

Index

Page numbers in italics are located in Appendices. Bold page numbers indicate Tables or Figures.

```
ACER research project, 157
                                                                                cholera, 181
actionable knowledge, 5, 7, 59, 155
                                                                                CIRAD, 87
actor-action-resources matrix, 97, 107
                                                                                CLAM. See Coastal Lake Assessment and Management model
adaptation during intervention, 60
                                                                                CmapTools software, 121
adaptive management, 3, 23, 24, 38, 44, 53, 157, 167, 223, 224
                                                                                CoAG. See Coalition of Australian Governments
ADD-COMMOD, 87, 170
                                                                                Coalition of Australian Governments, 13
advocacy planning, 208
Agenda 21, 10, 13, 186
                                                                                Coastal Lake Assessment and Management model, 97
                                                                                Code of Hammurabi, 180
agricultural production, 13, 76
                                                                                co-design phase
AHP. See Analytic Hierarchy Process
                                                                                  research review, 53–54
Algerian case study
                                                                                co-engineering. See also engineering
  comparison to Upper Iskar Basin intervention, 161
                                                                                  decision-aiding, 30
  context, 158-159
                                                                                  definition, 6, 51
  design, 159-160
                                                                                  evaluation, 66
  evaluation, 160-162
                                                                                  in Algerian case study, 158-162
                                                                                  in German case study, 156-158
analyst, 31
  in decision-aiding, 27
                                                                                  in Kiribati case study, 162-164
Analytic Hierarchy Process, 201
                                                                                  in Lower Hawkesbury Estuary intervention, 88-94, 89, 256-260
AquaStress project, 112, 113, 115, 133, 134, 139, 145, 178, 289, 290
                                                                                  in Montpellier pilot trial, 229-235, 245
Aral Sea, 21-22
                                                                                  in Upper Iskar Basin intervention, 113, 113-114, 119
Australian and New Zealand Risk Management Standard. See Australian Risk
                                                                                  intervention comparison, 75, 141-151
    Management Standard
                                                                                co-engineering process, 167-168
Australian Competition and Consumer Commission, 14
                                                                                  co-design phase, 53-54
Australian Constitution, 13, 84
                                                                                  co-implementation phase, 53
Australian case study. See Lower Hawkesbury Estuary intervention
                                                                                  co-initiation phase, 54
                                                                                  definition, 52
Australian Landcare Council, 13
Australian National University, 86, 87, 255
                                                                                  research review, 54-56
Australian Risk Management Standard, 87, 95, 99, 104, 107, 143, 144, 147,
                                                                                cognitive artefacts. See models
                                                                                cognitive mapping, 42, 43, 63, 77, 121, 226, 233
     173, 265, 270
                                                                                co-implementation phase research review, 53
Bayesian Networks Berowa Creek Estuary Model, 42, 252, 256
                                                                                co-initiation phase research review, 54
Berowra Creek Estuary Management Committee, 252
                                                                                collective action groups, 80, 104, 107, 135-136, 140, 155
Berowra Creek Estuary Management Plan, 252
                                                                                communicative rationality, 186
best practice
                                                                                Community of Practice, 158-161
                                                                                community stewardship groups, 3 companion modelling, 43, 222–223, 223
  co-engineering, 164, 165, 169
  cycle process, 185
                                                                                comparison. See also evaluation
Algerian and Bulgarian case studies, 161
  evaluation protocol, 65
  participatory modelling, 41
  planning and management theory, 185
                                                                                  Australian and Bulgarian case studies, 141-151
Blue Print for Safeguarding European Waters, 18
                                                                                  German and Australian case studies, 157-158
                                                                                  governance systems, 18-20
blue water, 177
Borowetz Summer School, 112
                                                                                  participatory structures, 151-154
Boyd's loop, 184-185
                                                                                  participatory modelling research, 63
Brooklyn Estuary Management Plan, 103
                                                                                competence, 38, 154
Bulgarian case study. See Upper Iskar Basin intervention
                                                                                complexity
Bulgarian Water Act 1999, 110
                                                                                  decision-aiding, 199-205
                                                                                  Lower Hawkesbury Estuary intervention, 106
capacity building. See Bulgarian and Kiribati case studies, companion modelling
                                                                                  Montpellier pilot trial, 249-250
Cemagref, 87
                                                                                   research positions, 191
CERAM, 272, 276
                                                                                  Upper Iskar Basin intervention, 137-138
challenges. See also crisis, messes, environmental degradation
                                                                                  water management, 23-24, 166-167
  decision-aiding, 29
                                                                                conflict
                                                                                  decision-aiding, 202-203
  governance, 3
  water management, 4
                                                                                  identification, 203
```

Lower Hawkesbury Estuary intervention evaluation, 100	disease, 13, 20, 83, 163, 181
management and resolution, 203	Drama Theory, 223
water management, 182–183, 203	drinking water, 4, 20, 162, 181
context	drought, 4, 11, 13, 15, 18–19, 22, 24, 43, 109–140, 145, 235. See also water
Algerian case study, 158–159	scarcity
decision-aiding, 202–203	Dublin Conference. <i>See</i> International Conference on Water and the
importance of, 144–146 Kiribati case study, 162–163	Environment Dublin Principles, 10
Lower Hawkesbury Estuary intervention, 83–84	Duolin Frincipies, 10 Dujiangyan irrigation project, 180
Montpellier pilot trial, 227–228	dyads, 138
multimethodology interventions, 49	dy addy, 120
in risk management, 144–146	Earth Summit, 10
Upper Iskar Basin intervention, 109–110, 289–290	education suggestions for water management, 173–174
CORMAS computer software, 42	EEC. See European Economic Community
Council of Europe, 17	effectiveness
creative design of methods, 47, 49–51, 53, 60	definition, 67
crisis. See also environmental degradation, messes, risk management	Lower Hawkesbury Estuary intervention, 102
definition, 23	Montpellier pilot trial, 243
management, 22–23	Upper Iskar Basin intervention, 132–133, 135
CSIRO, 87, 253	efficacy definition, 67
dam	Lower Hawkesbury Estuary intervention, 103
construction, 22–23, 167	Montpellier pilot trial, 243–244
Hoover, 184	Upper Iskar Basin intervention, 133–134, 138
Lake Pedder, 13	efficiency
Perth, 199	definition, 67
Sadd el-Kafara, 179	Lower Hawkesbury Estuary intervention, 103–104
Snowy Mountains Hydro-Electric Scheme, 13	Montpellier pilot trial, 244
DANA software, 42	Upper Iskar Basin intervention, 135
Darcy's Law, 180	ELECTRE methods, 42, 201
DCPs. See Local Government Development Control Plans decision pathways	embodied water, 177, 236 empowerment, 11, 48, 117, 208–209, 246
inter-organisational, 33–44	ENCORE, 65, 66 , 77, 113, 229, 237, 238, 244
need for new, 24–25	engineering. See also planning and management theory
unsustainable, 20–23	basic principles of, 30
decision-aiding. See also participatory structures	definition, 29
challenges, 29	process, 29
co-engineering, 30	environmental degradation, 13, 14, 83, 109, 176, 177. See also challenges,
complexity, 199–205	crisis, messes
conflict in, 202–203	Environmental Risk Management Principles and Process Handbook,
context, 28–29, 202–203	86, 144
definition, 26–27 interaction space, 33, 34 , 60	equity, 10, 12, 38, 78, 131–132 ESD. See National Strategy for Ecologically Sustainable
inter-organisational, 4, 33–44, 60	Development
Lower Hawkesbury Estuary intervention, 98–99, 261	ethics, 146–147
messes, 27, 35–36, 203–204	EU. See European Union
Montpellier pilot intervention, 246	European Economic Community, 17
for policy creation, 30, 31	European Union, 110, 146
potential approaches, 206–207	evaluation. See also comparison
research approaches in, 27, 30–33, 190–202, 205	Australian case study, 98–104, 286–288
in Upper Iskar Basin intervention, 129, 292	Bulgarian case study, 129–136, 298–299, 308–309
decision-aiding process	co-engineering, 66
four-stage, 32, 33, 99, 218, 252–253, 256	definition, 63 , 195–197
interactions, 31 model, 60–62, 98–99, 167, 205	German case study, 157–158 Kiribati case study, 164
DecisionExplorer® software, 42, 97, 226, 231, 236, 281	MERF Approach, 187
decision making. See also decision-aiding	Montpellier pilot intervention, 237–245
inter-organisational, 33–44	evaluation protocol, 75–76
models, 193–196	best practice in, 65
phase process, 193	decision-aiding, 63
technology-based, 20–21, 28	development, 63–68
Delphi Method, 203	participatory modelling, 62, 66
demand management, 12, 23	ex-ante evaluation. See evaluation protocol
Democracy Cube, 210	experimental reports, 76
dependence relations, 38–40	ex-post evaluation. See evaluation protocol
desalination, 11, 17 design. <i>See also</i> co-design phase	Falkenmark Water Stress Index, 177
German case study, 157	Feng Shui, 183
participatory modelling, 41	Fertile Crescent, 179
participatory structures, 36–40, 37 , 39	floods, 4, 11, 16–19, 22, 76, 109–140, 145–146, 176, 179–182, 200, 227, 235,
Dhünn Basin. See German case study	238, 278, 290–300
DIAS/FACET computer software, 42	four types of management research, 192
disaster prevention. See risk management	funnel of causality 30

```
intervention model comparison
Gantt chart, 184
garbage-can model, 30
                                                                                   inter-organisational decision-aiding, 151
GDSS. See Group Decision Support Systems
                                                                                   participatory structures, 151-154
Geographical Information Systems, 42, 201
                                                                                 intervention participatory process comparison
                                                                                   evaluation results, 143–144
German case study
  co-engineering, 156
                                                                                   leadership, 142
  comparison to Australian intervention, 157-158
                                                                                   participant experience, 144, 145
  design, 157
                                                                                   participatory dynamics, 141
  evaluation, 157-158
                                                                                   participatory modelling, 142-143
  objectives, 156
                                                                                intervention research
GIS. See Geographical Information Systems
                                                                                   boundaries, 59
                                                                                   definition, 58, 74-75
Global Water Partnership, 11, 187
Goal Programming, 201
                                                                                   evaluation, 68
Google Maps, 127 governance issues
                                                                                   experimental reports, 76
                                                                                   expert knowledge in, 79-80
  in Australia, 13, 14, 16-17
                                                                                   importance of negotiation in, 76
                                                                                   methodology, 58-59, 192-193
  in Europe, 17
  international, 11, 12
                                                                                   outside evaluator in, 75-76
governance mechanisms, 3
                                                                                   principles, 191
governance priorities
                                                                                   process phases, 190-191
  in Australia, 13-17
                                                                                   selection, 73-74
  in Europe, 17-18
                                                                                 intervention validation
                                                                                   evaluation protocol, 154-155
  international, 11
governance systems
                                                                                   research objective, 155
  comparison, 19
                                                                                irrigation, 13, 17, 21, 158-159, 179, 180
  future needs, 12, 24-25
  in Australia, 12-17, 24
                                                                                   governance, 11-14, 16-17
                                                                                   water management, 20–23, 162
  in Bulgaria, 112
  in Europe, 17-20, 24
                                                                                IWMI Index of Relative Scarcity, 177
  international, 9–12, 24, 25
                                                                                Joint-gains software, 203
green water, 177
                                                                                JOURNEY computer model, 33, 224
green-blue water paradigm, 177
Groundwater Daughter Directive, 18
                                                                                JustGame, 231
Group Decision Support Systems, 203
                                                                                 KAP. See Kiribati Adaptive Program
                                                                                 Kiribati Adaptive Program, 163
Hawkesbury Nepean Draft Catchment Action Plan 2006-2015, 84, 256
                                                                                 Kiribati case study
                                                                                   context, 162-163
  planning and management theory, 183-184
  water management, 28–29, 179–189
                                                                                   evaluation, 164
holistic principle, 35
                                                                                Knowledge-Constitutive Human Interests, 47
Hoover Dam, 184
Hornsby Shire Council, 85, 86, 252, 253, 255, 260
                                                                                ladder of citizen participation, 208
HSC. See Hornsby Shire Council
                                                                                ladder of empowerment, 209
                                                                                Lake Pedder Dam protests, 13 learning, 23, 32, 38–39, 43–44, 48–51, 54–55, 61, 73–74, 155–157, 159, 161,
human right to water, 9
hurricanes, 22
                                                                                      163, 174, 185, 187, 190–191, 203, 205, 216, 222
hydraulic civilisations, 180
                                                                                   evaluation of, 64–65, 66, 67, 76–77, 79, 94, 100, 101, 114, 130, 131, 145,
hydraulic warfare, 182
                                                                                      171, 227-229, 237-245
ICT. See Information and Communication Tool
                                                                                 least cost water planning, 186
                                                                                 LEPs. See Local Environment Plans
importance of context, 144-146
indigenous perspectives on water, 12, 179, 188
                                                                                LHEMP. See Lower Hawkesbury Estuary Management Plan
Information and Communication Tool, 203
                                                                                 living water, 179
                                                                                 Living With Floods and Droughts process. See Upper Iskar Basin
innovation
  Lower Hawkesbury Estuary intervention, 104
                                                                                      intervention
  Montpellier intervention, 80-81, 244-245
                                                                                Local Environment Plans, 84
  Upper Iskar Basin intervention, 135-136
                                                                                Local Government Development Control Plans, 84
Integrated Catchment Management, 13
                                                                                Local Public Stakeholder Forum, 110, 112, 114, 131–137, 289, 309
integrated resource planning, 185, 186
                                                                                Lower Hawkesbury Estuary intervention
Integrated Water Resources Management, 10, 23, 24, 166, 186, 219 interaction space, 33, 34, 60. See also Strategic Choice Approach model
                                                                                   and German case study, 157-158
                                                                                   context, 83–84
interactive planning, 35-36
                                                                                   decision-aiding, 98-99, 261-271
                                                                                   negotiation, 89-92
inter-institutional project management team, 107
International Conference on Water and the Environment, 10
                                                                                   participatory modelling, 106-107, 154
International Drinking Water Supply and Sanitation Decade, 10
                                                                                   participatory values-based risk management process, 88, 95, 99-100, 269
International Hydrological Decade. See International Hydrological Program
                                                                                   programme change, 258
International Hydrological Program, 10
                                                                                   risk response actions, 97
intervention co-engineering comparison
                                                                                   stakeholders, 84
  attendance fees, 149
                                                                                   time allocation, 98
  leadership, 150
                                                                                Lower Hawkesbury Estuary intervention co-engineering
  objectives, 147-148
                                                                                   co-design, 253, 253-255
  role distribution, 149
                                                                                   co-design and co-implementation phase, 86, 256-260
  team affiliations, 148
                                                                                   co-initiation phase, 85-86
  team processes, 142, 149-150
                                                                                   honesty in outcome expectations, 106
```

```
participant perceptions, 236 qualitative, 136–137
  project team role in, 106-107
  stakeholder values, 95
  timeline, 92
                                                                                   MOLP. See Multiple Objective Linear Programming
Lower Hawkesbury Estuary intervention evaluation
                                                                                   Montpellier pilot trial
  complexity, 106
                                                                                     co-engineering process, 245-246
                                                                                     cognitive mapping, 77
                                                                                     complexity, 249–250 context, 74, 227–228
  decision-aiding model, 99, 100, 102, 253-256, 273-274, 283-288
  effectiveness, 102
  efficacy, 103
                                                                                     decision-aiding, 246-249
  efficiency, 103-104
                                                                                     description, 76-77
  evaluation protocol development, 87-88
                                                                                     design, 205, 229-233
  innovation, 104
                                                                                     expert knowledge use in, 79-80
  possible future projects, 107–108 risk assessment, 83, 99–100, 105, 266, 271, 273, 274–281,
                                                                                     location, 227
                                                                                     objectives, 77, 229
    275, 281
                                                                                     participatory modelling, 77, 80, 233-237
  values, 99-100, 264
                                                                                     procedures, 246-249
Lower Hawkesbury Estuary intervention risk assessment
                                                                                     simulation model, 77–79, 230
  advantages and disadvantages, 105
                                                                                   Montpellier pilot trial results
  risk assessment, 83, 99-100, 266, 271, 273, 274-281, 275, 281
                                                                                     conclusions, 81-82
  stakeholder expert-knowledge in, 105
                                                                                     effectiveness, 243
                                                                                     efficacy, 243-244
Lower Hawkesbury Estuary Management Committee, 103
Lower Hawkesbury Estuary Management Plan, 260
                                                                                     efficiency, 244
LPSF. See Local Public Stakeholder Forum
                                                                                     evaluation, 231-233, 237-243, 239, 240, 250-251
                                                                                     final recommendations, 237
Maastricht Treaty. See Treaty on the European Union
                                                                                     innovations, 80-81, 244-245
management
                                                                                     issues requiring future research, 81
  adaptive, 3, 23, 24, 38, 44, 53, 157, 167, 223, 224 crisis, 22–23
                                                                                     lessons learnt from, 77
                                                                                   MULINO Decision Support Systems, 203
                                                                                   multi-accountable groups, 33–34
Multi-Attribute Utility Methods, 201
multi-criteria decision analysis, 7, 28, 38, 40, 42, 79, 80, 89, 98, 109,
  demand, 12, 23
mapping
  cognitive, 42, 43, 63, 77, 121, 226, 233
                                                                                        112, 115, 126, 137, 139, 143, 173, 196, 201, 203, 219, 230–232,
  methodology, 47
  Oval Mapping technique, 77, 205, 226, 231, 279
                                                                                        235, 250, 277
                                                                                   multi-level participatory processes. See participatory modelling multimethodology, 47, 47–48, 53 Multiple Objective Linear Programming, 201
  strategy mapping technique, 279
Mar del Plata Action Plan, 10
marginalisation theory, 51
Marine Strategy Framework Directive 2008, 18
                                                                                   Murray-Darling Basin, 13, 14, 16
matrix assessments, 143
                                                                                   Murray-Darling Basin Authority, 15
MCDA. See multi-criteria decision analysis
                                                                                   Murray-Darling Basin Commission, 13
MDGs. See Millennium Development Goals
mediated modelling, 221-222, 222
                                                                                   NAIADE methods, 42
mega-engineering projects, 21–22
MERF Approach, 187, 230
                                                                                   National Action Plan for Salinity and Water Quality (Australia), 14
                                                                                   National Competition Council (Australia), 14
messes. See also challenges, crisis, environmental degradation
                                                                                   National Competition Policy Reform Act (Australia), 14
    and inter-organisational decisions, 33
                                                                                   National Heritage Trust (Australia), 14
  decision-aiding, 27, 35-36
                                                                                   National Plan for Water Security (Australia), 15
  engineering approach to, 30
                                                                                   National Strategy for Ecologically Sustainable Development (Australia), 13
meta-objects. See models
                                                                                   National Water and Sanitation Coordination Committee (Australia), 163, 164
Millennium Development Goals, 11, 164
                                                                                   National Water Commission (Australia), 14
                                                                                   National Water Initiative (Australia), 14-15
Mitidja Plain. See Algerian case study
                                                                                   National Water Quality Management Strategy (Australia), 14
  Coastal Lake Assessment and Management, 97
                                                                                   National Water Resources Implementation Plan (Republic of Kiribati), 163
  companion, 43, 222-223
                                                                                   National Water Resources Policy (Republic of Kiribati), 163
  decision making, 61, 193-196
                                                                                   Natural Resource Management Ministerial Council (Australia), 14
                                                                                   negotiation
  expert-created, 4
  garbage-can, 30
                                                                                     importance in interventions, 76
  leadership, 56
                                                                                     Lower Hawkesbury Estuary intervention, 89-94
                                                                                     modes, 52
  multi-agent systems, 43, 222
  organisation, 40
                                                                                     protocol, 76
  situation, 144
                                                                                     research review, 55
  Strategic Choice Approach, 33, 223-224, 224
                                                                                     Upper Iskar Basin intervention, 115-121
                                                                                   New South Wales Occupational and Safety Act 2000, 103
  Strategic Options Development, 224–226
  system dynamics, 42, 43, 221-222
                                                                                   New South Wales Oyster Industry Sustainable Aquaculture
modelling
                                                                                        Strategy, 256, 272
  mediated, 221-222, 222
                                                                                   NeWater research project, 157
  participatory, 4, 28, 36, 80, 233-237
                                                                                   NHT. See National Heritage Trust
  in water management, 4, 185-189
                                                                                   Nominal Group Technique, 203
models. See also participatory modelling
                                                                                   Non-Government Organisations
  classification, 211-216
                                                                                     in Kiribati, 163
  comparative description, 31, 214
                                                                                     in Upper Iskar Basin intervention, 121, 289
  decision-aiding, 60-62, 167
                                                                                   NRMMC. See Natural Resource Management Ministerial Council
  evaluation, 236
                                                                                   NWC. See National Water Commission
  ideal, 220
                                                                                   NWI. See National Water Initiative
```

NWQMS. See National Water Quality Management Strategy	situation models, 202–203
NWSCC. See National Water and Sanitation Coordination	solving strategies, 204
Committee	process evaluation. See evaluation protocol
	productive use of water. See demand management
objectives	PROMETHEE methods, 42, 201
book, 5, 81, 107, 140, 166–169	Protege, 121
German case study, 156 happiness in, 235	protests, 13, 21, 23, <i>182</i> public participation
Montpellier pilot trail, 77, 229	classifications, 208–211
participatory modelling, 43, 216	in water management, 209
that can impact participatory processes, 211	in water management, 200
Upper Iskar Basin intervention, 111 , 112	qualitative modelling, 136–137
operational research, 24, 26–28, 30–33	
OR. See operational research	radical planning, 208
Ord River Irrigation Scheme, 13	reactionary crisis management, 22–23
Oriental despotism, 180	REPAST computer software, 42
Oval Mapping technique, 77, 205, 226, 230, 231, 279	Republic of Kiribati. See Kiribati case study
	research
participant. See also public participation	limitations, 169–170
definition, 216–217	objectives of book, 5, 81, 107, 140, 166–168
perceptions of model hypotheses, 236	operational, 24, 26–28, 30–33
participative principle, 35, 36	proposals for future, 170–171
participatory decision-aiding process. <i>See also</i> decision-aiding	time allocation, 74
evaluation protocols, 63–68 evaluation stages, 62	Riparian Doctrine, 180
inter-organisational, 60–61	risk assessment Lower Hawkesbury Estuary intervention, 83, 99–100, 266 , 270–273 ,
pluralism in, 63	274–281, 275 , 281
participatory modelling. See also models	sensitivity analysis, 276–277, 277
best practices, 41, 164, 165 , 169	subjectivity of, 103
comparative research assessments, 58 , 63	Upper Iskar Basin intervention, 301
conceptual methodology, 232	workshop process, 97, 260
decision-aiding in, 41	Risk Consequences Tables. See risk tables
design, 37 , 39 , 44	risk management
ENCORE, 66	definition, 86
evaluation, 66	Elin Pelin risk management plan, 296
four-stage processes, 99, 217–220	ethics, 146–147
impact of co-engineering, 168–169	factors to consider, 86–87
integrated methodology, 43-44	importance of context, 144–146
leadership models, 55	Lower Hawkesbury Estuary intervention, 87, 95, 269, 271,
linked systems definition for co-engineering processes, 6	273, 275
Lower Hawkesbury Estuary intervention, 106–107, 154	Upper Iskar Basin intervention, 111, 112, 296
Montpellier pilot trial, 77, 80, 233–237	Risk Management Standard. See Australian Risk Management Standard
multi-level, 3, 134, 139, 147 , 167, <i>176</i>	risk tables, 95, 260–263 , 271
objectives, 43, 216	River Murray Waters Commission/Agreement, 13
phases, 214	Robustness Analysis, 223
time allocation, 43, 215	0 11 177 0 1 170
Upper Iskar Basin intervention, 111, 112–113, 122–126, 133	Sadd el-Kafara dam, 179
in water management, 75, 168, 209 , 221	salinisation, 16, 180
participatory structures, 36–40, 164	sanitation, 4, 9–12, 19–21, 162–164, <i>176</i> , <i>181</i>
participatory values-based risk management process,	SAS. See System–Actors–Solutions Integrated Model
104, 107 Perth Dam inflows, <i>199</i>	SEI Water Resources Vulnerability Index, 177 SelfCORMAS, 231, 234
pilot intervention case. See Montpellier pilot trial	sensitivity analysis, 277
Plan–Do–Check–Act cycle, 187	risk assessment, 276–277
planning and management theory. See also engineering	SEPP. See State Environmental Planning Policies
advocacy planning, 208	simulation model
best practice cycle process, 185	critique of need for, 79
history of, 183–184	Montpellier pilot trial, 77–79
integrated resource, 185, 186	SIRMA project, 159, 160
interactive, 35, 36, 36	situation models, 144
questions and activities, 185	SMART methods, 201
radical planning, 208	SMCE methods, 42
transactive planning, 208	Snowy Mountains Hydro-Electric Scheme, 13
pluralism	social learning. See ENCORE, learning
critical, 51	SODA. See Strategic Options Development and Analysis
discordant, 48–49	Soft Systems Methodology, 42, 46, 65, 223
in participatory decision-aiding process, 63	SOSM. See System of Systems Methodologies
pragmatic, 49	Spiral Dynamics, 205
policy process guidelines, 30	spring-flow tunnels, 179
principle of continuity, 35	stakeholders
problem	classification, 209
formulation, 61, 194	levels of engagement, 212
reframing, 194–195	Lower Hawkesbury Estuary intervention, 84, 95

rationality model, 32	innovations, 135–136
Upper Iskar Basin intervention, 113, 121, 123, 126, 127	stakeholder opinions, 132
State Environmental Planning Policies, 84	visions and values, 123–127
State of the Environment Report 2004, 256	Tistons and values, 125 127
STELLA computer software, 42, 221	validation
Strategic Choice Approach model, 33, 202, 223–224, 224	of intervention models and protocols, 154–155
Strategic Options Development and Analysis, 42, 223, 224–226	consideration for, 62–63
strategy mapping technique, 279	values
e; 11 c 1 ·	
supply-side water planning, 185–186	importance of context, 146
Sustainable Total Water Cycle Management Strategy, 256	intervention comparison, 146
Synthesis Report, 95, 270, 272	Lower Hawkesbury Estuary intervention, 99–100, 26
System–Actors–Solutions Integrated Model, 112	Upper Iskar Basin intervention, 127
System Dynamics models, 42, 43, 221–222	VENSIM computer software, 42, 221
System of Systems Methodologies, 46–47, 47, 53	Viable Systems Method, 223
	virtual water, 177
Γarawa. See Kiribati case study	Vulnerability of Water Systems indices, 177
echnology-based decisions, 28	
est intervention case. See Montpellier pilot trial	water
The Art of War, 184	blue, 177
The Elephant Child, 194	distribution, 175
ime allocation	drinking water, 4, 20, 181
across research cases, 74	economic value of, 11
in Lower Hawkesbury Estuary intervention, 92	embodied, 177
in participatory modelling, 43, 215	as human right, 9
Upper Iskar Basin intervention, 119	indigenous perspectives on water, 13, 179, 188
Fotal Catchment Management, 13	living, 179
Fotal Systems Intervention, 46–47, 48	properties of, 175–176
Trade Practices Act, 14	
	pumps, 181
ransactive planning, 208	scarcity, 4, 13, 15, 177–178, 178
Treaty of Rome, 17	stress indicators, 177–178
Treaty on the European Union, 17	usage, 176–177
rialogue team, 156	virtual, 177
ΓSI. See Total Systems Intervention	world trends, 176
	Water Act 2007, 15, 16, 84
UML. See Unified Modelling Language	Water for the Future Plan, 15, 16
uncertainty	Water Framework Directive, 17–18, 24, 110, 156, 157,
and ambiguity, 201	187, 227
types of, 198	Water Information System for Europe 2007, 18
Unified Modelling Language, 233, 239	water management
United Nations, 9–11	challenges, 4
Upper Iskar Basin intervention	and co-engineering, 53
and Algerian case study, 161	complexity, 23–24, 166–167
cognitive maps, 124	computer use in, 41–42
complexity, 137–138	conflict in, 182–183, 203
context, 109–110, 110 , 289–290	education suggestions, 173–174
cultural aspects, 138–139	future proposals, 23, 174, 205
decision-aiding, 292	happiness as objective in, 235
languages and communication, 138	history of, 28–29, 179–189
negotiation, 115–121	interactions, 217
Non-Government Organisations, 121, 289	issues, 20–23, 162
objectives, 111, 112	models, 4, 185–189
participatory modelling, 122–126, 136–137	participation in, 209
risk assessment, 301	water planning
risk management approach, 111, 112, 296	integrated resource, 185, 186
stakeholders, 114, 122, 123, 125, 126, 127, 129	least cost, 186
Upper Iskar Basin intervention co-engineering	supply-side, 185–186
co-design phase, 112–113	Water Poverty Index, 177
co-initiation phase, 112	Water Quality Monitoring Program, 256
process timeline, 119	WEB-HIPRE software, 203
Upper Iskar Basin intervention evaluation	WFD. See Water Framework Directive
effectiveness, 132–133, 135	World Water Council.
efficacy, 133–134, 138	See World Water Forums
efficiency, 134	World Water Forums, 11–12
ENCORE model dimensions, 130–132	orac acce r oracino, ii iii
evaluation, 292–301	zhi, 180