Lower Central Plain, 261 Lower Mekong Basin (LMB), 68 Lower Peirce Reservoir, 245

Μ

Malaysia, 119 Actiflo system in, 171 bumiputra in, 138, 142 capacity-building programmes in, 131, 132 current initiatives, 128-32 dams in, 137, 167 development projects in, 131 diminishing biodiversity in, 123, 124, 127 emerging issues in, 123-25 financial crisis in, 151 flood occurrences in, 123 forest management in, 168 groundwater resources in, 122 land based developments, 128 management issues, 125–28 Ministry of Agriculture, 168 national development policy in, 138 national policies and plans, 130 National Privatization Policy in, 20, 142 peat swamp areas, 125 pollution of water in, 14 privatization in water supply. See privatization in water supply, Malaysia privatization of water, 20-21 privatized projects in, 139-42 project financing in, 152-53 water demand in, 12, 124

water-related agencies, 127 water resource management in, 132 water resources in, 2, 122–23 water revenue, 145 Malaysia Environmental Quality Report 2003, 169 Malaysia Incorporated Policy, 138 Malaysian Constitution, natural resources management, 15 Malaysian rivers deterioration by pollution, 146 quality of, 146 Malaysia Water Forum, 128 management contracts method, PSP, 215 Manila water privatization in, 213 water system, 21-22 Manila Bay, 183, 186, 220 Manilad project, 96 Manila Water Company, 227–28 promising case of, 233-35 MARD. See Ministry of Agriculture and Rural Development (MARD) Mar del Plata Action Plan (1979), 1 Marina Basin, Singapore, 17 Marina reservoir, 250–51 Ma River, 288, 289 massive clean-up operation in Singapore, 247 Maynilad Water Services, 21-22, 25n14, 213 Maynilad Water Services Incorporated, 228-30, 231-33

MDGs. See Millennium
Development Goals (MDGs)
Medium Term Development Plan
(MTDP), 116, 206n49
Mekong Agreement, 11, 69, 70, 73,
296
Mekong Basin, 22, 51, 68–73
fisheries in, 38
water problem in, 48
Mekong River, 29, 33, 36, 287, 295
and China's dam-building
activities, 10
dams, 37
riparian countries of, 4
tributaries of, 290
Mekong River Commission
(MRC), 11, 22, 23, 30, 37, 38,
41, 42, 69, 296
Mekong River Delta, 290, 293, 296
flood control measures, 311
flood in, 297, 298-300
melting
glaciers in China, 31–34
point of Mount Everest, 32
membrane-based desalination, 244
Membrane Bioreactor (MBR), 250
membrane technology, 249, 250
Metro Manila, 221
case of, 218–20
chronic water pollution in, 176
corporate agreement in, 216
environmental issues in, 179
pre-privatization water
provision in, 217-20
privatization in. See
privatization in Metro
Manila

river pollution in, 185 solid waste in, 183 urbanization of, 186 Metro Manila Development Authority (MMDA), 189 Metropolitan Manila. See Metro Manila Metropolitan Waterworks and Sewerage System (MWSS), 21, 22, 212, 218, 219 pre-privatized, 219 privatization of, 212 Regulatory Office (RO), 222 Metropolitan Waterworks Authority (MWA), 265 Meulle del Rio linear park, 190, 191 mgd. See million gallons per day (mgd) Millennium Development Goals (MDGs), 1, 213, 263 million gallons per day (mgd), 249, 250 Ministry of Agriculture and Rural Development (MARD), 305, 307, 308 Ministry of Construction (MOC), 305, 308 Ministry of Industry (MOI), 305, 308 Ministry of Natural Resources and Environment (MONRE), 168, 307, 308 Ministry of Public Works (MPW), 129 MOC. See Ministry of Construction (MOC)

Monterrey Consensus, 80-82 Morgan, Jennifer, 34 Mount Everest, melting point of, 32 MRC. See Mekong River Commission (MRC) muddy banks, 248 municipal water system in Indonesia, 108 in Jakarta, 102 MWA. See Metropolitan Waterworks Authority (MWA) MWSS. See Metropolitan Waterworks and Sewerage System (MWSS) Myanmar hydropower development plan in, 41 Mekong River Basin flows across, 287 MRC meetings, 37 water resources in, 2

Ν

Nam Rom, 290 national development policy, in Malaysia, 138 National Economic Action Council (NEAC), 95 National Environmental Protection Council (NEPC), 178 national leadership, in Russia, 47 National Medium Term Development Plan, 114 National Pollution Control Commission (NPCC), 177, 178, 186 National Privatization Policy, in Malaysia, 20, 142 national river basin, 290 National Water and Air Pollution Control Commission (NWAPCC), 177 National Water Crisis Act, 220 national water management, challenges of, 12-18 National Water Master Plan, 148 national water policy (NWP), 129, 130, 147 National Water Resources Committee (NWRC), 273, 274 National Water Resources Council (NWRC), 16, 129, 130, 148, 168, 307, 309 National Water Resources Study, 122 in Malaysia, 137 nationwide distribution, of water, 267 natural disasters, in Vietnam, 296-300 natural environment, 121 Navatos-Tullajan-Tenejeros River system, 183 NEAC. See National Economic Action Council (NEAC) Negri Sembilan, water crisis in, 12 neo-liberalism, 76, 77 NEWater, 244 plants, 93, 250 in Singapore, 7, 17, 23, 249-50

NGOs. See non-governmental organizations (NGOs) Nhan Dan newspaper, 298-99 Nha Trang, 304 Nhue-Day River Basin, water quality problems in, 301-2 Ninh Hai district, 298 Ninh Phuoc district, 298 Ninh Thuan province, 297 Ninth Malaysian Plan (2006–10), 140, 145, 146 nitrobenzene, 47 non-consumptive water sectors, 294, 295 non-governmental organizations (NGOs), 128, 189, 190, 198 non-municipal water system, in Jakarta, 102 non-revenue water (NRW), 219, 223 increasing rate of, 145-46 problem of, 157 North Central Vietnam, Ma River in. 288 northern sea, salinity of, 65 NRW. See non-revenue water (NRW) Nu River, hydropower project on, 39,40 NWP. See national water policy (NWP) NWRC. See National Water **Resources** Committee (NWRC); National Water Resources Council (NWRC)

Ο

Office of National Water Resources Committee (ONWRC), 273 old Peirce Reservoir, 245 ONWRC. *See* Office of National Water Resources Committee (ONWRC) Operations and Management (O&M) fund, 106 OPP3. *See* Third Outline Perspective Plan Oregon State University, 30 ozone layer, 31

Р

paddy field irrigation in Indonesia, 114 in Java, 105 Pahang, water revenues in, 144 PAM JAYA, in Jakarta, 102 Pangestu, Marie, 94 participatory irrigation management (PIM), 115-16 Pasig River, 182-85, 207n52 chronic pollution of, 200 civil society, 196–200 environmental impacts, 194 - 96rehabilitation of, 196-200 relocation and resistance, 193 - 94reviving, 186-88, 200-3 solid waste in, 183 ten-metre easements, 190-92

Pasig River Rehabilitation Commission (PRRC), 188-90, 194 Pasig River Rehabilitation Project (PRRP), 175, 200 environmental impacts of, 194-96 relocation and resistance, 193 - 94ten-metre easements in, 190-92 peat swamp areas, in Malaysia, 125 Penang privatization, 20 water revenues in, 144 3P engagement approach, 252–53 Perusahaan Daerah Air Minum (PDAM), 108 Phan Rang-Thap Cham, 298, 304 Phathum Thani Water Supply Project, 266 Philippines community involvement in, 179 environmental legislation, 179, 182 environment policy in, 175, 180 foremost urban centre, 218 government conflict in, 179–82 groundwater sources in, 4 incomplete decentralization in, 179-82 institutional capacity, 15 LGUs, 15 limitations of state authority, 176 - 79

local-central government conflict, 179-82 Marcos Martial Law, 190 Medium Term Development Plan (MTDP), 206n49 rainfall in, 217 river pollution in, 4 water demand rising in, 13 water pollution in, 14, 176 water privatization in, 21-22, 212 water supply in, 217 Phuoc Son commune, 298 Phu Yen province, 297 PIM. See participatory irrigation management (PIM) Ping River Basin, Chiang Mai of, 270piped water system, private sector in, 265-66 polluter-pays-principle (PPP), 269 - 70pollution, 181 air, 178 estuaries, 303-4 in Indonesia, 101 Malaysian rivers deterioration by, 146 river banks, 248 source of, 185-86 in Southeast Asian countries, 13 - 14of surface water, 301-4 water. See water pollution population in China, 10, 35

estimation of, 259 and Indonesia's water supply, 108 rural, 259 post-Cold War, 80 potable water, 250 to NEWater, 253 provision of, 84 reliable supply of, 245–46 and sanitation, 86 poverty, in Indonesia, 116 power station, in China, 51 PPP. See polluter-pays-principle (PPP); public-private partnership (PPP) pre-privatization water provision, in Metro Manila, 217-20 Presidential Decree 984, 177 Presidential Decree 1151, 177 Presidential Decree 1152, 177 Presidential Taskforce on the Rehabilitation of the Pasig River (PTRPR), 187 private concessionaire, 216 private-public partnerships, 92–93 private sector, 221, 261 in piped water system, 265-66 role in Malaysian economy, 137, 138 role in water supply industry, 144 in urban WSS, 214 in water sector, 18-20 private sector participation (PSP) BOT/BOOT/BOO contracts, 216 concessions, 216

divestiture, 216 leases, 216 management contracts, 215 service contracts, 215 privatization, 136 key issues in, 86-88 Philippines, 21–22 of water sector, 18-21 Privatization Cum Concession Agreement (PCCA), 149 privatization debate, global trends impacting on, 76-78 privatization in Metro Manila, 19, 213, 221 dispute settlement mechanism, 223 - 24minimal opposition to, 224 MWSS-Regulatory Office, 222 process of, 230 pros and cons of, 213-17 rate-setting procedures, 223 service obligations, 222-23 of urban water services, 217 privatization in water supply, Malaysia achievement, 139-42 benefits of, 171 ensuring water for future, 147 - 48historical development, 138-39 investment, 144-45 issues and challenges, 167-71 need for, 145-48 treated water distribution by SYABAS, 153-64 of water distribution, 164-67

of water services, 142-44 of water treatment, 148-50 Privatization Master Plan (PMP), in Malaysia, 138 privatized projects financing by PNSB, 150–53 in Malaysia, 139-42 privitization of water services, Southeast Asia failures and emerging trends, 86-88 infrastructure and utilities provision, 84-86 privatization debate, global trends impacting on, 76-78 public-private partnership. See public-private partnership (PPP), Southeast Asia social goods and services privatizing, 89-90 water and social reform sectors, 78-84 PR management, of PPP, 91–92 Provincial Waterworks Authority (PWA), 265, 266 PRRC. See Pasig River Rehabilitation Commission (PRRC) PRRP. See Pasig River Rehabilitation Project (PRRP) 3P (people, public and private) sectors, 18 PSP. See private sector participation (PSP) PUB. See Public Utilities Board (PUB)

public-private partnership (PPP), Southeast Asia, 87, 93-97 concept of, 89-90 different rationales and challenges, 93-97 economic advantages of, 91 hazards of, 90-91 to high sovereign risks, 91 importance of, 81 as privatization, 18-19 PR management of, 91–92 social goods and services, privatizing, 89-90 public sector, 264 Public Utilities Board (PUB), 17, 18, 243, 245, 248, 249 3P partners, 253 strategy in stormwater, 252 tagline, 244, 253 Puncak Niaga Holdings Berhad (PNHB) external borrowings, 152-53 flotation of, 151-52 Puncak Niaga (M) Sdn Bhd (PNSB) challenges faced by, 172 privatized projects financing by, 150 - 53technological commitments, 170-71 water treatment by, 148–50 pure capitalism, 77 PWA. See Provincial Waterworks Authority (PWA)

Q

Qinghai-Tibet Plateau, 27, 31, 32

Quang Ngai, 304

R

rainfall in Java, 101 in Malaysia, 122 in Philippines, 217 in Vietnam, 13, 289, 296 rainy season, 288, 296 Ramos, Fidel, 220 rapid economic development, 259, 262Rasa water treatment plants (WTPs), development of, 157 - 58Rate of Return on Base (RORB), 223 raw water demand in urban areas, 105 deterioration of quality, 20, 146 - 47pollution, 169 quality, 168 supply, 114, 122 RBCs. See River Basin Committees (RBCs) recreational activities indulge in, 251 reservoirs for, 253 Red River, 48, 288, 289, 293, 295 flood control measures, 310 Red River Delta, flood on, 297 Registry of River Basins (RRB), 131 regulatory environment, for water supply services, 167-68

Regulatory Office (RO), 221 creation of, 236 MWSS, 222 reservoirs, for recreational activities, 253 rice production in Indonesia self-sufficiency in, 105 slowdown in, 108 river banks, pollution in, 248 river basin, 120, 123, 126, 129, 133 agreements as facilitators, 11-12, 24 Chinese actions in, 11 deterioration in Indonesia, 100 - 6development principles, 113, 114 establishment of organization, 274human activities in, 121 management, 271-72 planning, 308 in Vietnam, 288-94 River Basin Committees (RBCs), 271, 274, 277-78 River basin management units (RBMUs), 131 river beds, 248 river pollution in Metro Manila, 185 in Philippines, 4 RO. See Regulatory Office (RO) "roof of the world", 32 Royal Irrigation Department, 267 rural areas, 263-65 Russia, 46-48

environmental activists in, 45 geography, 28 Irtysh-Ob River in, 45 Irtysh River in, 44 transboundary rivers, 28 water-dependent neighbours in, 27 Russian revolution, 66

S

Sabah, water revenues in, 144 Salween River in China, 48 in Myanmar, 39 sanitation services, 213, 214, 234 SeBang Hien, 290 Second Water Forum of The Hague, 79 Second World Water Forum, 136 sedimentation, 106 Sekong, 290 Selangor pollution in, 146 raw water pollution, 169 water supply privatization in, 140, 142, 144 Sembcorp Industries, 243 SEPA. See State Environmental Protection Agency (SEPA) service contracts methods, PSP, 215Se San River, 290 Yaly on, 295 Seventh Malaysia Plan, 144 sewerage, 219, 234 department, 247

privatization project, 240 Shanghai Cooperation Organization (SCO), 50 shared water resources, among nation-states, 9 Singapore, 287 application of technology, 243 cleaning up of river, 246-48 desalinated water in, 17, 23 Four Taps, 16, 250 freshwater usage in, 4 massive clean-up operation in, 247 NEWater, 249-50 PPP in, 97 PUB corporate tagline, 244 reservoir in, 251, 252 sustainable water supply in, 244 United Nations World Water Development Report, 244 water constraints in, 16-18 water infrastructure in, 7 water resources in, 2 water supply management in, 248 - 52Singapore International Water Week, 17, 244 Singapore's first seawater desalination project, 93 social goods and service importance of, 78 privatization, 89-90 social redistribution for, 88 social reform sectors, 78-84 socio-economic development, 311 sustainable, 78, 80, 81

Soc Trang, 300 soil erosion in China, 34 in South Asia, 34 solid waste, from Da Nang city, 304 Songhua River, 28, 46 toxic spill, 48 Son La Upper Hoa Binh dam, on Da River, 295 South Asia agriculture in, 28 glaciers in, 33 industry in, 28 soil erosion in, 34 Southeast Asia, 36-43 agriculture in, 28 average water availability per capita in, 286 climate change in, 256, 257 demands and available of water in, 5, 6 downstream countries in, 29 environmental activists in, 42 environmental awareness in, 23 environmental crisis in, 174, 175 freshwater resources in, 2, 5, 24n2 glaciers in, 33 groundwater in, 4 industry in, 28 Mekong basin in, 37 Mekong River in, 33 privitization of water services. See privitization of water services, Southeast Asia

public-private partnership. See public-private partnership (PPP), Southeast Asia soil erosion in, 34 stock of water resources, 256 urban planning in, 175 water-dependent neighbours in, 27 water in, 5-8 water pollution in, 174 water statistics in, 4 Southeast Asian region water conflict in, 9-12 water scarcity in, 12 Soviet Union, water management in, 67 space, water resources variation with, 296-300 spillover effects, 10 Sre Pok, 290 state authority limitations, in Philippines, 176–79 State Environmental Protection Agency (SEPA), 47 State of Water Resources Management Report, 2, 24n3 stormwater management, PUB's strategy in, 252 Sungai Selangor Phase 2 (SSP2), 149, 150 surface water in Brunei Darussalam, 4 pollution of, 301-4 resources, 168, 292, 295 utilization, licence issues for, 111

sustainability, forms of, 176 sustainable development, Johannesburg summit on, 83 sustainable irrigation, 108 sustainable socio-economic development, 78, 80, 81 sustainable sources, of water, 2, 3 sustainable water management strategy, 243, 244 sustainable water resources management, 58, 295-301 essential elements of, 61-63, 71, 72 sustainable water sector development programme, 112 - 13sustainable water supply, in Singapore, 244 Syarikat Bekalan Air Selangor Sdn Bhd (SYABAS), 148 challenges faced by, 172 client charter, 166 concept of penalty, 165 financial, 164-65 indebtness, 153-56 operating deficit, 158-60 poor billing, 160-62 poor planning in capacity development, 162-64 privatization of water distribution by, 153 problem of high NRW, 157 to reducing NRW, 170 regulation by government, 166-67 wrong planning on CAPEX works, 157-58

Syarikat Pengeluar Air Selangor Sdn Bhd (SPLASH), 148, 157 Syr Darya river, 65

Т

technological commitments, in water supply services, 170-71 Telekom Malaysia, 139 Tenaga Nasional Berhad, 139 Thac Ba, on Chay River, 295 Thach Nham irrigation system, downstream of, 304 Thai Binh River, 290 flood control measures, 310 Thailand Bang Pakong dialogue, 278, 279 - 80Bang Pakong river basin, 275-76 capacity-building in, 271, 280 diversion dam in, 276 drought in, 257 establishment of river basin organization, 274 factors affecting water uses in, 258 flash floods in, 256 governments of, 41 groundwater system in, 260 hydrological balance studies on, 260 hydropower development plan in, 41 institutional capacity, 15 introduction, 255-58 IWRM, 271-73 Mekong River Basin flows across, 287

MWAs and PWA, 265-66 NWRC and ONWRC, 273 population of, 260 river basin management, 271-72 river basins in, 260 surface water resources, 260 water and agriculture, 266-67 water and electricity, 268 water demand rising in, 13, 262 water governance in, 272-73 water management in, 262 water provision, 262 water quality and investment in wastewater treatment, 268 - 70water resources, 258-59 water resources management, 262, 276-78 watershed management and conservation, 270-71 water supply to rural areas, 263-65 water supply to urban areas, 265 Third Outline Perspective Plan (OPP3), 128, 129 Third World Water Forum, themes for, 60 Three Gorges Dam, on Yangtze River, 37, 40, 49 Thua Thien Hue province, 298 Thu Bon-Vu Gia, estuary regions of, 303, 304 Tibetan Plateau, 27, 31, 32, 33-34, 36 Tibet, Yarlung Zangbo in, 49

time, water resources variation with, 296–300 toxic spill in China, 46 in Songhua River, 48 trade, in China, 51 Tra Khuc River, 303 transboundary maze, 29–30 transboundary river, 28 transboundary river basin, 290 Tri An, on Dong Nai River, 295 tropical land, 258 Tu Duc project, 97

U

UK, water privatization in, 87 Ultraviolet B (UVB) radiation, 31 unbridled capitalism, 77 UN Committee on Economic, Social and Cultural Rights, 213 **UN Environment Programme** (UNEP), 44 UNEP. See UN Environment Programme (UNEP) UNESCO. 40 United Nationals World Water Development Report, 2, 7, 25n11 United Nations agencies, risk of wars, 30 United Nations Development Programme (UNDP), 69 United Nations Environment Programme (UNEP), 203n2

United Nations World Water Development Report, 244 Upper Central Plain, 260-61 URAs. See urban renewal areas (URAs) urban areas, 265 surface and groundwater use in, 102 water supplies in, 265 urban development, 176 urbanization, 38, 119 urban management, of water, 24 urban population, statistical survey of, 259 Urban Redevelopment Authority, 247 urban renewal areas (URAs), 188, 199 urban water services, privatization of, 217 urban water supply and sanitation systems, 214

V

Vam Co Tay River, 311 Variable Salinity Plant (VSP), 250 Vietnam, 287 climate change in, 293 coastal line, 289 floods control in, 310 institutional problem, 15 Mekong River Basin flows across, 287 natural disasters in, 296–300 pollution of water in, 14 rainfall of, 289, 296 river basins in, 288–90 water consumption by, 300 water demand rising in, 13 water quality in, 293, 301–3 water resources in, 290–94 water resources management in, 305–12 water utilization in, 294–95

W

Wangsa Maju water treatment plants, 149 DAF for, 171 Washington Consensus, 81 wastewater discharge, 301 treatment, 268-70 water for consumption, 263 demand, 261-62 inefficient use of, 261 legal jurisdiction, 15 legislations, 168 loss, 146, 219, 231 management of, 120, 133 nationwide distribution of, 265 need for, 257 private sector participation in, 214, 215-16 provision, 261-62 stealing, 169 trends in, 6 water absorption capacity, in riverside, 104 water allocation, for agriculture, 267

water availability, 102, 255 in Jakarta and West Java, 102-3 and sanitation, 2, 3 water catchment areas, 250-51, 252 water constraints, in Singapore, 16 - 18water consumption, 294-95 conflicts from rapid increase in, 300 - 1in Southeast Asia, 5, 10, 12-13 water crisis, 2, 16, 21 in China, 35-36 Klang Valley, 144, 158 water demand, 12-13, 162, 163 in agriculture, 105 domestic and industrial, 124 for irrigation, 294 management, 252-53 resources, 296 rising, 12-13 water provision and, 261-62 water distribution, privatization of client charter, 166 concept of penalty, 165 financial, 164-65 regulation by government, 166-67 Water Efficient Buildings Programme, 18, 253 Water Efficient Homes Programme, 18, 253 water governance, in Thailand, 272-73 water infrastructure, 116, 117 damaging, 106

Water in Thailand, 255-57 and agriculture, 266–67 Bang Pakong dialogue, 278, 279 - 80Bang Pakong River Basin, 275 - 78and electricity, 268 ground water resources, 260-61 provision and demand, 261-62 resources, 258-59 resources management, 262 rural areas, 263 surface water resources, 260 urban areas, 265 water issues institutional capacity and, 14–16 on political agenda, 168 research programme on, 7 water management challenges of national, 12-18 issues in Southeast Asia, 2, 5 sustainable, 71, 72 in Thailand, 262 in watersheds, 288 water management system formulation of, 62 in Soviet Union, 67 water pollution, 268, 288 in Amur River, 47-48 benzene compounds in Amur River, 46–48 control practices in Thailand, 269 crisis, 46 in estuaries, 303-4 in Malaysia, 14, 146

in Metro Manila, 176 raw, 169 in Southeast Asia, 2, 3, 13-14, 174 water privatization in Philippines, 212 in UK, 87 water privatization in Metro Manila, 213 dispute settlement mechanism, 223 - 24MWSS-Regulatory Office (RO), 222 pros and cons of, 213-17 rate-setting procedures, 223 water quality, 257, 269, 312 in ASEAN, 258 in Cau river basin, 302 in Jakarta, 108 in Vietnam, 293, 301-3 in wastewater treatment, 268-70 water reform sectors, international exigencies in, 78-84 water resources, 255, 257 availability of, 260 in Brunei Darussalam, 2 budget development, 259 development of, 167-68 for ecosystem services, 258 in Indonesia, 2 in Myanmar, 2 planning, 308-9 policy lessons for managing, 22 - 24population growth and, 256 projects, 148

protection of, 258 Southeast Asia's stock of, 256 surface, 260 water resources act, 272 water resources in Vietnam, 288 - 94facing environmental problems, 303 - 4problems of, 305 sustainable management of, 295-301 variation of, 296-300 Water Resources Law (WRL), 109-12, 309 water resources management, 15, 276 - 78challenges in, 263-72 integrated, 58-61 IWRM, 280-82 measures for, 309-12 organization of, 305-7 practices, 308-9 sustainable. See sustainable water resources management in Thailand, 262 water scarcity, 5, 7 growing, 12 in Jakarta, 102 water sector development in Indonesia, 113 - 14infrastructure, 117 water sector reform, Indonesia, 101 need for, 107-8

origins of, 107 principles of, 108-9 water sharing systems, 4, 5 watershed management, and conservation, 270–71 watershed management in Vietnam, 305 measures for, 309-12 practices, 308-9 water shortage, on future, 2 water statistics, in Southeast Asia, 4 water supply, 215, 218, 263 MWR and PWR, 282 in Philippines, 217 private operators in, 137 privatization in Selangor, 140, 142, 144 quality control of, 265 to rural areas, 263-65 water supply and sanitation systems (WSS), 213, 214, 215 water supply, Malaysia coverage level, 165 planning, 164 privatization of. See privatization in water supply, Malaysia water supply management desalination, 249 DTSS, 251-52 Marina reservoir, 250-51 NEWater, 249-50 new technologies, 250

in Singapore, 16, 248-52 stormwater management, 252 water treatment, 250, 251 operators, 154 privatization of, 148-50 process, 146 water treatment plants (WTPs), 20, 148, 149 development of, 157-58 operators, 153-55 water utilization, in Vietnam, 294 - 95Water Utilization Programme (WUP), 296 Wen Jiabao, 40, 50 West Java, water availability in, 103World Bank, 35, 63, 81, 185, 214 World Conservation Union (IUCN), 52n1 World Economic Forum Global Competitiveness Index, 94 World Environment Day, 44 World Summit on Sustainable Development (WSSD), 120 World Water Forum, Third, 60 World Wide Fund for Nature (WWF), 34 WRL. See Water Resources Law (WRL) WSS. See water supply and sanitation systems (WSS) WSSD. See World Summit on Sustainable Development (WSSD)

WTPs. See water treatment plants (WTPs) WWF. See World Wide Fund for Nature (WWF)

Х

Xiaowan, hydroelectric power dam on, 37 *Xinhua News Agency*, 32, 52n7 Xinjiang Uighur Autonomous Region, 43

Y

Yaly, on Se San River, 295 Yangtze River, 35 Three Gorges Dam on, 37, 40, 49 Yarlung Zangbo, in Tibet, 49