

Index

Note: Page references in *italic* refer to tables in the text, those in **bold** to figures and the letter n indicates material in the endnotes

- Abay-Ad* 121–122
Abba Adere 135–136
Abba Konfi 136
Abba Laga 135–136, 137, 142–143
abbaa gadaa 151–152
Abidjan 89n
abstraction hydrograph 234, **235**
access, open 17–18, 24
adat law 21
adjudicated lands, Kenya 182–183, 200, 209n
Africa
 land rights 14–15, 18–19, 20, 59–60
 water demand management 74–75
 water rights 13, 15–16, 17–18
 see also named African countries
African Development Bank 2, 252
al aela fil aela rule 119, 127
Algeria 116
alienation rights 16, 25n, 62–63n 126
Amharas 132, 134, 136
Anambar Plain, Pakistan 127–128
Andean countries **97**
 Bolivia 6, 98, 99, 106–107, 108, 109n
 Chile 17, 53, 57–59, 60, 61, 97, 105–106
 Ecuador 98, 104–105, 107–108, 109n 110n
 irrigation management transfer 91n
 local (indigenous) water rights 97–99
 legal recognition 103–108
 social and political construction 99–100
 Peru 98
 protests against water policies 98–99
apartheid 18, 54, 253–255
araara institution 152
araddaa 153
Asia
 land rights 19
 see also named Asian countries
ateetee institution 152
Australia 62, 70
authority, community 16, 73, 74, 84–85, 189, 219
Awash National Park, Ethiopia 147
Awash river basin, Ethiopia 146, 147, 147–148
Aymara communities, Bolivia 107

balawarante (Hygrophila auriculata) 133
bas fonds, Burkina Faso 19
basin institutions 9
basin management initiatives, Tanzania 229–230, 245–246n
Bedouin 21
Beneficiary Farmers' Associations (BFAs) 76, 91n
Berbers 21
Bin Ibrahim Al-Gabarty, Sheikh 123
Bolivia 6, 98, 99, 106–107, 108, 109n
Borana Oromo (Boran) 21, 149, 156n
Borana zone, Ethiopia 148–149, 156n
 conflict resolution institutions 149–152, 156n
 cultural administrative structures 152, 153
 ethnic groups 149
 relationship of statutory:customary institutions 154–155
 water management 152–154
boreholes
 Kenya 188
 Zimbabwe 258
Botswana 17
Briscoe, John 87
British colonies 18, 54
British South Africa Company (BSAC) 254
Brooke Bond Tea Company 55
bunds, breaching rules 117, 118
Bureau of Indian Standards 80, 86
Burkina Faso 16, 19

- caffee* 151
 capacity building, farmers 220
 cash crops 126, 206
 catchment apportionment 228
 definitions and theory 233–234
 Great Ruaha basin 236–237
 intake design
 proportional/flexible 239–243
 standard improvement 8, 230–232, 234, 242
 legal-infrastructural framework for (LIFCA)
 237–243
 transparency 231
 Catchment Management Authorities (CMAs), Malawi 224
 catchment water user associations (CWUAs) 237, 238
 Catholic dioceses 55
 cattle, access to water 15, 19, 152–154
 cheffe (*Cyperus latifolius*) 133, 135, 137
Cheffe Kore 135, 136
 chiefs 16, 189, 219
 Chile 17, 97
 Ley Indígena 106
 Water Code (1981) 53, 57–59, 60, 61, 105–106
 China
 electricity supply industry 73–74, 90n
 groundwater regulation 70–71
 irrigation reforms 85
 village authorities 73, 74, 85
 Chinamasa, Patrick 257
 Choclococha project 98
 cities, *see* urban water supply
 codification of rights 23
 spate irrigation 123–124
 wetland management institutions 137, **138**
 coffee production 135
 collection of water, households 146, 186, 187
 collective action, Andean countries 98–99
 collectives 8
 collectivization of agriculture 121
 Colombia 91n
 colonial policies
 Andean countries 103, 106–107
 India 89n
 Kenya 165, 178
 Latin America 52–53
 Tanzania 53–55
 Zimbabwe 249, 253–255
 command area development agencies (CADAs) 76, 91n
 commercial farms, Kenya 184–185
 commercial water use, Zimbabwe 257–258, 259, 266n
 common law 18, 51, 52
 common property 17, 67, 89n
 Communal Areas, Zimbabwe 254–255
 community-based natural resources management (CBNRM) 131–132
 Ethiopia 152–156
 community-based water law
 academic understanding 2–3
 applications beyond community 6
 defined 2
 incentive structures 7
 inequities of 6–7, 9
 interface with state 3, 7–8
 and livelihoods 6–7
 rule enforcement 7, 71–74, 120–123
 strengths of 2–3, 5–6, 10
 community-based water management
 application of institutional design principles 32–37
 financial empowerment 192–193
 gender roles 186–187, 190
 Concern Universal 220, 221
 Confederation of Indigenous Nationalities of Ecuador (CONAIE) 107–108
 conflict 20–21, 25n
 Andean countries 98–99
 categorization of 147
 Kenya 21, 202, 204
 pastoralists 19, 21, 147, 149
 permit systems 61
 conflict resolution, gadaa system 149–152, 156n
 constitutions, written 137, **138**
 Convention on Economic, Social and Cultural Rights (CESCR) 249, 251–252, 256, 263
 Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) 250, 253, 266n
 Convention on the Rights of the Child 250
 cooperatives
 electricity 74
 fisheries 77, 78–80, 83, 85, 92–93n
 irrigation 75–76
 tube wells 80–81, 92n
 cotton 126
 ‘council of elders’ 92n 152
 crops
 commercial/cash 91n 126, 206
 spate irrigation systems 119–120, 125–126, 127
 customary norms
 formalization 21
 Kenya 182–183, 189
 Zimbabwe 249, 260–263

Dado 136–137
dambo cultivation 255, 261–263, 266n
 Danish International Development Assistance (DANIDA) 54, 217
de minimis water use rights 56
Debo 136–137
 decentralization policies
 Kenya 159–160, 161–162
 Malawi 212, 218–221
 Zimbabwe 250, 265n

- defluoridation plants 77, 80, 83, 86, 91–92n
 Delhi 88
 demand management
 electricity 72–74
 water 74–75, 88, 202, 204, 224–225
 Derg regime 134–135, 137, 139, 147, 156n
 developed countries 51–52, 62–63n 67, 68, 69, 89n
 Dhan Foundation 77, 86
dheeda 153
 diesel pumps 82
 discrimination
 and human rights to water 252–253
 water permit systems 49, 59–61
 disease 175, 205, 208
 dispossession
 colonial water law 52–53
 water permit systems 48, 54–55
 ditch managers, China 85
 domestic water 16, 56
 collection 146, 186, 187
 exclusion from regulations 70
 India 67–68
 Kenya 158–159, 164
 Malawi 224–225
 drinking water
 privatization, Bolivia 99
 Zimbabwe 260–261
 see also primary water
 drought 13, 21, 72, 149
 dry season, irrigation water allocation 235–236, 237, 238
 Dublin Principles 1, 249, 265n

 economic growth, and water sector formalization 67, 68–69
 Economic Structural Adjustment Programme (ESAP) 253
 Ecuador 98, 104–105, 107–108, 109n 110n
 elders 92n 121–122, 150, 151, 152, 189
 electrician, village 73, 90n
 electricity, hydropower 58, 233, 236–237
 electricity charging 72–74
 China 73–74, 90n
 India 72–73, 74, 85–86
 Mexico 71
 energy-irrigation nexus 72–73
 enforcement of rights/rules 7, 71–74
 Chinese village committees 73, 74, 85
 India 85–86
 spate irrigation 120–123
 transaction costs 32, 60, 69–75, 85–86
 entrepreneurs, water 82, 92n
 environmental management institutions, Kenya 190–192

 equity 13
 and community-based laws 6–7, 9
 and water rights reform 23, 24, 60, 102
 see also gender inequities; poor; women
 Eritrea **115**
 spate irrigation
 land area 116
 local organizations/institutions 120–123
 maintenance of systems 123
 rights and rules 117–119, 124, 126–127
 erosion, Nyando basin, Kenya 175, 198, 207, 208
 Ethiopia **133, 148**
 Borana zone 148–149
 conflict resolution institutions 149–152, 156n
 cultural administrative structures 152, 153
 ethnic groups 149
 relationship of statutory and customary institutions 154–155
 water management 152–154
 Derg period 134–135, 137, 139, 147, 156n
 food security 134–135
 kebeles 134, 139–140, 143, 147–148, 155
 Oromia state 147, 148
 politics and economy 134–135, 137
 water resources 146–147, 149
 western highlands **133**
 ethnic groups 132
 wetland agriculture 132–135
 wetland management institutions 135–140, **141**
 Ethiopian Wetlands Research Programme 142
 eucalyptus 137
 exclusion, Andean water policies 103–108

 fairness 6–7, 102
 famine
 Ethiopia 135
 Malawi 212, 218
 farmers' organizations
 India 75–76, 91n
 spate irrigation 120–123, 127
 feudal system 51
 Fiat 76
 financial empowerment 192–193
 First World 89n
 fisheries, inland 77, 78–80, 83, 85, 92–93n
 flood water management, *see* spate irrigation
 flume intakes, proportional 240–242
 Food and Agriculture Organization (FAO) 217
 food security
 Andean countries 97
 Ethiopia 134–135
 Malawi 212
 forest reserves, Kenya 185–186
 formalization 21, 59–60, 88–89n 102, 218
 and economic growth 67, 68–69
 France 51, 52, 53–55

- gadaa system 132, 135–136, 148, 149–152, 156n
 foundations of 152
 grades 150–151
 relationship with statutory institutions 155
 role of women 152
- Gandhi, Mahatma 24, 90n
- gardens
 Kenya 159, 164, 197
 Zimbabwe 258, 259, 261–263, 266n
- Garee Misooma 135, 136
- Garii pastoralists 149, 156n
- gender inequities
 customary-based rights 7, 9
 formal rights 23, 61
 and human rights to water 252–253
 land access 9, 19, 23, 186, 223
 water management 186–187, 190, 208–209
 wetland use 19, 136, 144n
 Zimbabwe 259, 261, 263, 264, 266n
- Ghana 48
- Goa 68
- gram panchayats 72, 74, 77, 80
- grazing management, Ethiopia 152–154
- Great Ruaha river basin 232–233, 245–246n
- groundwater
 markets 78, 81
 recharge movement, India 82, 83, 90n
 regulation, Mexico 70, 90n
see also springs; tube wells; wells
- GTZ 160
- Gujarat 72
 Groundwater Bill 92n
 fisheries 79–80, 83, 85, 92–93n
 groundwater recharge movement 82, 83, 90n
 Public Tube Well Transfer programme 80–81, 83, 85, 86
 reverse osmosis/defluoridation plants 77, 80, 83, 86, 91–92n
- harambee* 168
- Haryana state 68, 88
- herdsmen, *see* pastoralists
- HIV/AIDS 175, 205, 208, 250
- household water, collection 146, 186, 187
- human right to water 6, 16, 249, 250–253, 258–259
- Human Rights, International Bill (1948) 251
- 'hydraulic property' 7
- hydrology, normal *versus* informal 82
- hydropower 58, 233, 236–237
- Ica valley, Peru 98
- Ider* 137
- incentives 7, 85
- India 6, **66**
 Andhra Pradesh 72, 90n
 Bihar 68
 domestic water supply 67–68, 89n
 electricity charging 72–73, 74, 85–86
 fishing contractors 77, 78–80, 83, 85, 92–93n
 Goa 68
 gram panchayats 72, 74, 80
 groundwater markets 78
 groundwater recharge 82, 83, 90n
 Independence Movement 69, 90n
 industrial sector 88
 informal water economy 67–68, 89n
 institutional arrangements 67, 69
 institutional environment 67
 irrigation economy 68, 78, 91n
 irrigation tank management 85, 86, 92n
 irrigation tank rehabilitation 77
 Maharashtra 72, 92n
 Model Groundwater Law 72
 participatory irrigation management 75–78
 public tube wells 80–81, 83
 reverse osmosis(RO) plants 77, 80, 83, 86, 91–92n
 Sardar Sarovar Project 81–82, 82, 92n
swayambhoo institutions 78–84, 91n
 tanker water markets 81, 83
 urban water supply 67, 81, 83, 88, 89n
 Water Policy (1987/2002) 72, 90n
 water reform advice 87–88
- Indian Standards Institution (ISI) 80, 92n
- 'Indians', Andean region 100
- indigenous water rights
 social and political construction 99–100
see also informal water rights
- indirect instruments 88
- Indonesia 17, 21
- industrialized countries 51–52, 62–63n 67, 68, 89n
- informal water economies 67, 88–89n
 formalization 67, 68–69
- informal water rights
 formalization 21, 59–60, 88–89n 102, 218
 recognition 62, 100–108, 109n
 social and political construction 99–100
- information, access to 60
- infrastructure
 improvements 8, 87
 spate irrigation systems 123, 124, 127–129
see also irrigation intake
- institutional analysis 66–67
- institutional arrangements (IA) 66–67
- institutional bricolage 218
- institutional design principles 32–37
- institutional environment (IE) 66–67, 86–87
- intakes, *see* irrigation intakes
- integrated water resources management (IWRM) 2, 8, 20
 basin institutions 9

- participatory irrigation management 8–9, 75–78, 90–91n
 permit systems 7–8
 International Food Policy Research Institute (IFPRI) 194n 198
 International Fund for Agricultural Development (IFAD) 215, 217, 220
 International Labour Organization (ILO), Convention 169 on Indigenous and Tribal Peoples in Independent Countries 99
 International Monetary Fund (IMF) 212, 252, 253
 international treaties 14, 240, 250–253, 265n
 International Water Management Institute (IWMI) 72
 IWMI/Tata programme 74, 81, 84, 91n
 irrigation allocation ratio (IAR)
 defined 234
 proportional and volumetric caps 235–236
 irrigation intakes
 and abstraction flow rate 234
 design
 negotiation 244
 proportional/flexible 239–243
 standard improvement 8, 230–232, 234, 242
 operability 240–242
 operation 242–243
 sizing and accuracy 231, 239
 irrigation management transfer (IMT)
 India 75–76, 81–82, 83, 90–91n
 Malawi 212–213, 216–218, 225
 irrigation tanks
 community management 85, 86, 92n
 rehabilitation programmes 77
 Islamic law 16
 Israel 21
- jaarsummaa* institution 152
 Japan 52
 ‘justice’ 102
- Kalenjin 182
 Kalenjin ethnic group, Kenya 175
kebeles (peasant associations) 134, 139–140, 143, 147–148
kemete (*Leersia hexandra*) 135
 Kenya 54, 61
 colonial era 165, 178
 conflict over water 21, 202, 204
 gender roles in water management 186–187, 190
 irrigation development 196–198
 irrigation laws and regulations 197–198
 land tenure 20, 22, 165–167, 178–186
 adjudicated land 182–183, 200, 209n
 forest reserves 185–186
 government lands 181–182
 government settlement schemes 183–184
 large-scale commercial farms 184–185
 trust lands 179–181
 Mwea irrigation scheme 209
 National Environment Management Authority (NEMA) 190–191, 192
 National Irrigation Board (NIB) schemes 197–198, 203, 204–205
 National Water Conservation and Pipeline Corporation (NWCP) 159, 161, 187, 188
 Nyando basin 15–16, 20, 178–186, **198**, 200
 ethnic groups 175, 182–183
 hydrology and history 175, **176**
 irrigation development 196–198
 Kiptegan site 15–16, 20
 land tenure 178–183, 189, 190
 poverty 175, **177**
 Safeguard project 174, 175–178, 194n
 198–200
 pastoralists 149
 small scale/‘tiny’ irrigation 159, 197
 statutory natural resources management institutions 190–192
 Tana river 21
 Water Act (2002) 160–164, 174, 190, 191, 209
 assumptions of 193
 state centrism 163–164
 water institutions **160**, 190, 197–198
 Department of Water Development (DWD) 158, 160
 history of 158–160
 water services 161, 162, 167–168, 186–188
 Kipsigis 182–183
 Kirindi Oya irrigation system 19
 kitchen gardens 159, 164, 197
Kulyat Rodwar 123–124
- labour 123, 136–137, 204
 Lake Victoria 175, 198
 land demarcation, spate-irrigated areas 117
 land inheritance
 Eritrea 125, 126
 Malawi 219, 223
 land nationalization, Ethiopia 137, 139
 land revenue 89n
 land tenure
 Andean countries 98
 customary 14–15, 22
 Eritrea 125–127
 Kenya 20, 22, 165–167, 178–186, 189, 190, 200
 Malawi 219, 221–222, 223, 225
 reform 21–22
 sub-Saharan Africa 59–60
 and water rights 14–15, 18–20, 51, 52, 54, 60–61, 164–167
 women 9, 19, 23, 186, 223
 Zimbabwe 254–255, 262

- land use
 Nyando basin, Kenya 184–185
 and water resources 20
- land-buying companies, Kenya 184–185, 189
- large-scale farms, Kenya 184–185
- Latin America
 colonial water law 52–53
see also named countries
- Leersia hexandra (kemetete)* 135
- legal pluralism 14–15, 22–23
 Andean countries 100–103
 Kenya 163, 166–167, 174, 189, 199
- legal-infrastructurel framework for catchment
 apportionment (LIFCA) 237–239
 intake structure design 239–243
- liberalization 206–207
- Libya 116
- licences, water use 18, 167–168
see also permit systems
- Licto district, Ecuador 104–105
- LIFCA, *see* legal-infrastructurel framework for
 catchment apportionment
- livelihoods 6
 Malawi 217
 Nyando basin, Kenya 205–207, 208
 Zimbabwe 249, 259–263, 265n
- livestock 15, 19, 25n 152–154, 262
- local institutions 131
 Ethiopia
 gadaa 132, 135–136, 148, 149–152, 155, 156n
 wetland management 135–143, 144
 natural resources management 131–132
 spate irrigation 120–123
 strengths of 131
 sustainability 132
- Los Castillos valley lands 98
- Lubas 150, 151
- Luo ethnic group 175, 182–183, 200, 201
- madaa* 153
- Madhya Pradesh 75
- maize, wetland cultivation 134, 137
- Malampuzha Project 91n
- Malawi **214**
 Domasi and Likangala watersheds 214–215
 economy 212
 famine 212, 218
 government-run smallholder irrigation schemes
 history 215–216
 transfer farmer management 216–218
 irrigated lands 214
 policy and law reforms 211, 212–213, 224
 implementation 218–225
 traditional authorities (TAs) 218–219
- Malawi Young Pioneers (MYP) 215, 216
- Mara-Serengeti basin 22
- marginalized groups 23, 24, 224–225
- markets
 agricultural produce 197, 209
 water 16, 81, 83
- Mexico
 colonial water law 53
 groundwater regulation 70, 71, 90n
 Law of the Nation's Water 70
- Mgambo* 89n
- Mhondoro Communal Land 259–261, 266n
- migration, Ethiopia 149
- Millenium Development Goals 190
- modernization, spate irrigation systems 127–129
- Mongolia 116
- Morales, Evo 108
- Morocco 21, 116
- Mozambique 17, 24
- Mumbai 88
- Napoleonic Code (1804) 51
- Narmada river, Sardar Sarovar Project 81–82, 83
- natural resources management
 community-based 131–132
 Ethiopia 152–156
 and conflict resolution 155–156
 statutory, Kenya 190–192
- neerkattis* 85, 86, 92n
- neo-liberalism 98, 103–104, 212, 213, 225
- Nepal 17, 21
- Netherlands 52
- New Institutional Economics (NIE) 66, 69, 70, 78
- New Partnership for Africa (NEPAD) 2
- non-governmental organizations (NGOs)
 Borana, Ethiopia 154
 India 75, 77, 84, 90–91n
 Kenya 170, 189
 and local institution sustainability 132, 142
 Malawi 213, 220, 221
- Nyerere, Julius 54, 89n
- Ogiek ethnic group, Kenya 175, 185
- ollaa* 153
- open access to water 17–18, 24
- Orissa 74, 85–86
- Orma pastoralists 21
- Oromia state, Ethiopia 147, 148
see also Borana zone, Ethiopia
- Oromo communities 132, 149
 gadaa system 135–136, 148, 149–152, 156n
 role of women 152
- Pakistan 69, **115**
 spate irrigation
 area of 116
 rights/rules 118, 120–124, 127–128

- pani panchayats 75, 84
 participatory irrigation management (PIM) 8–9
 India 75–78, 90–91n
 see also water user associations (WUA)
 participatory research 199–200
 pastoralists 18–19, 25n
 Borana zone, Ethiopia 21, 147
 conflict resolution 147–148
 conflict sources 147
 cultural administrative structures 152, 153
 water management 152–154
 Kenya 21, 22, 149
 and wildlife 19
 path-dependence 87
 peasant associations (*kebeles*), Ethiopia 134,
 139–140, 147–148
 permit systems 7–8, 17
 China 70–71
 colonial water law 52–55
 defined 47
 discrimination 49, 59–61
 exclusion of small-scale users 70
 in high-income countries 48–49, 62–63n
 Kenya 163–164
 in low- and middle-income countries 55–57, 61–62
 Malawi 224
 promotion in water laws 47
 in Roman water law 50–51
 Tanzania 224, 230
 user obligations 8, 47–48, 62
 Zimbabwe 258, 266n
 Peru 98
 Philippines 76
 Pokomo farmers 21
 ‘polluter pays’ principle 2
 pollution of water 191–192
 ponds, hand-dug 153–154
 poor, marginalization 23, 24, 225–226
 poverty
 Malawi 212, 225
 Nyando basin, Kenya 175, **177**, 205–208
 power, supply and pricing 71, 72–74
 pricing
 electricity 72–74
 water 88, 202, 204, 224–225
 primary water rights 16
 Malawi 224–225
 Zimbabwe 254–255, 257–258, 263–264
 see also domestic water; drinking water
 private water 17, 81, 92n
 privatization of water, Andean countries 98, 99,
 103–104
 property rights
 defined 14
 importance of 12–13
 overlap 14–15, 18
 see also land tenure; water rights
 Protocol to the African Charter on the Rights of
 Women 253, 263, 265–266n
 public land 50
 public tube wells 80–81, 83, 85, 86
 public water 16–17
 India 67–68
 Roman 49–51
 quality standards, India 80, 86
 rainwater harvesting
 Gujarat, India 82, 90n
 Nyando basin, Kenya 189
 Raising Irrigation Productivity and Releasing Water
 for Intersectoral Needs (RIPARWIN) 229,
 245n 246n
 rangelands 16, 19
 Rapid Water Resources Assessment 54–55
 recognition of rights
 Andean countries 103–108
 concept 100–101, 109n
 see also formalization, of water rights
 religions 14, 82, 83, 90n
 resource grab, permit systems 61–62
 reverse osmosis (RO) plants 77, 80, 83, 86, 91–92n
 rewards, *see* incentives
 rice cultivation 205–206, 206–207, 209
 Rio+10 Summit 246n
 riparian use rights 51, 52, 54, 254
 Risti tenure system 125, 126
 River Basin Management and Smallholder Irrigation
 Improvement Project (RBMSIIP) 230, 245n
 Roman Dutch Law 254
 Roman Water Law 49–51
 transformation in high-income countries 51–52
 Rufiji basin, Tanzania 55, 229–230
 Rukuni Commission 256
 rural water supply
 Ethiopia 146–147
 Kenya 168–170
 Safeguard project 174, 194n 198–199
 implications for Kenyan water reform 190–193
 methods 175–178, 199–200, 201
 results
 land and water governance 200, 202,
 203–204
 resource management and allocation 202, 204
 sanctions, community 86
 Sardar Sarovar Project (SSP) 81–82, 83, 92n
 sedge vegetation 133
 Selassie, Haile 134, 136, 137, 147
 self-supply of water 67, 88
 settlement schemes, Kenya 183–184

- sewerage services, Kenya 161
- Shah, Anil 90n
- Sheikhs al-wadis* 120–122
- SIDA 160
- siiqee* institution 152
- siltation, Nyando basin, Kenya 175, 198, 207, 208
- sinchai samitis 75
- sluice gates, undershot 231–232
- small-scale water users
- discrimination 60–61
 - exclusion from water regulations 56, 70
 - Kenya 158–159
 - Malawi 224–225
 - Tanzania 55
- smallholder irrigation
- Kenya 197, 206–207
 - Malawi 215–218
 - Zimbabwe 255–256
- social analysis 69
- social capital 8, 131
- social contracts 22
- social structures
- China 73, 74, 85
 - Eritrea 121–122
 - gadaa system 149–152, 156n
 - Yemen 120–121
- Somali clans, Ethiopia 149, 156n
- Somalia 116, 149
- sorghum crops 119–120
- South Africa
- colonial rights 18, 54
 - irrigation boards 76, 91n
 - water economy formalization 68–69, 89n
 - water rights reform 18, 22, 24, 70
- Southern Africa Development Community (SADC), Protocol on Shared Water Course Systems 251
- Spain 52, 53
- spate irrigation
- defined 116
 - land coverage versus total irrigation 116
 - rights and rules 114, 116–120, 128
 - enforcement organizations 120–123
 - and maintenance 123
 - modification 124–128
- springs, access 15–16, 20, 183, 188
- Sri Lanka 19, 21
- Stages of Progress method (Krishna) 199
- state 1–2, 10
- interface with community-based laws 3, 9
 - land expropriation 19
 - water 'ownership' 15–16, 16–17
 - water sector formalization 22–23, 67, 89n
- state-run irrigation schemes, Malawi 215–216
- sub-Saharan Africa 2, 9, 47
- colonial water law revival 53–55
 - community-based water law 6
 - land tenure 59–60
 - water permits 48
 - see also named countries*
- Sudan 116
- sugarcane (*tef*) 134, 137
- Sukhomajari* experiment 84
- Suleman range, Pakistan 123–124
- sultans 120–121
- Sumaye, Frederick 246n
- supply management
- Great Ruaha basin 236–237
 - irrigation intake design
 - proportional/flexible 239–243
 - standard 233–236
- sustainability
- local institutions 132
 - wetland cultivation 131, 135, 142–143
- Sustainable Management of the Usangu Wetland and its Catchment (SMUWC) 229, 245n
- Swadhyaya Pariwar* 82, 90n
- Swaminarayana Sampradaya* 82, 92n
- swayambhoo* institutions 78–84, 91n
- Switzerland 89n
- Swynnerton Plan (1955) 22, 165, 182
- Taiwanese (Chinese) Agricultural Technical Mission 216
- tanker markets, India 81, 83
- Tanzania 6, 22, **232**
- Mgambo* institution 89n
 - National Water Policy 233
 - river basin initiatives 229–230, 245n
 - formal water rights 54–55, 224, 230
 - Great Ruaha basin 55, 232–233, 236–237, 245–246n
 - irrigation improvement programmes 230–232
 - Ruaha National Park 233, 236–237, 245n
 - Rufiji basin 55, 229–230
- Tarun Bharat Sangh 82
- tef* (*Eragrostis tef*/sugarcane) 134, 137
- Ternafi* 121–122
- Teshkil* 121–122
- Tihama Plain, Yemen 119, 120, 123
- tourism 19, 22
- tradable water rights 16, 62–63n
- tragedy of the commons 8, 17, 60
- Transaction Cost Economics (TCE) 70
- transaction costs 32, 69–71
- permit systems 60
 - reduction 70–75, 84, 87
- transaction sector 67, 89n
- Tribal Trust Lands (Communal Areas), Zimbabwe 254–255
- trust lands, Kenya 179–181
- tube wells
- China 70
 - India 78, 80–81, 83, 85, 86
 - Mexico 70

- Tula 137
 Tunisia 116
 Turkey 91n
- Unilever 184
 United Kingdom (UK) 51, 52
 United Nations
 Committee on Economic, Social and Cultural Rights 251, 252
 Convention on the Law of Non-Navigational Uses of Water-courses 250–251, 252, 265n
 human rights to water 249
- urban water supply
 China 70–71
 India 67, 81, 83, 88, 89n
 Kenya 158, 159
 tanker water markets 81, 83
- US Agency for International Development (USAID) 215
- ‘user pays’ principle 2, 54
 usufruct rights 15
 Utete, Dr Charles 258
 Uttar Pradesh 75
- vegetable gardens
 Kenya 159, 164, 197
 Zimbabwe 261–263
- vegetables, wetland cultivation 134, 137
vidyut sanghas (electricity cooperatives) 74
 village service areas (VSA) 81
- Wadi Laba, Eritrea 117–118, 119–120, 126–127
 Wadi Zabid, Yemen 127
warabandi systems 75
 water fees, payment 202, 204
 Water Law and Indigenous Rights Program (WALIR) 97, 109n
 water markets 16, 81, 83
 water pans 188
 water rights 12, 13–14
 codification 23, 123–124, 137, **138**
 common 17, 67, 89n
 control of water 16
 difficulties in defining 13
 and human rights 6, 16, 249, 250–253, 258–259
 international conventions 249, 250–253, 265n
 and land tenure 14–15, 18–20, 51, 52, 54, 60–61, 164–167
 primary water 16
 private 17, 81, 92n
 reform 21–24
 transfer 16, 25n 62–63n 126
 types of 16–18
 use of water 16
- water scarcity 13, 21, 72, 149
 water services
 community management 186–188
 India 67–68
 Kenya 161, 162, 167–168, 186–188
 private 81, 92n
- water user associations (WUAs) 8–9
 India 75–76, 81–82, 90–91n
 irrigation catchment apportionment 237, 238
 Kenya 162, 168
 Malawi 213, 219, 220–221, 222–223, 225
 South Africa 76, 91n
 Tanzania 224, 230
- ‘water wars’, Bolivia 99
- watershed management programmes 20
- weirs
 castellated 241–242
 spate irrigation systems 127–128
 standard designs 231
- wells
 Borana, Ethiopia 154
 private 17
 shallow, Kenya 188–189
 see also tube wells
- wet season, irrigation water allocation 235, 236, 237, 238
- wetland management institutions
 Ethiopia 135–140, **141**
 gender roles 136, 144n
 relations with external institutions 140–143, 144
- wetlands
 agricultural use 130–131
 bas fonds 19
 Ethiopia 133–135
 Malawi 213
 sustainability of 131, 135, 142–143
 Zimbabwe 255, 261–263, 266n
 environmental functions 130
 relationship of land and water rights 18–19
 Ruaha National Park, Tanzania 233
 western Ethiopia 132–134
- wildlife 19, 22, 233
- women
 customary-based rights 7, 9
 formal rights 23, 61
 household water collection 186, 187
 international rights 250, 253, 265–266n
 land access 9, 19, 23, 186, 223
 Oromo communities 152
 water management organizations 122–123, 190, 208–209
 wetland use 19, 144n
 Zimbabwe 259, 261, 263, 264, 266n
- Woreda* 148–149, 156n
 World Agroforestry Centre 20, 194n 198

- World Bank 2, 212, 253
 human right to water 249, 252
 India 76, 77, 80–81, 90–91n
 Kenya 160
 Tanzania 229–230
World Health Organization 252
WUAs, *see* water user associations
- Yemen **115**
 spate irrigation
 land area 116
 maintenance 123
 rights/rules 117, 119, 120–121, 123, 124–125
- Zimbabwe 54, **251**
 customary water rights 16, 21
 Economic Structural Adjustment Programme (ESAP) 253
 economy and politics 250
 human rights to water 249, 250–253
 land tenure 250, 254–255, 265n
 Mhondoro Communal Land 259–261, 266n
 National Water Authority (ZINWA) 257
 smallholder irrigation 255–256
 water law development 249, 253–255
 water law reform 17, 256–259, 266n
Zimbabwe Tobacco Association 260
Zomba Rural Development Project (RDP) 221