
Global Water Market 2011

Volume I: Introduction and The Americas

Publication information	ii
Foreword	iii
Executive summary	iv
China and America overtake Europe	iv
Desal and reuse rise to the challenge	iv
Water reuse changes the game for oil & gas	iv
Private finance beats private operations	iv
Total water market size according to population and GDP (with capex growth)	v
Unit conversion factors used in this publication	vi
Exchange rates used in this publication	vi
1. Introduction	1
1.1 The global water myth	1
1.2 The global water market	2
Figure 1.1 The global water market, 2010	3
Figure 1.2 Water utility costs (developed country average)	4
Figure 1.3 Fixed assets required per unit of revenues for utility services	4
1.3 Utility capital expenditure	5
Figure 1.4 Municipal water capex by category	5
Figure 1.5 Municipal wastewater capex by category	6
1.4 Utility capex drivers	6
Figure 1.6 Global annual urban population growth, 2010-2015	6
Figure 1.7 Global income growth, 1998-2008	7
1.5 Water utility finance	7
Figure 1.8 Global water tariffs	8
Figure 1.9 The cycle of decline	11
Figure 1.10 Progress towards the MDGs for water	12
Figure 1.11 Progress towards the MDGs for sanitation	13
Figure 1.12 Sanitation practices around the world	14
Figure 1.13 Cashflows in global water finance	15
Figure 1.14 Sources of utility finance	16
Figure 1.15 The water financing challenge: current investment versus required investment, 2010	17
Figure 1.16 The cycle of improvement	17
1.6 Water market trends	18
Figure 1.17 Global forecast for water, wastewater and desalination	18
Figure 1.18 Regional forecast for water and wastewater (combined)	18
Figure 1.19 Global forecast for water	19
Figure 1.20 Global forecast for wastewater	19
Figure 1.21 Global forecast for market equipment	20
1.7 The industrial water market	20
Figure 1.22 Industrial water and wastewater equipment market by sector	21
1.7.1 Power generation	21
Figure 1.23 Historical and forecast power generation capacity by region, 1980-2030	22
Figure 1.24 Water and wastewater technology for power production	22
1.7.2 Oil and gas	23
Figure 1.25 The ratio of produced water to hydrocarbons	23
Figure 1.26 The salinity of produced water from a selection of US oilfields	24
Figure 1.27 Water and wastewater equipment for the oil and gas industry	25
1.7.3 Refining industry	25
Figure 1.28 Water and wastewater technology for the refining industry	26
1.7.4 Mining	26
Figure 1.29 Water and wastewater technology for the mining industry	27

1.7.5 Chemical industry	27
Figure 1.30 Water and wastewater technology for the chemicals industry	28
1.7.6 Metals production	28
Figure 1.31 Water and wastewater technology for the metals industry	28
1.7.7 Automotive industry	29
Figure 1.32 Summary of automotive industry water uses	29
Figure 1.33 Water and wastewater technology for the automotive industry	29
1.7.8 Food & beverage	29
Figure 1.34 Water and wastewater technology for the food & beverage industry	30
1.7.9 Microelectronics	30
Figure 1.35 Water and wastewater technology for the microelectronics industry	31
1.7.10 Pulp and paper	31
Figure 1.36 Net water use for the manufacture of pulp and paper	31
Figure 1.37 Water and wastewater technology for the pulp and paper industry	32
1.7.11 Textiles	32
Figure 1.38 Water and wastewater technology for the textile industry	32
1.7.12 Pharmaceuticals	32
Figure 1.39 Water and wastewater technology for the pharmaceutical industry	33
1.8 Industrial water market outlook	33
Figure 1.40 Industrial water and wastewater equipment market forecast to 2016	33
Figure 1.41 Industrial water and wastewater technologies by market share in 2010	34
Figure 1.42 Industrial water and wastewater technologies by market share in 2016	34
Figure 1.43 Top 10 industrial water and wastewater technology markets by total capex, 2010-2016	35
Figure 1.44 Industrial water and wastewater treatment equipment market by end-user sector, 2007-2016	35
Figure 1.45 Industrial water and wastewater treatment market by equipment type, 2007-2016	35
1.9 The water treatment chemicals market	36
Figure 1.46 The water treatment chemical market, 2007-2016: industrial vs. municipal	36
Figure 1.47 The water treatment chemical market by industrial end-user, 2010 (showing CAGR to 2016)	37
Figure 1.48 The water treatment chemical market by product type, 2010	37
Figure 1.49 Water treatment chemical market forecast data	38
1.10 Outsourced services	38
Figure 1.50 The industrial water services market by category, 2007-2016	38
Figure 1.51 The mobile water market by region, 2007-2016	39
Figure 1.52 The top 10 industrial water services markets	39
1.11 Procurement patterns	39
Figure 1.53 US municipal treatment plant market by delivery mechanism	40
1.12 The supply chain	41
Figure 1.54 Water supply chain by numbers	41
1.13 Influencing the supply chain	42
Figure 1.55 Selling to the US supply chain	42
Figure 1.56 Selling to the rest of the world	43
1.14 The water industry	44
1.15 Major water companies	46
1.15.1 Veolia Environnement	46
Water revenues	46
Development	46
Figure 1.57 Structure of Veolia Environnement	46
Market position	46
Strategy	47
1.15.2 Suez Environnement	48
Water revenues	48
Development	48
Figure 1.58 Structure of Suez Environnement	48
Market position	48
Strategy	49
1.15.3 ITT Corporation	49
Water-related revenues	49
Development	49
Market position	49

Figure 1.59 Structure of ITT Corporation	50
Strategy	50
1.15.4 United Utilities	50
Water-related revenues	50
Development	50
Figure 1.60 Structure of United Utilities	51
Market position	51
Strategy	51
1.15.5 Macquarie/Thames Water	51
Water-related revenues	51
Development	51
Figure 1.61 Structure of Macquarie's water interests	52
Market position	52
Strategy	52
1.15.6 American Water Works Company	53
Water revenues	53
Development	53
Figure 1.62 Structure of American Water	53
Market position	53
Strategy	53
1.15.7 GE Water	54
Water revenues	54
Development	54
Figure 1.63 Structure of GE Water	55
Strategy	55
1.15.8 Severn Trent	56
Revenues	56
Development	56
Figure 1.64 Structure of Severn Trent	56
Strategy	56
1.15.9 Kurita Water Industries	56
Water-related revenues	56
Development	56
Figure 1.65 Structure of Kurita Water Industries	57
Market position	57
Strategy	57
1.15.10 Nalco	57
Water-related revenues	57
Development	57
Figure 1.66 Structure of Nalco	58
Market position	58
Strategy	58
1.15.11 Siemens Water Technologies	58
Water-related revenues	58
Development	58
Figure 1.67 Structure of Siemens Water Technologies	59
Strategy	59
Figure 1.68 The 6 technology areas where Siemens aims to develop its leadership	60
1.15.12 Kemira	60
Water-related revenues	60
Development	60
Figure 1.69 Structure of Kemira	60
Market position	60
Strategy	61
1.16 Investing in water	61
Figure 1.70 Performance of the GWI water indices, 2008-09	61
Figure 1.71 Constituent stocks of the GWI Global Water Index, April 2010	63
1.17 Notes on forecast methodology	65

2. The outlook for private water	66
2.1 The outlook for private water	66
Figure 2.1 Private investment in water and wastewater infrastructure, 2007-2016	67
Figure 2.2 Expenditure on private water and wastewater operations, 2007-2016	67
Figure 2.3 Private water investment forecast data by region, 2007-2016 (\$investment value)	68
Figure 2.4 Private water investment forecast data by region 2007-2016, (% of total capex)	68
Figure 2.5 Private wastewater investment forecast data by region, 2007-2016 (\$ investment value)	69
Figure 2.6 Private wastewater investment forecast data by region, 2007-2016 (% of total capex)	69
Figure 2.7 Private water operations forecast data by region, 2007-2016 (\$ investment value)	70
Figure 2.8 Private water operations forecast data by region, 2007-2016 (% of total capex)	70
Figure 2.9 Private wastewater operations forecast data by region, 2007-2016 (\$ investment value)	71
Figure 2.10 Private water operations forecast data by region, 2007-2016 (% of total capex)	71
2.2 An overview of PSP trends – The different models of private sector participation	71
2.2.1 Comparing the ‘British’, ‘French’ and ‘German’ models	71
Figure 2.11 The ‘British’, ‘French’ and ‘German’ models	72
2.2.2 Privatisation and private sector participation	72
2.2.3 Operating/management contracts for networks	72
Figure 2.12 O&M contract summary	72
2.2.4 Lease/‘affermage’ contract	72
Figure 2.13 Lease/‘affermage’ contract summary	72
2.2.5 Concessions: DBO and BOO/BOT	73
Figure 2.14 BOT/BOO concession summary	73
Figure 2.15 Variants of the BOT model	73
Figure 2.16 DBO concession summary	73
2.2.6 Investor-owned systems	74
Figure 2.17 Investor-owned summary	74
2.3 Funding flows and populations served	74
2.3.1 Global trends	74
Figure 2.18 Global contract awards	75
Figure 2.19 Global investment trends	76
Figure 2.20 Regional breakdown of contract awards	76
Figure 2.21 Regional breakdown of investment	77
2.3.2 China	77
Figure 2.22 China: Concessions	77
Figure 2.23 China: Greenfield	78
Figure 2.24 China: Acquisitions	78
Figure 2.25 China: BOT contracts	79
Figure 2.26 China: TOT contracts	79
Figure 2.27 China: Asset privatisations	80
2.3.3 Rest of Asia	80
Figure 2.28 Rest of Asia: Concessions	80
Figure 2.29 Rest of Asia: Greenfield	81
Figure 2.30 Rest of Asia: BOT contracts	81
2.3.4 Europe	81
Figure 2.31 Europe: BOT contracts	82
2.3.5 North America	82
Figure 2.32 North American tuck-in acquisitions, 1996-2009	83
Figure 2.33 Development of the outsourcing market in the USA, 1997-2008	83
2.3.6 Latin America and the Caribbean	84
Figure 2.34 Latin America and Caribbean: Concessions	84
Figure 2.35 Latin America and Caribbean: Greenfield	85
Figure 2.36 Latin America: BOT contracts	85
2.3.7 Middle East and North Africa	85
Figure 2.37 Middle East and North Africa: Greenfield	86
Figure 2.38 Middle East and North Africa: O&M contract awards	86
Figure 2.39 Middle East and North Africa: BOT awards	87
2.3.8 Sub-Saharan Africa	87
Figure 2.40 Sub-Saharan Africa: BOT contracts	88

Figure 2.41 Sub-Saharan Africa: Lease contracts	88
Figure 2.42 Sub-Saharan Africa: O&M contracts	89
3. Water Scarcity, Desalination and Reuse	90
3.1 The crisis of water scarcity	90
3.2 Understanding water scarcity	91
Figure 3.1 World renewable water availability	91
Figure 3.2 World Water Availability, 2025	91
3.3 Water demand	92
Figure 3.3 Water withdrawals, 1905-2015	92
Figure 3.4 Water withdrawals relative to world population	92
Figure 3.5 Global water withdrawal by sector	93
3.4 Agricultural demand	93
Figure 3.6 Percentage increase in land under irrigation since 1961	93
Figure 3.7 The dynamics of water use, 1900 - 2025	93
3.5 Industrial demand	94
3.6 Domestic demand	94
Figure 3.8 Per capita domestic water demand, 1950 - 2025	95
3.7 Water supply	95
Figure 3.9 The 10 countries with the lowest natural renewable water resources	95
3.8 Global warming	96
3.9 Demand management	96
Figure 3.10 The virtual water content of some common products	97
3.10 Water tariffs	97
3.11 Water efficiency	98
Figure 3.11 Unaccounted-for water in the Middle East region	98
3.12 Demand management summary	99
3.13 Supply management	99
3.14 Water transport	99
Figure 3.12 Major international water transfer projects	100
3.15 Desalination	100
3.16 Defining desalination	100
Figure 3.13 Desalination market by feedwater category	101
3.17 Desalination processes	101
3.17.1 MSF desalination	101
Figure 3.14 Multi-Stage Flash desalination	101
Figure 3.15 MSF plant cost vs. capacity (with fixed gain output ratio)	102
Figure 3.16 MSF unit size trend: selected plants since 1990	103
3.17.2 Multi-Effect Distillation (MED)	103
Figure 3.17 The Multi-Effect Distillation desalination process with thermal vapour compression	103
Figure 3.18 The Multi-Effect Distillation desalination process with mechanical vapour compression	104
3.17.3 Reverse Osmosis (RO)	104
Figure 3.19 The Reverse Osmosis desalination process	104
3.17.4 Electrodialysis (ED)	105
Figure 3.20 The Electrodialysis desalination process	105
3.17.5 Hybrid models	105
3.17.6 Other processes	106
3.17.7 Nano-engineered membranes	106
3.17.8 Thin film composite membranes	106
3.17.9 Aquaporin	106
3.17.10 Membrane distillation	106
3.17.11 Forward osmosis	106
3.18 Process comparison	107
Figure 3.21 Desalination process comparison	107
3.18.1 Reverse osmosis	108
3.18.2 MSF desalination	108
3.18.3 MED desalination	109
Figure 3.22 The top ten MED plants by capacity in the world (by contract date)	109
3.19 Desalination process trends	110

Figure 3.23 Trends in desalination process technology contracted since 1980	110
Figure 3.24 Market share by process technology contracted since 2000	111
Figure 3.25 The largest SWRO plants drawing feedwater from the Gulf	111
3.20 Research directions	111
3.21 The cost of desalination	112
Figure 3.26 Water price from selected reverse osmosis projects	112
Figure 3.27 Average relative EPC cost per m ³ of the main desalination processes (large plants)	113
Figure 3.28 Segmental RO capital costs	113
Figure 3.29 Segmental MED capital costs	113
Figure 3.30 Segmental MSF capital costs	114
Figure 3.31 Relative operating costs of the main desalination processes	114
3.22 Price sensitivity	115
Figure 3.32 Income versus installed capacity in Gulf countries	115
3.23 Financing desalination	115
Figure 3.33 Proposed desalination capacity by delivery mechanism, plants over 5,000 m ³ /d	116
3.24 Independent Water and Power Projects	117
Figure 3.34 Completed IWPPs	117
Figure 3.35 Equity market share of IWPPs by developer	118
3.25 Finance in low-income countries	118
3.26 Permitting and political issues	118
3.27 Desalination market forecast	119
Figure 3.36 Desalination market forecast to 2016: contracted and commissioned capacity	119
Figure 3.37 Annual desalination capex by plant type 2007-2016 by annual contracted capacity	120
Figure 3.38 Thermal versus membrane technology by annual contracted capacity	120
3.28 Water reuse	120
Figure 3.39 Annual additional tertiary and advanced capacity: Desalination versus reuse	121
Figure 3.40 Forecast growth of tertiary and advanced water reuse capacity	122
Figure 3.41 Total water reuse versus estimated wastewater output in selected countries	123
3.29 Defining water reuse	123
3.30 The water reuse business	124
3.31 Water reuse finance	125
Figure 3.42 Reuse projects by contract structure	125
3.32 Defining the water reuse market	125
Figure 3.43 Water reuse: Volume market development, 1980-2008	126
Figure 3.44 Tertiary and advanced water reuse: Annual increment in output capacity, 1980-2008	126
3.33 The value of the water reuse market	127
3.34 Water reuse applications	127
Figure 3.45 Water reuse categories and typical applications	127
Figure 3.46 Water reuse: Market share by application	128
Figure 3.47 Global Water Demand, 1900-2025	128
3.35 Moving up the value chain	128
Figure 3.48 Moving up the value chain: The growth in the market for three-stage water reuse	129
Figure 3.49 Moving up the value chain: Annual increment in reuse capacity	130
3.36 The price of water reuse	131
Figure 3.50 Typical cost of reclaimed water	131
Figure 3.51 Seawater membrane element performance chronology	131
Figure 3.52 Typical energy consumption by treatment processes	132
Figure 3.53 Top 10 water reuse projects by capital expenditure/m ³ /d	132
3.37 Water Reuse and the water economy	133
3.37.1 Supply drivers and analysis	133
3.37.2 Water reuse customers	133
Figure 3.54 Water reuse projects by user category	133
3.37.3 Pricing analysis	134
Figure 3.55 Pricing strategies for reclaimed water	134
Figure 3.56 Reclaimed water tariffs	135
Figure 3.57 Highlights of reclaimed water user tariffs around the world	135
Figure 3.58 Top 10 water reuse projects by connection charges	136
Figure 3.59 The rationale for water reuse pricing	136

3.38 The rationale for higher value water reuse	137
Figure 3.60 The model for agricultural water reuse: the theory	137
Figure 3.61 The model for agricultural water reuse: the practice	137
Figure 3.62 The model for high value water reuse	138
4. Canada	140
4.1 Demographic indicators	140
Figure 4.1 Population indicators, Canada	140
Figure 4.2 Economic indicators, Canada	140
4.2 Introduction	140
4.3 Overview of challenges	140
4.4 Water sector organisation and structure	140
4.4.1 Government ministries and agencies	140
Figure 4.3 Government water resources-related agencies in Alberta	141
4.4.2 Companies	141
4.5 Supply and demand details	141
4.5.1 Water supply	141
Figure 4.4 Water resources in Canada	141
4.5.2 Sectoral water use	141
Figure 4.5 Breakdown of water withdrawal by user, 2005	142
4.6 Municipal water and wastewater infrastructure	142
4.6.1 Key performance indicators: water	142
Figure 4.6 Breakdown of municipal water supply by source, 1996-2004	142
Figure 4.7 Municipal water demand in Canada	143
Figure 4.8 Population forecast for Canada, 2011-2031	143
Figure 4.9 Water supply indicators, Canada	144
4.6.2 Key performance indicators: wastewater	144
Figure 4.10 Wastewater indicators, Canada	144
4.6.3 Water treatment plants	144
4.6.4 Desalination	145
4.6.5 Wastewater treatment plants	145
4.6.6 Water reuse	145
4.7 Water in industry	146
Figure 4.11 Services and Goods Industry contribution to GDP in Canada, 2008	146
Figure 4.12 Industrial water use, 1996- 2005	147
Figure 4.13 Calculated GDP/m ³ for water use in selected industries	147
Figure 4.14 Sources of water intake by industries, 2005	147
Figure 4.15 Breakdown of wastewater treatment by treatment type, 2005	148
Figure 4.16 Industrial water discharge by treatment type, 2005	148
4.8 Water finance	149
4.8.1 Tariffs	149
Figure 4.17 Mean price for residential municipal water at 25m ³ usage, 1991-2004	149
4.8.2 Operating expenditure	149
Figure 4.18 Operation and maintenance costs of drinking water plants, 2005-2007	150
Figure 4.19 Breakdown of operation and maintenance costs of drinking water plants, 2007	150
Figure 4.20 WWTP operation and maintenance costs by treatment type, 2007	150
4.8.3 Capital expenditure	151
Figure 4.21 Municipal capital expenditure on water, 2004-2007	151
4.9 Government's water strategy	151
Figure 4.22 National Performance Standards	151
Figure 4.23 Estimated costs of implementation of National Performance Standards over 30 years	152
4.10 Private sector participation	152
4.10.1 General discussion	152
4.10.2 Existing PPPs	152
4.11 Current and future projects	153
4.11.1 Tracked projects	153
Figure 4.24 Tracked PPP projects in Canada	153
4.12 Market forecast	153
Figure 4.25 Market forecast, 2007-2016	154

Figure 4.26 Market forecast breakdown, 2010	155
Figure 4.27 Market forecast data, 2007-2016 (US\$ million)	156
5. United States of America (USA)	158
5.1 Demographic indicators	158
Figure 5.1 Population indicators, United States of America	158
Figure 5.2 Economic indicators, United States	158
5.2 Introduction	158
5.3 Overview of challenges	158
5.4 Water sector organisation and structure	159
5.4.1 Federal agencies	159
5.4.2 Regional agencies	159
5.4.3 State agencies	159
5.4.4 Public Utilities	160
5.5 Supply and demand details	160
5.5.1 Water supply	160
Figure 5.3 Water resources in the USA	160
5.5.2 Sectoral water use	160
Figure 5.4 Sectoral water use	161
5.6 Municipal water and wastewater infrastructure	161
5.6.1 Key performance indicators: water	161
Figure 5.5 Distribution of community water systems	161
Figure 5.6 Water supply indicators, United States	162
5.6.2 Key performance indicators: wastewater	162
Figure 5.7 Wastewater indicators, United States	162
5.6.3 Water treatment plants	162
5.6.4 Desalination	163
5.6.5 Wastewater treatment plants (WWTPs)	163
Figure 5.8 Distribution of Public WWTPs	163
5.6.6 Water reuse	163
5.7 Water in industry	164
5.7.1 Thermoelectricity	164
5.7.2 Agriculture	164
5.7.3 Manufacturing	164
5.7.4 Gas and oil	164
5.8 Water finance	164
5.8.1 Tariffs	165
5.8.2 Operating expenditure	165
5.8.3 Capital expenditure	165
5.8.3.1 Spending needs	165
Figure 5.9 20-year needs for drinking water infrastructure, by state and project type	166
Figure 5.10 20-year needs for wastewater, stormwater and recycled-water infrastructure	167
5.8.3.2 The 2009 stimulus package	168
Figure 5.11 ARRA 2009 SRF stimulus package - allocations by state	169
5.9 Government's water strategy	170
5.9.1 Federal funding	170
5.9.2 Future infrastructure investment	170
5.10 Private sector participation	170
Figure 5.12 Water and wastewater services by provider type	170
5.11 Current and future projects	171
5.11.1 Tracked projects	172
Figure 5.13 Tracked desalination projects in United States of America	172
Figure 5.14 Tracked reuse projects in the United States of America	178
Figure 5.15 Tracked PPP projects in the United States of America	184
5.12 Market forecast	187
Figure 5.16 Market forecast, 2007-2016	188
Figure 5.17 Market forecast breakdown, 2010	189
Figure 5.18 Market forecast data, 2007-2016 (\$ million)	190

6. Argentina	192
6.1 Demographic indicators	192
Figure 6.1 Population indicators, Argentina	192
Figure 6.2 Economic indicators, Argentina	192
6.2 Introduction	192
6.3 Overview of challenges	192
6.4 Water sector organisation and structure	193
6.4.1 Government ministries and agencies	193
Figure 6.3 Main federal government water related institutions	193
Figure 6.4 AySA regulatory framework	194
6.4.2 Companies	194
6.5 Supply and demand details	195
6.5.1 Water supply	195
Figure 6.5 Water resources in Argentina	195
6.5.2 Sectoral water use	195
Figure 6.6 Sectoral water withdrawal, Argentina	195
Figure 6.7 Water demand forecast	196
6.6 Municipal water and wastewater infrastructure	196
6.6.1 Key performance indicators: water	196
Figure 6.8 Water supply indicators, Argentina	196
6.6.2 Key performance indicators: wastewater	197
Figure 6.9 Wastewater indicators, Argentina	197
6.6.3 Water treatment plants	197
6.6.4 Desalination	197
6.6.5 Wastewater treatment plants	197
6.6.6 Water reuse	197
6.7 Water in industry	197
Figure 6.10 Main oil producers in Argentina, 2008	198
Figure 6.11 Main gas producers in Argentina, 2008	198
6.8 Water finance	198
Figure 6.12 ENOHSA Investment 2003-2008 (ARS million)	199
6.8.1 Tariffs	199
6.8.2 Operating expenditure	199
Figure 6.13 AySA Operating Expenditure by Zone	200
Figure 6.14 AySA operating variables	200
6.8.3 Capital expenditure	200
Figure 6.15 Network expansion capital expenditure (million ARS 2008)	201
Figure 6.16 Network maintenance capital expenditure (million ARS 2008)	201
Figure 6.17 Capital expenditure on water	201
Figure 6.18 Capital expenditure on wastewater	202
6.9 Government's water strategy	202
6.9.1 Federal policy on water resources	202
6.9.2 ENHOSA investment plan	202
6.10 Private sector participation	202
6.11 Current and future projects	203
6.12 Market forecast	203
Figure 6.19 Market forecast, 2007-2016	204
Figure 6.20 Market forecast breakdown, 2010	205
Figure 6.21 Market forecast data, 2007-2016 (\$ million)	206
7. Brazil	208
7.1 Demographic indicators	208
Figure 7.1 Population indicators, Brazil	208
Figure 7.2 . Economic indicators, Brazil	208
7.2 Introduction	208
7.3 Overview of challenges	208
Figure 7.3 Distribution of water resource by region	209
7.4 Water sector organisation and structure	210

7.4.1 Government ministries and agencies	210
Figure 7.4 Structure of the water resources and water and sanitation sectors	210
7.4.2 Companies	211
Figure 7.5 Main water and sanitation utilities in Brazil	211
7.5 Supply and demand details	212
7.5.1 Water supply	212
Figure 7.6 Water flow and availability in Brazil	212
Figure 7.7 Water resources in Brazil	212
7.5.2 Sectoral water use	212
Figure 7.8 Sectoral water withdrawal, Brazil	213
Figure 7.9 Water withdrawal by region and sector	213
7.5.3 Availability vs. demand	214
7.6 Municipal water and wastewater infrastructure	214
7.6.1 Key performance indicators: water	214
Figure 7.10 Water supply coverage by region	214
Figure 7.11 Water supply indicators, Brazil	215
Figure 7.12 National annual water balance (revenue and non-revenue)	215
7.6.2 Key performance indicators: wastewater	215
Figure 7.13 Sewerage coverage by region	216
Figure 7.14 Wastewater indicators, Brazil	216
7.6.3 Water treatment plants	217
Figure 7.15 Overview of major WTPs	217
7.6.4 Desalination	217
7.6.5 Wastewater treatment plants	217
Figure 7.16 Overview of major WWTPs	217
7.6.6 Water reuse	217
7.7 Water in industry	218
Figure 7.17 Demand for water/wastewater technologies by sector	218
7.7.1 Hydropower	218
7.8 Water finance	218
Figure 7.18 Examples of financing in the water sector in Brazil	219
7.8.1 Tariffs	219
7.8.2 Operating expenditure	219
Figure 7.19 Brazilian utilities financial data, 2007	219
7.8.3 Capital expenditure	219
Figure 7.20 Cumulative investments needed to achieve universal access of WSS	220
7.9 Government's water strategy	220
7.10 Private sector participation	221
Figure 7.21 Current PPP arrangements in Brazil	222
Figure 7.22 Private concession utilities	222
7.11 Current and future projects	222
Figure 7.23 Current and future projects in Brazil	222
7.12 Market forecast	223
Figure 7.24 Market forecast, 2007-2016	224
Figure 7.25 Market forecast breakdown, 2010	225
Figure 7.26 Market forecast data, 2007-2016 (\$ million)	226
8. Chile	228
8.1 Demographic indicators	228
Figure 8.1 Population indicators, Chile	228
Figure 8.2 Economic indicators, Chile	228
8.2 Introduction	228
8.3 Overview of challenges	228
8.4 Water sector organisation and structure	229
8.4.1 Government ministries and agencies	229
Figure 8.3 Main federal government water related institutions	230
Figure 8.4 Chilean water sector regulatory framework	231
8.4.2 Companies	231
Figure 8.5 Chilean water industry main providers	231

8.5 Supply and demand details	232
8.5.1 Water supply	232
Figure 8.6 Water resources in Chile	232
8.5.2 Sectoral water use	232
Figure 8.7 Breakdown of sectoral water use	232
8.6 Municipal water and wastewater infrastructure	232
8.6.1 Key performance indicators: water	232
Figure 8.8 Water supply indicators, Chile	233
8.6.2 Key performance indicators: wastewater	233
Figure 8.9 Wastewater indicators, Chile	233
8.6.3 Water treatment plants	233
8.6.4 Desalination	233
8.6.5 Wastewater treatment plants	234
Figure 8.10 Distribution of WWTPs by region	234
Figure 8.11 Wastewater treatment technologies	234
8.6.6 Water reuse	234
8.7 Water in industry	235
Figure 8.12 Average water use by industry	235
8.8 Water finance	235
Figure 8.13 Investment plan, 2009-2019	236
8.8.1 Tariffs	236
Figure 8.14 Water tariffs in Chile	236
8.8.2 Operating expenditure	237
Figure 8.15 Operating revenues and expenses, 2003-2007 (CLP million)	237
Figure 8.16 Operating variables, 2008	237
8.8.3 Capital expenditure	237
Figure 8.17 Capital expenditure on water	237
8.9 Government's water strategy	237
8.10 Private sector participation	238
8.11 Current and future projects	238
8.11.1 WWTP	238
8.11.2 Desalination	238
8.11.3 Desalination in the mining industry	238
Figure 8.18 Future desalination projects	239
8.11.4 Tracked projects	239
Figure 8.19 Tracked desalination projects in Chile	239
Figure 8.20 Tracked PPP projects in Chile	241
8.12 Market forecast	241
Figure 8.21 Market forecast, 2007-2016	242
Figure 8.22 Market forecast breakdown, 2010	243
Figure 8.23 Market forecast data, 2007-2016 (\$ million)	244
9. Colombia	246
9.1 Demographic indicators	246
Figure 9.1 Population indicators, Colombia	246
Figure 9.2 Economic indicators, Colombia	246
9.2 Introduction	246
9.3 Overview of challenges	246
9.4 Water sector organisation and structure	246
9.4.1 Legal framework	246
9.4.2 Government ministries and agencies	247
Figure 9.3 Structure of the water sector at the national level	247
9.4.3 Companies	248
Figure 9.4 Population covered by water utilities in Colombia's largest cities	248
9.5 Supply and demand details	248
9.5.1 Water supply	248
Figure 9.5 Water resources in Colombia	249
9.5.2 Sectoral water use	249
Figure 9.6 Sectoral water use, 2005	249

9.6 Municipal water and wastewater infrastructure	249
9.6.1 Key performance indicators: water	249
Figure 9.7 Water supply indicators, Colombia	250
9.6.2 Key performance indicators: wastewater	250
Figure 9.8 Percentage of wastewater treated at a national level	250
Figure 9.9 Wastewater indicators, Colombia	251
9.6.3 Water treatment plants	251
Figure 9.10 The 11 largest WTPs in Colombia, 2008	251
9.6.4 Desalination	251
Figure 9.11 Desalination Plants in Colombia, 2009	251
9.6.5 Wastewater treatment plants	251
Figure 9.12 Design capacity of WWTPs in Colombia's main urban areas, 2008	252
Figure 9.13 10 Largest WWTPs in Colombia	252
9.6.6 Water reuse	253
9.7 Water in industry	253
9.8 Water finance	253
9.8.1 Tariffs	253
Figure 9.14 Water tariff in Bogota (EAAB utility), 2009 in \$	254
9.8.2 Operating expenditure	254
9.8.3 Capital expenditure	254
9.9 Government's water strategy	255
9.9.1 Water supply programme	255
Figure 9.15 Budget for Water for Life Programme, 2007-2009	255
9.9.2 Wastewater treatment programme	255
Figure 9.16 Cauca river Sanitation Programme, 2009-2023	256
9.10 Private sector participation	256
9.11 Current and future projects	256
9.11.1 Tracked projects	257
Figure 9.17 Tracked PPP projects in Colombia	257
9.12 Market forecast	257
Figure 9.18 Market forecast, 2007-2016	258
Figure 9.19 Market forecast breakdown, 2010	259
Figure 9.20 Market forecast data, 2007-2016 (\$ million)	260
10. Mexico	262
10.1 Demographic indicators	262
Figure 10.1 Population indicators, Mexico	262
Figure 10.2 Economic indicators, Mexico	262
10.2 Introduction	262
10.3 Overview of challenges	262
10.4 Water sector organisation and structure	262
10.4.1 Government ministries and agencies	262
Figure 10.3 Regulatory structure of the environment sector	263
Figure 10.4 Conagua organisation chart	263
10.4.2 Companies	264
Figure 10.5 Major Mexican water companies	264
10.5 Supply and demand details	264
10.5.1 Water supply	264
Figure 10.6 Water resources in Mexico	264
10.5.2 Sectoral water use	265
Figure 10.7 Sectoral water use	265
10.6 Municipal water and wastewater infrastructure	265
10.6.1 Key performance indicators: water	265
Figure 10.8 Water supply indicators, Mexico	265
10.6.2 Key performance indicators: wastewater	266
Figure 10.9 Wastewater indicators, Mexico	266
10.6.3 Water treatment plants	266
Figure 10.10 WTPs by state	267
10.6.4 Desalination	267

10.6.5 Wastewater treatment plants	268
10.6.6 Water reuse	268
Figure 10.11 Volume of municipal wastewater treated, 1996-2007	268
10.7 Water in industry	269
Figure 10.12 Top 5 Mexican states for industrial waste water treated	269
Figure 10.13 WWTPs operated by PEMEX	269
Figure 10.14 WTPs operated by PEMEX	270
10.8 Water finance	270
Figure 10.15 Tender models used by Conagua	271
10.8.1 Tariffs	271
Figure 10.16 Total duties billed by Conagua, 1989-2007	272
Figure 10.17 Domestic tariffs for drinking water, sewerage and sanitation in various cities, 2007	272
Figure 10.18 Comparative tariffs for domestic, commercial and industrial use in selected cities, 2007	273
10.8.2 Operating expenditure	273
10.8.3 Capital expenditure	273
Figure 10.19 The evolution of Conagua's exercised budget, annual series 1997-2007	273
10.9 Government's water strategy	274
10.10 Private sector participation	274
10.11 Current and future projects	274
10.11.1 Desalination	274
10.11.2 Water treatment and PPPs	275
10.11.3 WWTPs and water reuse	275
Figure 10.20 Tracked desalination projects in Mexico	277
Figure 10.21 Tracked reuse projects in Mexico	278
Figure 10.22 Tracked PPP projects in Mexico	279
10.12 Market Forecast	280
Figure 10.23 Market forecast, 2007-2016	281
Figure 10.24 Market forecast breakdown, 2010	282
Figure 10.25 Market forecast data, 2007-2016 (\$ million)	283
11. Peru	285
11.1 Demographic indicators	285
Figure 11.1 Population indicators, Peru	285
Figure 11.2 Economic indicators, Peru	285
11.2 Introduction	285
11.3 Overview of challenges	285
11.4 Water sector organisation and structure	286
Figure 11.3 Members of the National System for Water Resources Management (SNGRH)	286
11.4.1 Government ministries and agencies	286
Figure 11.4 Government ministries and agencies involved in water management	287
11.4.2 Water utilities	287
11.5 Supply and demand details	288
11.5.1 Water supply	288
Figure 11.5 Type of access to water resources (population %)	288
Figure 11.6 Coverage objectives of the National Sanitation Plan 2006-2015	288
Figure 11.7 Water resources in Peru	289
11.5.2 Sectoral water use	289
Figure 11.8 Sectoral water withdrawal, Peru	289
11.6 Municipal water and wastewater infrastructure	289
11.6.1 Key performance indicators: water	289
Figure 11.9 Water supply indicators, Peru	289
11.6.2 Key performance indicators: wastewater	290
Figure 11.10 Wastewater indicators, Peru	290
11.6.3 Water treatment plants	290
Figure 11.11 Top 10 WTPs in Peru	290
11.6.4 Desalination	290
11.6.5 Wastewater treatment plants	291
Figure 11.12 Top 10 WWTPs in Peru	291
11.6.6 Wastewater management	291

11.6.7 Water reuse	292
11.7 Water in industry	292
11.8 Water finance	292
Figure 11.13 Investment required to meet objectives of the National Sanitation Plan 2006-2015 (\$million)	293
Figure 11.14 Funding scheme for 2009-2015	293
11.8.1 Tariffs	294
11.8.2 Operating expenditure	294
11.8.3 Capital expenditure	294
11.9 Government's water strategy	294
11.10 Private sector participation	295
11.11 Current and future projects	295
11.11.1 Current projects	295
11.11.2 Future projects	295
11.11.3 Tracked Projects	296
Figure 11.15 Tracked desalination projects in Peru	296
Figure 11.16 Tracked reuse projects in Peru	297
Figure 11.17 Tracked PPP projects in Peru	297
11.12 Market forecast	298
Figure 11.18 Market forecast, 2007-2016	299
Figure 11.19 Market forecast breakdown, 2010	300
Figure 11.20 Market forecast data, 2007-2016 (\$ million)	301

Volume 2: Europe and Africa

12. Water regulation in the European Union	303
12.1 The Environment Directorate General and EU environmental legislation	303
12.1.1 Environment DG and environmental compliance	303
Figure 12.1 Annual number of infringement cases detected across the EU, 1996-2008	303
12.2 EU environmental directives	304
12.2.1 Environmental Liability: 2000/66/EC	304
12.2.2 IPPC - Integrated Pollution Prevention & Control: 1993/423/EC, amended 1995/88/EC	304
12.2.3 Public Access to Environmental Information: 2003/4/EC	304
12.2.4 Landfill: 1991/102/EC, amended 1993/275/EC & 1991/31/EC	304
Figure 12.2 Four year derogation period for compliance for Greece, Ireland, Portugal and UK	305
12.2.5 Waste Incineration: 98/558/EC, amended 2000/76/EC	305
12.2.6 European Environment Agency: 1990/120/EC	305
12.2.7 Urban Wastewater Treatment: 1991/271/EC, amended 1998/15/EC	305
Figure 12.3 Full timetable for the Urban Wastewater Treatment Directive	305
Figure 12.4 Breakdown of collecting systems in 17 countries	306
12.2.8 Bathing Water Directive (2006/7/EC)	307
Figure 12.5 Compliance levels for assessing bathing water quality	307
Figure 12.6 Revised bathing water compliance levels	307
12.2.9 Water Framework Directive: 2000/219/EC	307
Figure 12.7 Year-end preparation targets for the Water Framework Directive	308
12.2.10 Priority Substances List: 2001/17/EC	308
Figure 12.8 List of priority substances	309
12.2.11 Marine Strategy Framework Directive (2008/56/EC)	309
12.2.12 Floods Risk Management Directive (2007/60/EC)	309
12.2.13 Drinking Water Directive (1980/778/EC & 1994/612/EC, revised 1998/83/EC)	310
Figure 12.9 Compliance dates	310
12.2.14 Nitrates in Agriculture (1991/676/EC)	310
12.2.15 Sewage Sludge Directive (1986/278/EC)	311
Figure 12.10 Allowable levels of metals in sewage sludge	311
Figure 12.11 Compliance dates for the UWWTD and Drinking Water Directive	311
12.3 The opportunities created	311
12.4 The cost of compliance	312

12.4.1 Compliance costs for the EU-15	312
Figure 12.12 Cost estimates for compliance with the lead levels in drinking water standards	313
Figure 12.13 The original 15 member states: current and anticipated compliance programmes	313
12.4.2 The EU-12	313
Figure 12.14 Range of estimates for water and wastewater compliance	314
12.4.3 How will the EU support this investment?	314
12.4.3.1 The EU Cohesion Fund	314
Figure 12.15 Payments made in 2008 under the Cohesion Fund for environment spending	314
12.4.3.2 structural funding	314
Figure 12.16 structural funding for environment & water in Objective 1 areas	315
12.4.3.3 Financing the accession process	315
12.4.4 Structural and cohesion funding for the new member states	316
12.4.4.1 Bulgaria and Romania	316
12.4.4.2 EU environmental legislation and political & economic realities	316
Figure 12.17 Timescales for complying with EU directives	317

Western Europe

13. Austria	318
13.1 Demographic indicators	318
Figure 13.1 Population indicators, Austria	318
Figure 13.2 Economic indicators, Austria	318
13.2 Introduction	318
13.3 Overview of challenges	318
13.4 Water sector organisation and structure	318
13.4.1 Government ministries and agencies	318
13.4.2 Legal framework	319
13.4.2.1 Monitoring of water resources	319
13.4.2.2 Protection of water resources	319
13.4.3 Companies	320
13.5 Supply and demand details	320
13.5.1 Water supply	320
Figure 13.3 Water resources in Austria	320
13.5.2 Sectoral water use	320
Figure 13.4 Sectoral water withdrawal, Austria	321
13.6 Municipal water and wastewater infrastructure	321
13.6.1 Key performance indicators: water	321
Figure 13.5 Water supply indicators, Austria	321
13.6.2 Key performance indicators: wastewater	322
Figure 13.6 Wastewater indicators, Austria	322
13.6.3 Water treatment plants	322
Figure 13.7 Largest WTPs in Austria	322
13.6.4 Desalination	322
13.6.5 Wastewater treatment plants	322
Figure 13.8 Capacity of the 9 main WWTPs in Austria, 2008	323
Figure 13.9 Total number of WWTPs by state, 2008	323
13.6.6 Water reuse	323
13.7 Water in industry	323
Figure 13.10 Major industrial water users, 2004	324
13.8 Water finance	324
Figure 13.11 Environmental Protection Programme funding lines, 1993-2008	324
13.8.1 Urban Water Management funding line	324
Figure 13.12 Breakdown of Urban Water Management projects according to plant type, 1993-2008	325
13.8.2 Environment and Water Management funding line	325
Figure 13.13 Funding sources for water and wastewater projects, 1993-2006	325
13.8.3 Tariffs	325
Figure 13.14 Water supply and wastewater treatment tariffs in Vienna and Graz	326
13.8.4 Operating and capital expenditure	326

13.9 Government's water strategy	326
13.10 Private sector participation	326
Figure 13.15 Turnover of private industries servicing water and wastewater sectors	327
13.11 Current and future projects	327
13.12 Market forecast	327
Figure 13.16 Market forecast, 2007-2016	328
Figure 13.17 Market forecast breakdown, 2010	329
Figure 13.18 Market forecast data, 2007-2016 (\$ million)	330
14. Belgium	332
14.1 Demographic indicators	332
Figure 14.1 Population indicators, Belgium	332
Figure 14.2 Economic indicators, Belgium	332
14.2 Introduction	332
14.3 Overview of challenges	332
14.4 Water sector organisation and structure	332
14.4.1 Government ministries and agencies	332
14.4.2 Flanders	333
Figure 14.3 Water sector structure in Flanders	333
14.4.3 Wallonia	333
Figure 14.4 Water sector structure in Wallonia	334
14.4.4 Brussels	334
Figure 14.5 Water sector structure in Brussels	334
14.4.5 Companies	335
14.5 Supply and demand details	335
14.5.1 Water supply	335
Figure 14.6 Water resources in Belgium	335
14.5.2 Sectoral water use	335
Figure 14.7 Sectoral fresh water use, 1995-2006	335
14.6 Municipal water and wastewater infrastructure	335
14.6.1 Key performance indicators: water	335
Figure 14.8 Water production of the largest Belgian water companies	336
Figure 14.9 Major Belgian water companies by region	336
Figure 14.10 Water supply indicators, Belgium	337
14.6.2 Key performance indicators: wastewater	337
Figure 14.11 Wastewater indicators, Belgium	337
14.6.3 Water treatment plants	337
14.6.4 Desalination	337
14.6.5 Wastewater treatment plants	338
14.6.6 Water reuse	338
14.7 Water in industry	338
Figure 14.12 Industrial fresh water use, 1995-2006	339
14.8 Water finance	339
14.8.1 Flanders	339
14.8.2 Wallonia	339
14.8.3 Brussels	339
14.8.4 Tariffs	339
Figure 14.13 Brussels water tariff	340
14.8.5 Operating expenditure	340
14.8.6 Capital expenditure	340
Figure 14.14 Regional capital expenditure on wastewater, 2008	341
14.9 Government's water strategy	341
14.10 Private sector participation	341
14.10.1 Brussels	341
14.10.2 Wallonia	341
14.10.3 Flanders	341
14.11 Current and future projects	342
14.12 Market forecast	342
Figure 14.15 Market forecast, 2007-2016	343

Figure 14.16 Market forecast breakdown, 2010	344
Figure 14.17 Market forecast data, 2007-2016 (\$ million)	345
15. France	347
15.1 Demographic indicators	347
Figure 15.1 Population indicators, France	347
Figure 15.2 Economic indicators, France	347
15.2 Introduction	347
15.3 Overview of challenges	347
15.4 Water sector organisation and structure	348
15.4.1 Government ministries and agencies	348
Figure 15.3 Government ministries and agencies	348
Figure 15.4 Direct management	349
Figure 15.5 Lease contract	349
Figure 15.6 Concession contract	350
15.4.2 Companies	350
Figure 15.7 Breakdown of water services by operator	351
Figure 15.8 Breakdown of wastewater services by operator	352
Figure 15.9 Management of wastewater treatment services according to size	352
15.5 Supply and demand details	352
15.5.1 Water supply	352
Figure 15.10 Water resources in France	353
15.5.2 Sectoral water use	353
Figure 15.11 Breakdown of water withdrawals by sector, 1995 and 2006	353
Figure 15.12 Sectoral water withdrawal and consumption	354
15.6 Municipal water and wastewater infrastructure	354
15.6.1 Key performance indicators: water	354
Figure 15.13 Evolution of drinking water consumption	354
Figure 15.14 Water supply indicators, France	355
15.6.2 Key performance indicators: wastewater	355
Figure 15.15 Wastewater indicators, France	355
15.6.3 Water treatment plants	355
15.6.4 Desalination	356
15.6.5 Wastewater treatment plants	356
15.6.6 Water reuse	356
15.7 Water in industry	357
15.8 Water finance	357
Figure 15.16 Breakdown of finances in the water and sanitation sectors, 2006 and 2008	358
Figure 15.17 Breakdown of water and sanitation sector investments, 2006 and 2008	359
15.8.1 Tariffs	359
Figure 15.18 Breakdown of water billing in 1996, 2007 and 2008	359
Figure 15.19 Comparison of combined water and wastewater tariffs in 7 French cities	360
Figure 15.20 Comparison of wastewater tariffs in Marseille and Nice	361
15.8.2 Operating expenditure	361
Figure 15.21 Water billing distribution	361
Figure 15.22 Wastewater billing distribution	362
Figure 15.23 Water and wastewater sector billing flow distribution	362
Figure 15.24 Operational expenditure on the collective water distribution system	363
15.8.3 Capital expenditure	363
Figure 15.25 Capital expenditure on the collective water distribution system	364
Figure 15.26 Capital expenditure in the wastewater sector	364
15.9 Government's water strategy	365
15.10 Private sector participation	365
Figure 15.27 Timeline of water contracts in major towns	365
15.11 Current and future projects	365
15.12 Market forecast	366
Figure 15.28 Market forecast, 2007-2016	367
Figure 15.29 Market forecast breakdown, 2010	368
Figure 15.30 Market forecast data, 2007-2016 (\$ million)	369

16. Germany	371
16.1 Demographic indicators	371
Figure 16.1 Population indicators, Germany	371
Figure 16.2 Economic indicators, Germany	371
16.2 Introduction	371
16.3 Overview of challenges	371
16.4 Water sector organisation and structure	372
16.4.1 Government ministries and agencies	372
Figure 16.3 Principal German federal authorities with responsibility for water resources	372
16.4.2 Companies/Water service providers	373
Figure 16.4 Distribution of water and wastewater utilities by state, 2007	373
Figure 16.5 Organisational forms in the water production and distribution sector, 1997-2005	373
16.4.3 Wastewater companies	374
Figure 16.6 Organisational forms in the wastewater sector, 1997-2007	374
16.5 Supply and demand details	374
16.5.1 Water supply	374
Figure 16.7 Water resources in Germany	374
16.5.2 Sectoral water use	375
Figure 16.8 Sectoral water use breakdown, 2007	375
16.6 Municipal water and wastewater infrastructure	375
16.6.1 Key performance indicators: water	375
Figure 16.9 Water distribution losses in %	375
Figure 16.10 Water supply indicators, Germany	376
Figure 16.11 Municipal water supply breakdown, 1990 and 2007	376
Figure 16.12 Evolution of per capita daily water consumption, 1990-2008	377
16.6.2 Key performance indicators: wastewater	377
Figure 16.13 Wastewater indicators, Germany	378
16.6.3 Water treatment plants	378
Figure 16.14 Breakdown of water treatment plants by state, 2007	378
16.6.4 Desalination	378
16.6.5 Wastewater treatment plants	379
Figure 16.15 Distribution of WWTPs by state	379
Figure 16.16 Number of WWTPs according to treatment type	379
16.6.6 Water reuse	379
16.7 Water in industry	380
Figure 16.17 Sectoral breakdown of industrial self-supply, 2007	380
Figure 16.18 Types of industrial WWTP	381
Figure 16.19 Type of industrial water use by sector, 2007	381
16.8 Water finance	382
16.8.1 Tariffs	382
Figure 16.20 Drinking water and wastewater annual expenditure, 2000-2007	382
16.8.2 Operating expenditure	382
Figure 16.21 Cost structure of water supply, 2007	383
Figure 16.22 Cost structure of wastewater supply, 2007	383
16.8.3 Capital expenditure	383
Figure 16.23 Water supply capital expenditure, 1990-2009	384
Figure 16.24 Distribution of different types of investments in 2007	384
16.9 Government's water strategy	384
16.10 Private sector participation	385
16.11 Current and future projects	385
16.12 Market forecast	385
Figure 16.25 Market forecast, 2007-2016	386
Figure 16.26 Market forecast breakdown, 2010	387
Figure 16.27 Market forecast data, 2007-2016 (\$ million)	388

17. Italy	390
17.1 Demographic indicators	390
Figure 17.1 Population indicators, Italy	390
Figure 17.2 Economic indicators, Italy	390
17.2 Introduction	390
17.3 Overview of challenges	390
17.4 Water sector organisation and structure	391
17.4.1 Legislation and institutions	391
17.4.2 Companies	391
17.5 Supply and demand details	392
17.5.1 Water supply	392
Figure 17.3 Water resources in Italy	392
17.5.2 Sectoral water use	392
Figure 17.4 Sectoral water withdrawal, Italy	392
17.6 Municipal water and wastewater infrastructure	393
17.6.1 Key performance indicators: water	393
Figure 17.5 Water supply indicators, Italy	393
Figure 17.6 Unaccounted for water in regions and major cities	394
17.6.2 Key performance indicators: wastewater	394
Figure 17.7 Wastewater indicators, Italy	395
17.6.3 Water treatment plants	395
17.6.4 Desalination	395
17.6.5 Wastewater treatment plants	395
Figure 17.8 Wastewater treatment plant characteristics	396
Figure 17.9 WWTP design capacity and operational capacity by region, 1999-2008	396
17.6.6 Water reuse	397
17.7 Water in industry	397
17.8 Water finance	397
17.8.1 Tariffs	397
Figure 17.10 Water tariffs, 2009	398
17.8.2 Operating expenditure	398
17.8.3 Capital expenditure	398
Figure 17.11 Planned capital investment by geographical area, 2009-2038	399
17.9 Government's water strategy	399
17.10 Private sector participation	400
17.11 Current and future projects	400
17.12 Market forecast	401
Figure 17.12 Market forecast, 2007-2016	401
Figure 17.13 Market forecast breakdown, 2010	402
Figure 17.14 Market forecast data, 2007-2016 (\$ million)	403
18. The Netherlands	405
18.1 Demographic indicators	405
Figure 18.1 Population indicators, Netherlands	405
Figure 18.2 Economic indicators, Netherlands	405
18.2 Introduction	405
18.3 Overview of challenges	405
18.4 Water sector organisation and structure	405
18.4.1 Government ministries and agencies	405
18.4.1.1 State level: government ministries	405
18.4.1.2 Regional level: boards	406
18.4.1.3 Provincial level: provinces	406
18.4.1.4 Local level: municipalities	406
18.4.1.5 Other authorities: Rijkswaterstaat	406
18.4.2 Public Limited Companies (PLCs)	406
Figure 18.3 Overview of Dutch water companies (PLCs), 2008	406
Figure 18.4 Levels of water authorities and their responsibilities	407
18.5 Supply and demand details	407

18.5.1 Water supply	407
Figure 18.5 Water resources in the Netherlands	408
18.5.2 Sectoral water use	408
Figure 18.6 Sectoral water withdrawal, Netherlands	408
18.6 Municipal water and wastewater infrastructure	408
18.6.1 Key performance indicators: water	408
Figure 18.7 Municipal water supply and demand in the Netherlands	408
Figure 18.8 PLCs water abstraction by source, 2003 and 2007	409
Figure 18.9 Water abstraction by source by various companies, 2007 (in million m ³ /yr)	409
Figure 18.10 Water production by various PLCs, 2007	410
Figure 18.11 PLCs network length, 2008	410
Figure 18.12 Water pipe network length breakdown by construction material, 2008	411
Figure 18.13 Water supply indicators, Netherlands	411
18.6.2 Key performance indicators: wastewater	411
Figure 18.14 Wastewater indicators, Netherlands	412
Figure 18.15 Length of the sewer networks by system type, 2008	412
18.6.3 Water treatment plants	412
18.6.4 Desalination	412
18.6.5 Wastewater treatment plants	413
18.6.6 Water reuse	413
18.7 Water in industry	413
Figure 18.16 Overview of water consortiums	414
18.8 Water finance	414
Figure 18.17 Public water management financing	415
18.8.1 Tariffs	415
18.8.1.1 Drinking water tariff	415
Figure 18.18 Drinking water cost/connection/household/yr and domestic l/c/d, 1997-2006	415
Figure 18.19 Rates of drinking water prices to households/yr, 2007	416
18.8.1.2 Wastewater tariff	416
Figure 18.20 Water boards sewerage management costs and taxation revenues, 2000-2006	416
18.8.2 Operating expenditure: water	416
Figure 18.21 : PLC costs/water connection	417
18.8.2.1 Taxes	417
Figure 18.22 Taxes paid by PLCs annually	417
18.8.2.2 Operational costs	417
Figure 18.23 Distribution of expenditures incurred by PLCs, by various operational costs, 2006	418
18.8.3 Operating expenditure: wastewater	418
18.8.4 Capital expenditure	418
18.8.4.1 Water services	418
Figure 18.24 Distribution of capital expenditure incurred on water services by PLCs, 2008	418
18.8.4.2 Wastewater	418
18.9 Government's water strategy	418
18.10 Private sector participation	419
18.10.1 Municipal sector	419
18.10.2 Industrial sector	419
18.11 Current and future projects	419
18.12 Market forecast	420
Figure 18.25 Market forecast, 2007-2016	421
Figure 18.26 Market forecast breakdown, 2010	422
Figure 18.27 Market forecast data, 2007-2016 (\$ million)	423
19. Spain	425
19.1 Demographic indicators	425
Figure 19.1 Population indicators, Spain	425
Figure 19.2 Economic indicators, Spain	425
19.2 Introduction	425
19.3 Overview of challenges	425
19.4 Water sector organisation and structure	425
19.4.1 Government ministries and agencies	425

19.4.2 Water and wastewater industries	426
19.5 Supply and demand details	427
19.5.1 Water supply	427
Figure 19.3 Water resources in Spain	427
19.5.2 Sectoral water use	427
Figure 19.4 Sectoral water withdrawal, Spain	427
19.6 Municipal water and wastewater infrastructure	427
19.6.1 Key performance indicators: water	427
Figure 19.5 Water supply indicators, Spain	427
19.6.2 Key performance indicators: wastewater	428
Figure 19.6 Wastewater indicators, Spain	428
19.6.3 Water treatment plants	428
19.6.4 Desalination	429
19.6.5 Wastewater treatment plants	429
19.6.6 Water reuse	430
Figure 19.7 Reclaimed water production in 2008 by river basin authority	431
19.7 Water in industry	431
Figure 19.8 Water demand by industries not connected to municipal supply	431
Figure 19.9 Use of water by industrial sector	432
19.8 Water finance	432
19.8.1 Tariffs	433
Figure 19.10 Total unit value of water by autonomous region	434
Figure 19.11 Price of water for industrial use	434
Figure 19.12 Integral cycle water charges for domestic and industrial use by region, 2009	434
19.8.2 Operating expenditure	435
Figure 19.13 Revenue from water supply services and sewerage and wastewater charges	435
19.8.3 Capital expenditure	435
Figure 19.14 Water infrastructure capex, 2006-2010	435
Figure 19.15 Capital expenditure on water supply and wastewater treatment services, 2005-2007	436
19.9 Government's water strategy	436
19.10 Private sector participation	437
19.10.1 Desalination	437
19.10.2 Wastewater treatment and reuse	437
19.11 Current and future projects	437
19.11.1 Desalination	437
19.11.2 WWTPs and water reuse	437
19.11.3 Tracked projects	438
Figure 19.16 Tracked desalination projects in Spain	438
Figure 19.17 Tracked reuse projects in Spain	440
19.12 Market forecast	444
Figure 19.18 Market forecast, 2007-2016	445
Figure 19.19 Market forecast breakdown, 2010	446
Figure 19.20 Market forecast data, 2007-2016 (\$ million)	447
20. Sweden	449
20.1 Demographic indicators	449
Figure 20.1 Population indicators, Sweden	449
Figure 20.2 Economic indicators, Sweden	449
20.2 Introduction	449
20.3 Overview of challenges	449
20.4 Water sector organisation and structure	449
20.4.1 Government ministries and agencies	450
20.4.2 Companies	450
Figure 20.3 Largest water companies in Sweden in 2008	450
20.5 Supply and demand details	451
20.5.1 Water supply	451
Figure 20.4 Water resources in Sweden	451
20.5.2 Sectoral water use	451
Figure 20.5 Sectoral water use in Sweden, 2005	451

Figure 20.6 Sectoral water withdrawal, Sweden	451
20.6 Municipal water and wastewater infrastructure	452
20.6.1 Key performance indicators: water	452
Figure 20.7 Water supply indicators, Sweden	452
20.6.2 Key performance indicators: wastewater	452
Figure 20.8 Wastewater indicators, Sweden	452
20.6.3 Water treatment plants	453
Figure 20.9 Breakdown of water source, number of WTPs and population served	453
Figure 20.10 Norsborg WTP specifications	453
Figure 20.11 Lovö WTP specifications	453
Figure 20.12 Görvåln WTP specifications	453
20.6.4 Desalination	454
20.6.5 Wastewater treatment plants	454
Figure 20.13 Overview of largest municipal WWTPs in Sweden, 2008	454
Figure 20.14 Henriksdal WWTP specifications	454
Figure 20.15 Bromma WWTP specifications	455
Figure 20.16 Käppala WWTP specifications	455
Figure 20.17 Rya WWTP specifications	455
20.6.6 Water reuse	455
20.7 Water in industry	455
20.8 Water finance	456
20.8.1 Tariffs	456
20.8.2 Operating and capital expenditure	456
20.9 Government's water strategy	456
20.10 Private sector participation	456
20.11 Current and future projects	457
20.12 Market forecast	457
Figure 20.18 Market forecast, 2007-2016	458
Figure 20.19 Market forecast breakdown, 2010	459
Figure 20.20 Market forecast data, 2007-2016 (\$ million)	460
21. Switzerland	462
21.1 Demographic indicators	462
Figure 21.1 Population indicators, Switzerland	462
Figure 21.2 Economic indicators, Switzerland	462
21.2 Introduction	462
21.3 Overview of challenges	462
21.4 Water sector organisation and structure	463
21.4.1 Government ministries and agencies	463
21.4.2 Types of enterprise	463
21.5 Supply and demand	463
21.5.1 Water supply	463
Figure 21.3 Water resources in Switzerland	463
Figure 21.4 Sectoral water use	464
Figure 21.5 Water supply in 2006 (not including nuclear power station cooling water)	464
21.6 Municipal water and wastewater infrastructure	464
21.6.1 Key performance indicators: water	464
Figure 21.6 Structure of Swiss municipal drinking water production	464
Figure 21.7 Largest water suppliers in Switzerland	465
Figure 21.8 Water supply indicators, Switzerland	465
21.6.2 Key performance indicators: wastewater	465
Figure 21.9 Wastewater indicators, Switzerland	466
21.6.3 Water treatment plants	466
21.6.4 Desalination	466
21.6.5 Wastewater treatment plants	466
Figure 21.10 Largest WWTPs in Switzerland	466
21.6.6 Water reuse	467
21.7 Water in industry	467
21.7.1 Industrial water in industry	467

Figure 21.11 Sectoral breakdown of water supply to industry, 2006	467
21.7.2 Industrial wastewater in industry	467
21.7.3 Chemicals industry	468
21.8 Water finance	468
21.8.1 Water costs	468
21.8.2 Wastewater finance	468
21.8.3 Tariffs	469
21.8.4 Drinking water tariffs	469
21.8.5 Wastewater tariffs	469
21.8.6 Water supply - operating expenditure	469
21.8.7 Water supply - capital expenditure	470
21.8.8 Wastewater operating expenditure and capital expenditure	470
Figure 21.12 Estimate of annual wastewater costs, 2005	471
21.9 Government's water strategy	471
21.9.1 General strategy	471
21.9.2 Institutional & legal arrangements	471
21.10 Private sector participation	471
21.11 Current and future projects	472
21.11.1 WTP for Ewl Energie wasser Luzern	472
21.11.2 UV water treatment	472
21.11.3 Zurich ring pipeline	472
21.11.4 Wastewater infrastructure	472
21.11.5 WWTP upgrades for emerging contaminants	472
21.11.6 Tendering	473
21.12 Market forecast	473
Figure 21.13 Market forecast, 2007-2016	474
Figure 21.14 Market forecast breakdown, 2010	475
Figure 21.15 Market forecast data, 2007-2016 (\$ million)	476
22. United Kingdom	478
22.1 Demographic Indicators	478
Figure 22.1 Population indicators, UK	478
Figure 22.2 Economic indicators, UK	478
22.2 Introduction	478
22.3 Overview of challenges	478
22.3.1 Climate change and water scarcity	478
22.3.2 Political and regulatory climate	478
22.3.3 Population growth	479
22.3.4 Ageing infrastructure	479
22.3.5 European legislation	479
22.4 Water sector organisation and structure	479
22.4.1 Government ministries and agencies	479
22.4.2 Companies	480
22.4.2.1 England & Wales	480
22.4.2.2 Scotland	480
22.4.2.3 Northern Ireland	480
Figure 22.3 Water companies in the UK	480
22.5 Supply and demand details	481
22.5.1 Water supply	481
Figure 22.4 Water resources in the United Kingdom	481
22.5.2 Sectoral water use	481
Figure 22.5 Licensed abstractions, 2005	481
Figure 22.6 Public water supply in England & Wales, 2006-07	482
22.6 Municipal water and wastewater infrastructure	482
22.6.1 Key performance indicators: water	482
Figure 22.7 Water supply indicators, UK	482
22.6.2 Key performance indicators: wastewater	482
Figure 22.8 Wastewater indicators, UK	483
22.6.3 Water treatment plants	483

22.6.4 Desalination	483
22.6.5 Wastewater treatment plants	483
22.6.6 Water reuse	483
22.7 Water in industry	483
22.8 Water finance	484
22.8.1 England & Wales	484
Figure 22.9 England & Wales: WaSCs and WoCs water revenues, 1990-2009	484
Figure 22.10 England & Wales: Annual investment and spending, 1990-2009	485
22.8.2 Scottish Water	486
Figure 22.11 Scottish Water – profit & loss account	486
22.8.3 Northern Ireland Water	486
Figure 22.12 Northern Ireland Water – profit & loss account	486
22.8.4 Tariffs	486
Figure 22.13 Average annual price limits for England and Wales (K)	487
Figure 22.14 AMP1 ‘K’ factors for England & Wales, 1990-95	487
Figure 22.15 ‘K’ factors for England & Wales, 1995-2000	487
Figure 22.16 ‘K’ factors for England & Wales, 2000-05	488
Figure 22.17 ‘K’ factors for England & Wales, 2005-10	488
Figure 22.18 ‘K’ factors for England & Wales, 2010-15	489
Figure 22.19 Scottish Water: annual water and sewerage charges, 2009-10	490
Figure 22.20 Scotland: tariff limits against the RPI, 2010-15	490
22.8.5 Operating expenditure	490
22.8.6 Capital expenditure	490
22.9 Government’s water strategy	491
22.9.1 Bill paying in England & Wales	491
22.9.2 Security of supplies	491
22.9.3 Competition	491
Figure 22.21 Major customers in England & Wales	491
22.10 Private sector participation	491
22.10.1 The private finance initiative	492
Figure 22.22 PFI contract awards for England and Wales	492
22.11 Current and future projects	492
Figure 22.23 Ofwat: capital spending areas, 2010-15	493
Figure 22.24 Tracked desalination projects in the United Kingdom	493
22.12 Market forecast	493
Figure 22.25 Capital spending targets for England & Wales, 2010-15	494
Figure 22.26 Operating spending targets for England & Wales, 2010-15	494
Figure 22.27 Capital spending & infrastructure renewals, England and Wales for AMP4 and AMP5	495
Figure 22.28 Market forecast, 2007-2016	496
Figure 22.29 Market forecast breakdown, 2010	497
Figure 22.30 Market forecast data, 2007-2016 (\$ million)	498

Eastern Europe and Central Asia

23. Belarus	500
23.1 Demographic indicators	500
Figure 23.1 Population indicators, Belarus	500
Figure 23.2 Economic indicators, Belarus	500
23.2 Introduction	500
23.3 Overview of challenges	500
23.4 Water sector organisation and structure	500
23.4.1 Government ministries and agencies	500
23.4.2 Companies	500
23.5 Supply and demand details	501
23.5.1 Water supply	501
23.5.2 Sectoral water withdrawal	501
Figure 23.3 Breakdown of water withdrawal by sector, 1997-2003	501

Figure 23.4 Breakdown of total annual water withdrawal and water use, 1998-2003	502
23.6 Municipal water and wastewater infrastructure	502
23.6.1 Key performance indicators: water	502
Figure 23.5 Key performance indicators: water supply, Belarus	503
23.6.2 Key performance indicators: wastewater	503
Figure 23.6 Wastewater indicators, Belarus	503
23.6.3 Water treatment plants	503
23.6.4 Desalination	503
23.6.5 Wastewater treatment plants	503
23.6.6 Water reuse	503
23.7 Water in industry	504
Figure 23.7 Annual GDP in Belarus, 2001-2008	504
Figure 23.8 GDP/unit of water withdrawn for agriculture and industry, 1997-2003	504
23.8 Water finance	505
23.8.1 Tariffs	505
Figure 23.9 Tariffs for different water users	505
Figure 23.10 Wastewater tariffs, 2004	506
23.8.2 Operating expenditure	506
Figure 23.11 O&M expenditures on protection and rational use of water resources, 2000-2002	506
Figure 23.12 Environmental protection funds: revenues and expenditures, 2000-2004	507
Figure 23.13 Utility operating revenues and expenditures for major cities in Belarus, 2008	507
23.8.3 Capital expenditure	508
Figure 23.14 Capital expenditures on water and wastewater, 2000-2002	508
23.9 Government's water strategy	508
23.10 Private sector participation	508
23.11 Current and future projects	508
23.11.1 World Bank water and sanitation project	508
Figure 23.15 Proposed projects under the World Bank Water and Sanitation Project	509
23.11.2 Belarus post-Chernobyl recovery project	509
23.11.3 The Pripjat transboundary river basin management project	509
23.12 Market forecast	509
Figure 23.16 Market forecast, 2007-2016	510
Figure 23.17 Market forecast breakdown, 2010	511
Figure 23.18 Market forecast data, 2007-2016 (\$ million)	512
24. Croatia	514
24.1 Demographic indicators	514
Figure 24.1 Population indicators, Croatia	514
Figure 24.2 Economic indicators, Croatia	514
24.2 Introduction	514
24.3 Overview of challenges	514
24.4 Water sector organisation and structure	515
24.4.1 Government ministries and agencies	515
Figure 24.3 National government water management structure	515
Figure 24.4 Organisational structure of Croatian Waters	516
Figure 24.5 Water Management Departments in Croatia and their local offices	517
24.4.2 Companies	517
24.5 Supply and demand details	518
24.5.1 Water supply	518
Figure 24.6 Water resources in Croatia	518
24.5.2 Sectoral water use	518
Figure 24.7 Croatia's water use by sector in 2006	518
24.6 Municipal water and wastewater infrastructure	518
24.6.1 Key performance indicators: water	518
Figure 24.8 Water supply indicators, Croatia	519
24.6.2 Key performance indicators: wastewater	519
Figure 24.9 Wastewater indicators, Croatia	519
24.6.3 Water treatment plants	519
Figure 24.10 Overview of the water supply treatment plants	520

24.6.4 Desalination	520
24.6.5 Wastewater treatment plants	520
Figure 24.11 Breakdown of wastewater treatment by level, 2007 and 2008	520
24.6.6 Water reuse	520
24.7 Water in industry	520
Figure 24.12 Water supply in industry in Croatia, 2008	521
Figure 24.13 Different purposes of industrial water use, 2008	522
Figure 24.14 Volumes of discharged wastewater, 2008	523
Figure 24.15 Volumes of discharged treated wastewater	524
24.8 Water finance	524
24.8.1 Tariffs	524
Figure 24.16 Water tariff structure for households in Zagreb	525
Figure 24.17 Water tariff structure for industry in Zagreb	525
Figure 24.18 Example of the water tariffs in Zagreb, Osijek and Pula	526
24.8.2 EU Funds and other available funds	526
Figure 24.19 Financial breakdown of the financial allocation for water supply, wastewater and waste management	526
Figure 24.20 Available financial sources for investment expenditure in water and wastewater sector	528
24.8.3 Operating expenditure	528
Figure 24.21 Operating expenditure	528
24.8.4 Capital expenditure	528
Figure 24.22 Capital expenditure on water, 2006-2009	529
Figure 24.23 Capital expenditure on wastewater, 2006-2009	529
24.9 Government's water strategy	529
Figure 24.24 Expenditure for the implementation of the Drinking Water Directive – DWD (2005 prices)	530
Figure 24.25 Expenditure for the implementation of the Urban Wastewater Drinking Directive (UWWTD) - normal scenario (2005 prices)	530
Figure 24.26 Expenditure for the implementation of the UWWTD - sensitive scenario (2005 prices)	530
Figure 24.27 Gap between financial resource and investment needs	530
Figure 24.28 Summary of investment expenditure required for water and wastewater	531
Figure 24.29 Summary of necessary transition periods for DWD and UWWTD	531
24.10 Private sector participation	531
24.11 Current and future projects	531
24.12 Market forecast	532
24.13 Acknowledgements	532
Figure 24.30 Market forecast, 2007-2016	533
Figure 24.31 Market forecast breakdown, 2010	534
Figure 24.32 Market forecast data, 2007-2016 (\$ million)	535
25. Czech Republic	537
25.1 Demographic indicators	537
Figure 25.1 Population indicators, Czech Republic	537
Figure 25.2 Economic indicators, Czech Republic	537
25.2 Introduction	537
25.3 Overview of challenges	537
25.4 Water sector organisation and structure	537
25.4.1 Government ministries and agencies	537
25.4.2 Companies	538
25.5 Supply and demand details	538
25.5.1 Water supply	538
Figure 25.3 Water resources in the Czech Republic	538
25.5.2 Sectoral water use	538
Figure 25.4 Breakdown of water withdrawal by sector and source, 2008	539
25.6 Municipal water and wastewater infrastructure	539
25.6.1 Key performance indicators: water	539
Figure 25.5 Water supply volume, per capita consumption and UFW, 1989-2008	540
Figure 25.6 Water supply indicators, Czech Republic	540
25.6.2 Key performance indicators: wastewater	540
Figure 25.7 Wastewater coverage and discharge volume, 1989-2008	540
Figure 25.8 Wastewater indicators, Czech Republic	541

25.6.3 Water treatment plants	541
25.6.4 Desalination	541
25.6.5 Wastewater treatment plants	541
Figure 25.9 WWTPs constructed in 2008 (PE > 2,000)	541
Figure 25.10 WWTPs upgraded or expanded in 2008 (PE > 5,000)	542
25.6.6 Water reuse	542
25.7 Water in industry	542
Figure 25.11 Annual GDP with agriculture and industry sectoral information, 2001-2008	543
Figure 25.12 Calculated GDP per unit of water withdrawn for agriculture and industry, 2000-2008	543
25.8 Water finance	543
Figure 25.13 Water supplied and water billed, 2000-2008	544
25.8.1 Tariffs	544
25.8.2 Operating expenditure	544
25.8.3 Capital expenditure	544
Figure 25.14 State Subsidies: Construction and Rehabilitation of Water Supply and Sewerage System Infrastructure Programme, 2004-2008	545
Figure 25.15 OPE Investment under Priority Axis 1	545
25.9 Government's water strategy	545
25.10 Private sector participation	545
25.11 Current and future projects	546
Figure 25.16 Planned Projects: Operational Programme Environment for Priority Axis I > €25 million	546
25.12 Market forecast	546
Figure 25.17 Market forecast, 2007-2016	547
Figure 25.18 Market forecast breakdown, 2010	548
Figure 25.19 Market forecast data, 2007-2016 (\$ million)	549
26. Hungary	551
26.1 Demographic indicators	551
Figure 26.1 Population indicators, Hungary	551
Figure 26.2 Economic indicators, Hungary	551
26.2 Introduction	551
26.3 Overview of challenges	551
26.4 Water sector organisation and structure	551
26.4.1 Government ministries and agencies	551
Figure 26.3 Hungarian water-related institutions	552
26.4.2 Companies	552
26.5 Supply and demand details	552
26.5.1 Water supply	552
Figure 26.4 Water resources in Hungary	553
26.5.2 Sectoral water use	553
Figure 26.5 Sectoral water withdrawal, Hungary	553
26.6 Municipal water and wastewater infrastructure	553
26.6.1 Key performance indicators: water	553
Figure 26.6 Water supply indicators, Hungary	553
26.6.2 Key performance indicators: wastewater	554
Figure 26.7 Wastewater indicators, Hungary	554
26.6.3 Water treatment plants	554
26.6.4 Desalination	554
26.6.5 Wastewater treatment plants	554
26.6.6 Water reuse	554
26.7 Water in industry	554
26.8 Water finance	555
26.8.1 Tariffs	555
Figure 26.8 First block tariffs for three major cities	556
26.8.2 Operating expenditure	556
Figure 26.9 Operating expenditure	556
26.8.3 Capital expenditure	556
Figure 26.10 Water capital expenditure, 2006-2009	556
Figure 26.11 Wastewater capital expenditure, 2006-2009	557

26.9 Government's water strategy	557
26.10 Private sector participation	557
Figure 26.12 Main private operators	558
26.11 Current and future projects	558
Figure 26.13 Future projects	558
Figure 26.14 Environment and Energy Operational Programme Breakdown	559
26.12 Market forecast	559
Figure 26.15 Market forecast, 2007-2016	560
Figure 26.16 Market forecast breakdown, 2010	561
Figure 26.17 Market forecast data, 2007-2016 (\$ million)	562
27. Kazakhstan	564
27.1 Demographic indicators	564
Figure 27.1 Population indicators, Kazakhstan	564
Figure 27.2 Economic indicators, Kazakhstan	564
27.2 Introduction	564
27.3 Overview of challenges	564
27.4 Water sector organisation and structure	564
27.4.1 Government ministries and agencies	564
Figure 27.3 Organisational structure of the water sector in Kazakhstan	565
27.4.1.1 Water resource management	565
27.4.1.2 Permits	565
27.4.1.3 Monitoring	565
27.4.1.4 Tariffs	566
27.4.2 Companies	566
27.5 Supply and demand details	566
27.5.1 Water supply	566
Figure 27.4 Water resources in Kazakhstan	566
27.5.2 Sectoral water use	566
Figure 27.5 Total water withdrawal and sources between 2004 and 2008	567
Figure 27.6 Fresh water withdrawal and sources of demand between 2004 and 2008	567
27.6 Municipal water and wastewater infrastructure	568
27.6.1 Key performance indicators: water	568
Figure 27.7 Water supply indicators, Kazakhstan	568
27.6.2 Key performance indicators: wastewater	568
Figure 27.8 Wastewater indicators, Kazakhstan	568
27.6.3 Water treatment plants	568
27.6.4 Desalination	568
27.6.5 Wastewater treatment plants	569
27.6.6 Water reuse	569
27.7 Water in industry	569
Figure 27.9 Industrial recycled water usage in Kazakhstan between 2004 and 2008	569
Figure 27.10 Total wastewater (industrial and municipal) treatment and discharge, 2004-2008	570
27.8 Water finance	570
27.8.1 Tariffs	570
Figure 27.11 Average water tariffs in Kazakhstan between 2004-2008	571
27.8.2 Operating expenditure	571
27.8.3 Capital expenditure	571
27.9 Government's water strategy	571
27.10 Private sector participation	572
27.11 Current and future projects	572
27.12 Market forecast	572
Figure 27.12 Market forecast, 2007-2016	573
Figure 27.13 Market forecast breakdown, 2010	574
Figure 27.14 Market forecast data, 2007-2016 (\$ million)	575
28. Poland	577
28.1 General indicators	577
Figure 28.1 Population indicators, Poland	577

Figure 28.2 Economic indicators, Poland	577
28.2 Introduction	577
28.3 Overview of challenges	577
28.4 Water sector organisation and structure	577
28.4.1 Government ministries and agencies	577
Figure 28.3 Organisation of water management administration at national and basin levels in Poland	578
Figure 28.4 The regulatory structure of water management in Poland	579
28.4.2 Companies	579
28.5 Supply and demand details	580
28.5.1 Water supply	580
Figure 28.5 Water resources in Poland	580
28.5.2 Sectoral water use	580
Figure 28.6 Water use by sector, 2007	581
Figure 28.7 Breakdown of fresh water abstraction and consumption, 1980-2006	581
28.6 Municipal water and wastewater infrastructure	582
28.6.1 Key performance indicators: water	582
Figure 28.8 Municipal water supply network length and ownership in Poland	582
Figure 28.9 Water supply indicators, Poland	583
28.6.2 Key performance indicators: wastewater	583
Figure 28.10 Municipal wastewater supply network length and ownership in Poland	583
Figure 28.11 Wastewater indicators, Poland	583
28.6.3 Water treatment plants	583
28.6.4 Desalination	583
28.6.5 Wastewater treatment plants	584
Figure 28.12 WWTPs by capacity and type	584
28.6.6 Water reuse	584
28.7 Water in industry	585
Figure 28.13 Non-domestic water use in Poland, 1980-2006	585
28.8 Water finance	585
28.8.1 Tariffs	586
Figure 28.14 Water supply and wastewater discharge cost	586
28.8.2 Operating expenditure	586
28.8.3 Capital expenditure	587
28.9 Government's water strategy	587
28.10 Private sector participation	587
28.11 Current and future projects	587
28.12 Market forecast	588
Figure 28.15 Market forecast, 2007-2016	589
Figure 28.16 Market forecast breakdown, 2010	590
Figure 28.17 Market forecast data, 2007-2016 (\$ million)	591
29. Romania	593
29.1 Demographic indicators	593
Figure 29.1 Population indicators, Romania	593
Figure 29.2 Economic indicators, Romania	593
29.2 Introduction	593
29.3 Overview of challenges	593
29.4 Water sector organisation and structure	593
29.4.1 Government ministries and agencies	593
29.4.2 Companies	594
29.5 Supply and demand details	594
29.5.1 Water supply	594
Figure 29.3 Water resources in Romania	594
29.5.2 Sectoral water use	595
Figure 29.4 Sectoral water withdrawal, Romania	595
29.6 Municipal water and wastewater infrastructure	595
29.6.1 Key performance indicators: water	595
Figure 29.5 Water supply indicators, Romania	595
29.6.2 Key performance indicators: wastewater	595

Figure 29.6 Wastewater indicators, Romania	595
29.6.3 Water treatment plants	596
29.6.4 Desalination	596
29.6.5 Wastewater treatment plants	596
29.6.6 Water reuse	596
29.7 Water in industry	596
29.8 Water finance	596
Figure 29.7 Financial sources (€million)	597
29.8.1 Tariffs	597
Figure 29.8 Tariff level	597
29.8.2 Operating expenditure	597
Figure 29.9 Operating expenditure on water and wastewater	597
29.8.3 Capital expenditure	598
Figure 29.10 Capital expenditure on water, 2007	598
Figure 29.11 Capital expenditure on wastewater, 2007	598
29.9 Government's water strategy	598
29.10 Private sector participation	598
29.11 Current and future projects	599
Figure 29.12 Current projects	599
29.12 Market forecast	599
Figure 29.13 Total costs for compliance with the environmental EU Directives	600
Figure 29.14 Market forecast, 2007-2016	601
Figure 29.15 Market forecast breakdown, 2010	602
Figure 29.16 Market forecast data, 2007-2016 (\$ million)	603
30. Russian Federation	605
30.1 Demographic indicators	605
Figure 30.1 Population indicators, Russian Federation	605
Figure 30.2 Economic indicators, Russia	605
30.2 Introduction	605
30.3 Overview of challenges	605
30.4 Water sector organisation and structure	605
30.4.1 Government ministries and agencies	605
30.4.2 Companies	606
Figure 30.3 Major MUE and SUE vodokanal operators in Russia	606
30.5 Supply and demand details	606
30.5.1 Water supply	606
Figure 30.4 Water resources in Russia	607
30.5.2 Sectoral water use	607
Figure 30.5 Sectoral water withdrawal, Russia	607
30.6 Municipal water and wastewater infrastructure	607
30.6.1 Key performance indicators: water	607
Figure 30.6 Water supply indicators, Russian Federation	607
30.6.2 Key performance indicators: wastewater	607
Figure 30.7 Wastewater indicators, Russian Federation	608
30.6.3 Water treatment plants	608
Figure 30.8 Capacity of WTPs in Moscow	608
30.6.3.1 WTPs in St. Petesburg	608
Figure 30.9 Average operational capacity of all WTPs in St. Petersburg	608
30.6.3.2 WTPs in other major cities	609
30.6.4 Desalination	609
30.6.5 Wastewater treatment plants	609
30.6.5.1 WWTPs in Moscow	609
Figure 30.10 Capacity of WWTPs in Moscow	609
30.6.5.2 WWTPs in St. Petersburg	609
30.6.5.3 WWTPs in other major cities	609
30.6.6 Water reuse	610
30.7 Water in industry	610
Figure 30.11 Wastewater discharged by industry, 2006	610

30.8 Water finance	610
30.8.1 Tariffs	611
30.8.2 Operating expenditure	611
30.8.3 Capital expenditure	611
30.9 Government's water strategy	611
Figure 30.12 Key goals of the Clean Water Programme, according to the 2008 draft	612
30.10 Private sector participation	612
Figure 30.13 Ownership and coverage of some major private operators	612
30.11 Current and future projects	613
30.12 Market forecast	613
Figure 30.14 Market forecast, 2007-2016	615
Figure 30.15 Market forecast breakdown, 2010	616
Figure 30.16 Market forecast data, 2007-2016 (\$ million)	617

North Africa

31. Algeria	619
31.1 Demographic indicators	619
Figure 31.1 Population indicators, Algeria	619
Figure 31.2 Economic indicators, Algeria	619
31.2 Introduction	619
31.3 Overview of challenges	619
31.3.1 Demand outstrips supply	619
31.3.2 Municipal supply and UFW	619
31.4 Water sector organisation and structure	620
31.4.1 Government ministries and agencies	620
Figure 31.3 Structure of the water sector in Algeria	620
31.4.2 Management contracts	620
Figure 31.4 Contracts for water and sanitation in Algeria's four biggest cities	620
31.4.3 Desalination plant project companies	620
31.5 Supply and demand details	621
31.5.1 Water supply	621
Figure 31.5 Water resources in Algeria	621
31.5.2 Sectoral water use	621
Figure 31.6 Sectoral water withdrawal, Algeria	621
31.6 Municipal water and wastewater infrastructure	622
31.6.1 Key performance indicators: water	622
Figure 31.7 Water supply indicators, Algeria	622
31.6.2 Key performance indicators: wastewater	622
Figure 31.8 Wastewater indicators, Algeria	622
31.6.3 Desalination	622
Figure 31.9 Desalination plants already contracted out	623
31.6.4 Water treatment plants	624
31.6.5 Wastewater treatment plants	624
31.6.6 Water reuse	624
31.7 Water in industry	624
31.8 Water finance	624
31.8.1 Tariffs	625
Figure 31.10 Domestic water tariffs	625
Figure 31.11 Wastewater and other water tariffs	626
31.8.2 Operating expenditure	626
31.8.3 Capital expenditure	626
31.9 Government's water strategy	627
31.9.1 Five-year plan 2010-2014	627
31.9.2 Loi de Finances Complémentaire and the principle of 'Préférence Nationale'	627
31.10 Private sector participation	627
31.11 Current and future projects	628
31.11.1 Water supply and WTPs	628

31.11.2 WWTPs	628
Figure 31.12 WWTPs planned for 2010	628
31.11.3 Desalination	628
Figure 31.13 Planned SWRO plants	628
Figure 31.14 Tracked desalination projects in Algeria	629
Figure 31.15 Tracked PPP projects in Algeria	630
31.11.4 Management contracts	630
31.11.5 Market forecast	630
Figure 31.16 Market forecast, 2007-2016	631
Figure 31.17 Market forecast breakdown, 2010	632
Figure 31.18 Market forecast data, 2007-2016 (\$ million)	633
32. Egypt	635
32.1 Demographic indicators	635
Figure 32.1 Population indicators, Egypt	635
Figure 32.2 Economic indicators, Egypt	635
32.2 Introduction	635
32.3 Overview of challenges	635
32.4 Water sector organisation and structure	635
32.4.1 Government ministries and agencies	635
Figure 32.3 Organisation of government bodies involved in water management in Egypt	637
32.4.2 Companies	637
32.5 Water resources and sectoral water use	637
32.5.1 Water resources	637
Figure 32.4 Water resources in Egypt	638
32.5.2 Sectoral water use	638
Figure 32.5 Water supply and sectoral use: estimates for 2007 and 2017	638
32.6 Municipal water and wastewater infrastructure	638
32.6.1 Key performance indicators: water	638
Figure 32.6 Water supply indicators, Egypt	639
32.6.2 Key performance indicators: wastewater	639
Figure 32.7 Wastewater indicators, Egypt	639
32.6.3 Water treatment plants	639
Figure 32.8 Breakdown of WTPs by type	640
32.6.4 Desalination	640
32.6.5 Wastewater treatment plants	640
32.6.6 Water reuse	640
32.7 Water in industry	640
Figure 32.9 Industrial water demand, 1980 and 2000	641
Figure 32.10 Anticipated future industrial water demand, 2017	641
Figure 32.11 Calculated GDP/unit of water withdrawal for agriculture and industry	641
32.8 Water finance	642
32.8.1 Tariffs	642
Figure 32.12 Water tariffs	642
32.8.2 Operating expenditure	642
Figure 32.13 : Operating expenditure for Egypt's NWRP (EGP million)	643
32.8.3 Capital expenditure	643
Figure 32.14 Capital investment for high priority projects	644
Figure 32.15 Capital expenditure for Egypt's NWRP (EGP million)	644
32.9 Government's water strategy	645
32.10 Private sector participation	645
32.11 Current and future projects	645
32.11.1 Planned water reuse projects	645
Figure 32.16 Current and planned water reuse projects	645
32.11.2 Planned WTPs and WWTPs	646
Figure 32.17 Planned WWTPs	646
Figure 32.18 Planned WTPs/desalination plants involving private sector participation (PPP)	646
Figure 32.19 Planned WWTPs involving private sector participation (PPP)	646
32.11.3 Tracked projects	647

Figure 32.20 Tracked desalination projects in Egypt	647
Figure 32.21 Tracked PPP projects in Egypt	647
32.12 Market forecast	649
Figure 32.22 Market forecast, 2007-2016	650
Figure 32.23 Market forecast breakdown, 2010	651
Figure 32.24 Market forecast data, 2007-2016 (\$ million)	652
33. Morocco	654
33.1 Demographic indicators	654
Figure 33.1 Population indicators, Morocco	654
Figure 33.2 Economic indicators, Morocco	654
33.2 Introduction	654
33.3 Overview of challenges	654
33.4 Water sector organisation and structure	655
33.4.1 Government ministries and policy-makers	655
Figure 33.3 Organisation of the water sector in Morocco	655
33.4.2 Distribution	655
Figure 33.4 Régies and concession services	656
33.5 Supply and demand details	656
33.5.1 Water supply	656
Figure 33.5 Water resources in Morocco (includes Western Sahara)	656
33.5.2 Sectoral water use	656
Figure 33.6 Sectoral water withdrawal, Morocco (includes Western Sahara)	657
33.6 Municipal water and wastewater infrastructure	657
33.6.1 Key performance indicators: water	657
Figure 33.7 Share of the population per distribution system	657
Figure 33.8 Water supply indicators, Morocco	657
Figure 33.9 ONEP investment programme, 2008-2010	658
33.6.2 Key performance indicators: wastewater	658
Figure 33.10 Actual and projected volumes of wastewater produced, 1960-2020	658
Figure 33.11 Wastewater indicators, Morocco	659
33.6.3 Water treatment plants	659
33.6.4 Desalination	659
33.6.5 Wastewater treatment plants	659
Figure 33.12 Main WWTPs under development	659
33.6.6 Water reuse	660
33.7 Water in industry	660
33.8 Water finance	660
33.8.1 Tariffs	660
Figure 33.13 ONEP water and wastewater tariffs (excluding VAT, MAD)	661
33.8.2 Operating expenditure	661
Figure 33.14 Revenues by sector in 2008	661
33.8.3 Capital expenditure	661
Figure 33.15 Past and future investments for the régies	662
Figure 33.16 Past and future investments for the concessions	662
33.9 Government's water strategy	662
33.9.1 Programme National d'Economie d'Eau et d'Irrigation (PNEEI)	662
33.9.2 Programme National d'Assainissement (PNA)	663
Figure 33.17 Government investments in wastewater	663
33.9.3 Initiative Nationale pour le Développement Humain (INDH)	663
33.9.4 Merger ONEP-ONE	664
33.9.5 Regionalisation	664
33.10 Private sector participation	664
33.10.1 Lydec	664
Figure 33.18 Lydec investments between 1997 and 2008, by sector	665
Figure 33.19 Lydec revenues by sector, 2008	665
33.10.2 Veolia Maroc (Redal and Amendis)	665
33.11 Current and future projects	666
33.11.1 Desalination and reuse	666

Figure 33.20 Planned desalination investments at ONEP	666
33.11.2 Water treatment plants	666
Figure 33.21 Planned water treatment plants, ONEP	666
33.11.3 Wastewater	667
33.11.4 Concessions and private sector involvement in service distribution	667
33.11.5 Tracked projects	667
Figure 33.22 Tracked PPP projects in Morocco	667
Figure 33.23 Tracked desalination projects in Morocco	667
Figure 33.24 Tracked reuse projects in Morocco	668
33.12 Market forecast	669
Figure 33.25 Market forecast, 2007-2016	670
Figure 33.26 Market forecast breakdown, 2010	671
Figure 33.27 Market forecast data, 2007-2016 (\$ million)	672
34. Tunisia	674
34.1 Demographic indicators	674
Figure 34.1 Population indicators, Tunisia	674
Figure 34.2 Economic indicators, Tunisia	674
34.2 Introduction	674
34.3 Overview of challenges	674
34.4 Water sector organisation and structure	674
Figure 34.3 Water sector organisation in Tunisia	675
34.5 Supply and demand details	675
34.5.1 Water supply	675
Figure 34.4 Total withdrawal from North-western Sahara Aquifer System (NWSAS), 1950-2000	675
Figure 34.5 Water resources in Tunisia	676
34.5.2 Sectoral water use	676
Figure 34.6 Major water resource allocation by sector, 2010 and 2030	676
34.6 Municipal water and wastewater infrastructure	677
34.6.1 Key performance indicators: water	677
Figure 34.7 Water supply indicators, Tunisia	677
34.6.2 Key performance indicators: wastewater	677
Figure 34.8 Wastewater indicators, Tunisia	677
Figure 34.9 The president's sanitation programme for peripheral urban areas	677
34.6.3 Water treatment plants	678
34.6.4 Desalination	678
Figure 34.10 Main desalination plants in Tunisia	678
34.6.5 Wastewater treatment plants	678
Figure 34.11 Main WTPs in Tunisia	678
34.6.6 Water reuse	678
Figure 34.12 Reclaimed water applications, 2001-2008	679
34.7 Water in industry	679
34.8 Water finance	679
34.8.1 Tariffs	679
Figure 34.13 Overview of consumer water tariffs excluding tax, 2005-2009	680
34.8.2 Operating expenditure	680
34.8.3 Capital expenditure	680
34.9 Government's water strategy	680
34.9.1 Agricultural water saving programme	681
34.9.2 Wastewater	681
Figure 34.14 ONAS wastewater targets, 2007-2016	681
34.9.3 Water reuse	681
Figure 34.15 ONAS targets for wastewater treatment and reuse, 2007-2016	681
34.10 Private sector participation	681
34.11 Current and future projects	682
34.11.1 Seawater desalination	682
Figure 34.16 Planned seawater desalination plants	682
34.11.2 Programme National d'Amélioration de la Qualité de l'Eau (water quality improvement programme)	682
Figure 34.17 Plants included in the first phase of the programme	682

Figure 34.18 Plants included in the second phase of the programme	683
34.11.3 New WWTPs	683
Figure 34.19 Forthcoming WWTPs	683
34.11.4 Projet de transfert des eaux épurées Nord-Sud (North-South reclaimed water transfer project)	683
Figure 34.20 North-South transfer project - irrigated areas	684
Figure 34.21 North-South transfer project - aquifer recharge	684
34.11.5 Projet de valorisation des effluents industriels (quality of industrial effluents project)	684
34.11.6 Projet d'extension et de réhabilitation (WWTP extension and upgrade programme)	684
Figure 34.22 First phase of the WWTP extension programme	685
34.11.7 Tracked projects	685
Figure 34.23 Tracked reuse projects in Tunisia	685
Figure 34.24 Tracked desalination projects in Tunisia	686
Figure 34.25 Tracked PPP projects in Tunisia	687
34.12 Market forecast	687
Figure 34.26 Market forecast, 2007-2016	688
Figure 34.27 Market forecast breakdown, 2010	689
Figure 34.28 Market forecast data, 2007-2016 (\$ million)	690

Sub-Saharan Africa

35. Nigeria	692
35.1 Demographic indicators	692
Figure 35.1 Population indicators, Nigeria	692
Figure 35.2 Economic indicators, Nigeria	692
35.2 Introduction	692
35.3 Overview of challenges	692
35.4 Water sector organisation and structure	693
35.4.1 Government ministries and agencies	693
Figure 35.3 Departmental structure of FMAWR	693
35.4.2 Companies	693
35.5 Supply and demand details	693
35.5.1 Water supply	693
Figure 35.4 Water resources in Nigeria	694
35.5.2 Sectoral water use	694
Figure 35.5 Sectoral water withdrawal, Nigeria	694
35.6 Municipal water and wastewater infrastructure	694
35.6.1 Key performance indicators: water	694
Figure 35.6 Water supply indicators, Nigeria	695
35.6.2 Key performance indicators: wastewater	695
Figure 35.7 Wastewater indicators, Nigeria	695
35.6.3 Water treatment plants	695
35.6.4 Desalination	696
35.6.5 Wastewater treatment plants	696
35.6.6 Reuse	696
35.7 Water in industry	696
35.8 Water finance	696
35.8.1 Federal level investments	696
Figure 35.8 Allocation of funds to meet MDGs	697
35.8.2 Water revenues and state level investments	697
Figure 35.9 Water allocation as a portion of the total federal budget, 1999-2007	697
35.8.3 International level investments	698
35.8.4 Tariffs	698
35.8.5 Operating expenditure	698
35.8.6 Capital expenditure	698
Figure 35.10 Kwara State capital expenditure annual breakdown	699
35.9 Government's water strategy	699
35.10 Private sector participation	699
35.11 Current and future projects	700

35.11.1 Plateau State	700
35.11.2 Lagos State	700
35.11.3 Cross River State	700
35.11.4 Bauchi State	700
35.11.5 Taraba and Oyo States	701
35.12 Market forecast	701
Figure 35.11 Market forecast, 2007-2016	702
Figure 35.12 Market forecast breakdown, 2010	703
Figure 35.13 Market forecast data, 2007-2016 (\$ million)	704
36. South Africa	706
36.1 Demographic indicators	706
Figure 36.1 Population indicators, South Africa	706
Figure 36.2 Economic indicators, South Africa	706
36.2 Introduction	706
36.3 Overview of challenges	706
36.3.1 Water scarcity	706
36.3.2 Demographics	707
36.3.3 Social factors	707
36.3.4 Planning, financing and regulation	707
36.3.5 Lack of capacity	707
36.4 Water sector organisation and structure	707
36.4.1 Government ministries and agencies	707
36.4.2 Water supply, management and user organisations	707
Figure 36.3 Water boards	708
Figure 36.4 Water sector institutional and agency structure	709
36.4.3 Laws and regulations	709
36.4.4 Companies	710
36.5 Supply and demand details	710
36.5.1 Water supply	710
Figure 36.5 Water resources in South Africa	710
Figure 36.6 Suppliers of municipal water, 2006	711
Figure 36.7 Anticipated changes in water supply	711
Figure 36.8 Average incremental cost of municipal water supply methods	711
36.5.2 Sectoral water use	711
Figure 36.9 Sectoral water withdrawal, South Africa	712
Figure 36.10 Distribution of municipal water, 2006	712
Figure 36.11 Municipal water purchases and sales, 2006	712
Figure 36.12 Economic value of water, by sector	712
36.6 Municipal water and wastewater infrastructure	713
Figure 36.13 Access to services meeting RDP1 standards (% of population)	713
36.6.1 Key performance indicators: water	713
Figure 36.14 Water supply indicators, South Africa	713
Figure 36.15 Wastewater indicators, South Africa	714
36.6.2 Key performance indicators: wastewater	714
36.6.3 Water treatment plants	714
36.6.4 Desalination	714
36.6.5 Wastewater treatment plants	714
Figure 36.16 Ownership/management of WWTPs, 2007	715
36.6.6 Water reuse	715
36.7 Water in industry	715
Figure 36.17 Value and volume of water used, by commercial sector, 2004	715
36.7.1 Water for mining	716
Figure 36.18 Value and volume of water use, by mining sector, 2004	716
36.7.2 Water for energy	716
36.7.3 Other industries	716
36.8 Water finance	716
Figure 36.19 Sources of municipal water capital expenditure	717
36.8.1 Tariffs	717

Figure 36.20 Average domestic monthly water tariffs, 2007/08 – 2008/09 (including VAT)	718
Figure 36.21 Average commercial and industrial water tariffs, 2007/08 – 2008/09 (including VAT)	718
36.8.2 Operating expenditure	719
Figure 36.22 Total annual water and sanitation operating expenditures, 2003-09	719
Figure 36.23 Operating expenditures by municipality type, 2008-09	719
36.8.3 Capital expenditure	719
Figure 36.24 Estimated and projected water and sanitation capital expenditures, 2006-12	720
36.9 Government's water strategy	720
36.10 Private sector participation	721
Figure 36.25 No. of municipalities with commercialised or outsourced water services by province, 2007-2008	721
36.10.1 Management contracts	721
36.10.2 Concessions	721
36.10.3 Wastewater treatment	722
36.10.4 Desalination	722
36.10.5 Water reuse	722
36.11 Current and future projects	722
Figure 36.26 Water infrastructure projects under construction	723
Figure 36.27 Remaining useful life and replacement costs of infrastructure and other assets	723
36.11.1 Dams and other bulk water infrastructure	723
Figure 36.28 Major bulk water projects	724
Figure 36.29 Current and future bulk water infrastructure projects	724
36.11.2 Desalination	724
36.11.3 Wastewater	725
36.11.4 Reuse	725
36.11.5 Tracked projects	725
Figure 36.30 Tracked desalination projects in South Africa	725
Figure 36.31 Tracked reuse projects in South Africa	725
36.12 Market forecast	725
36.13 Acknowledgements	726
Figure 36.32 Market forecast, 2007-2016	727
Figure 36.33 Market forecast breakdown, 2010	728
Figure 36.34 Market forecast data, 2007-2016 (\$ million)	729

Volume 3: Middle East and Asia Pacific

Middle East

37. Iran	731
37.1 Demographic indicators	731
Figure 37.1 Population indicators, Iran	731
Figure 37.2 Economic indicators, Iran	731
37.2 Introduction	731
37.3 Overview of challenges	731
37.3.1 Water quantity and quality	731
37.3.2 Rising demand for water services	731
37.3.3 Poor infrastructure	731
37.3.4 Need for better planning and coordination within the water sector	731
37.4 Water sector organisation and structure	732
Figure 37.3 Water sector structure in Iran	732
37.5 Supply and demand details	732
37.5.1 Water supply	732
Figure 37.4 Status of dams	733
Figure 37.5 Water resources in Iran	733
37.5.2 Sectoral water use	733
Figure 37.6 Sectoral water withdrawal, Iran	733
Figure 37.7 Status of irrigation and drainage systems	733
Figure 37.8 Water balance in Iran, 2007	734

37.6 Municipal water and wastewater infrastructure	734
37.6.1 Key performance indicators: water	734
Figure 37.9 Water supply indicators, Iran (urban)	735
Figure 37.10 Water network statistics	735
37.6.2 Key performance indicators: wastewater	735
Figure 37.11 Wastewater indicators, Iran (urban)	735
Figure 37.12 Wastewater network statistics	736
37.6.3 Water treatment plants	736
Figure 37.13 WTPs currently under operation	736
37.6.4 Desalination	737
Figure 37.14 Large desalination plants in Iran	737
37.6.5 Wastewater treatment plants	737
Figure 37.15 WWTPs currently in operation, by province	738
37.6.6 Water reuse	738
37.7 Water in industry	739
37.8 Water finance	739
37.9 Government's water strategy	739
37.9.1 The Fourth Five-Year Economic Development Plan, 2005-10	739
37.9.2 The programmes and needs of the water and wastewater sector (NWWEC-2009)	739
37.9.3 NWWEC vision for 2021	740
37.10 Private sector participation	740
37.11 Current and future projects	740
37.11.1 Water treatment plant projects	740
Figure 37.16 Large-scale WTPs currently under design or construction	740
37.11.2 Desalination projects	740
Figure 37.17 Desalination plants under planning or construction	741
37.11.3 Wastewater treatment projects	741
Figure 37.18 Main WWTPs currently under design or construction	741
37.11.4 Tracked projects	742
Figure 37.19 Tracked desalination projects in Iran	742
Figure 37.20 Tracked PPP projects in Iran	742
37.12 Market forecast	743
37.12.1 Fourth Development Plan forecasts, 2005-2010	743
Figure 37.21 Prediction of finance required to meet the Fourth Development Plan objectives, 2005-2009	743
Figure 37.22 Target average annual growth of sectors in the Fourth Development Plan, 2005-2010	744
37.12.2 Fifth Development Plan (2005-2010)	744
37.12.3 Predictions for 2015 and 2025	744
Figure 37.23 Major urban water and wastewater predictions	745
Figure 37.24 Major rural water and wastewater predictions	745
Figure 37.25 Market forecast, 2007-2016	746
Figure 37.26 Market forecast breakdown, 2010	747
Figure 37.27 Market forecast data, 2007-2016 (\$ million)	748
38. Israel	750
38.1 Demographic indicators	750
Figure 38.1 Population indicators, Israel	750
Figure 38.2 Economic indicators, Israel	750
38.2 Introduction	750
38.3 Overview of challenges	750
38.3.1 Geographical challenges	750
38.3.2 Political challenges	750
38.4 Water sector organisation and structure	751
38.4.1 Legal framework	751
38.4.2 Government ministries and agencies	751
38.4.3 Companies	752
38.5 Supply and demand details	752
38.5.1 Water supply	752
Figure 38.3 Water resources in Israel	752
38.5.2 Sectoral water use	753

Figure 38.4 Distribution of water consumption, 2007	753
38.6 Municipal water and wastewater infrastructure	753
38.6.1 Key performance indicators: water	753
Figure 38.5 Water source types, 2007 and 2020 projections	754
Figure 38.6 Water supply indicators, Israel	755
38.6.2 Key performance indicators: wastewater	755
Figure 38.7 Wastewater produced, 2007	755
Figure 38.8 Wastewater indicators, Israel	755
38.6.3 Water treatment plants	756
38.6.4 Desalination	756
38.6.5 Wastewater treatment plants	756
Figure 38.9 Wastewater treatment in Israel, 2007	757
38.6.6 Water reuse	757
Figure 38.10 Effluent quality, 2008	757
38.7 Water in industry	758
Figure 38.11 Sectoral industrial water consumption, 2001	758
38.8 Water finance	758
38.8.1 Sewage, wastewater treatment and reuse	758
38.8.2 Water technologies	759
38.8.3 Tariffs	759
38.8.4 Operating expenditure	759
38.8.5 Capital expenditure	759
38.9 Government's water strategy	759
38.10 Private sector participation	760
38.11 Current and future projects	761
38.11.1 Ongoing projects	761
38.11.2 Tracked projects	762
Figure 38.12 Tracked desalination projects in Israel	762
Figure 38.13 Tracked reuse projects in Israel	765
38.12 Market forecast	765
Figure 38.14 Market forecast, 2007-2016	766
Figure 38.15 Market forecast breakdown, 2010	767
Figure 38.16 Market forecast data, 2007-2016 (\$ million)	768
39. Kuwait	770
39.1 Demographic indicators	770
Figure 39.1 Population indicators, Kuwait	770
Figure 39.2 Economic indicators, Kuwait	770
39.2 Introduction	770
39.3 Overview of challenges	770
39.3.1 Developing Kuwait's water supply and demand strategy	770
39.3.2 Reducing the cost of desalination	770
39.3.3 Ensuring competitive procurement processes	770
39.3.4 Exploiting the potential of water reuse	771
39.3.5 Rehabilitation of wastewater infrastructure	771
39.3.6 Managing groundwater resources	771
39.4 Water sector organisation and structure	771
39.4.1 Government ministries and agencies	771
39.5 Supply and demand details	771
39.5.1 Water supply	771
Figure 39.3 Water supply by source in Kuwait	772
39.5.2 Water resources	772
Figure 39.4 Water resources in Kuwait	772
39.5.3 Sectoral water use	772
Figure 39.5 Fresh water consumption in Kuwait	773
Figure 39.6 Per capita water consumption in Kuwait, 1960-2003	773
39.6 Municipal water and wastewater infrastructure	773
39.6.1 Key performance indicators: water	773
Figure 39.7 Water supply indicators, Kuwait	774

39.6.2 Key performance indicators: wastewater	774
Figure 39.8 Wastewater indicators, Kuwait	774
Figure 39.9 Forecasted wastewater flows in Kuwait, 2009-2014	775
39.6.3 Water treatment plants	775
39.6.4 Desalination	775
Figure 39.10 Existing desalination plants in Kuwait	775
39.6.5 Wastewater treatment plants	776
Figure 39.11 Existing wastewater treatment plants in Kuwait	776
39.6.6 Water reuse	776
39.7 Water in industry	777
39.8 Water finance	777
39.8.1 Tariffs	777
39.8.2 Operating expenditure	778
39.8.3 Capital expenditure	778
39.9 Government's water strategy	778
39.10 Private sector participation	778
39.11 Current and future projects	778
Figure 39.12 Current and future projects in Kuwait	779
39.11.1 Tracked projects	779
Figure 39.13 Tracked desalination projects in Kuwait	779
39.12 Market forecast	780
Figure 39.14 Market forecast, 2007-2016	781
Figure 39.15 Market forecast breakdown, 2010	782
Figure 39.16 Market forecast data, 2007-2016 (\$ million)	783
40. Qatar	785
40.1 Demographic indicators	785
Figure 40.1 Population indicators, Qatar	785
Figure 40.2 Economic indicators, Qatar	785
40.2 Introduction	785
40.3 Overview of challenges	785
40.4 Water sector organisation and structure	785
40.4.1 Government ministries and agencies	785
Figure 40.3 Main government water resource-related agencies	786
Figure 40.4 Eligibility for tenders issued by Ashghal	786
Figure 40.5 Organisational structure of Ashghal (Public Works Authority)	787
40.4.2 Companies	787
40.5 Supply and demand details	787
40.5.1 Water supply	787
Figure 40.6 Water resources in Qatar	788
40.5.2 Sectoral water use	788
Figure 40.7 Sectoral water withdrawal, Qatar	788
Figure 40.8 Breakdown of agricultural and domestic water consumption by source, 1965-2005	788
40.6 Municipal water and wastewater infrastructure	788
40.6.1 Key performance indicators: water	788
Figure 40.9 Municipal water demand and supply in Qatar, 2003-2008	789
Figure 40.10 Water connection rate for residential buildings, 2004	789
Figure 40.11 Water supply indicators, Qatar	790
40.6.2 Key performance indicators: wastewater	790
Figure 40.12 Wastewater connection rate for residential buildings, 2004	790
Figure 40.13 Wastewater indicators, Qatar	790
40.6.3 Water treatment plants	791
40.6.4 Desalination	791
40.6.5 Wastewater treatment plants	791
40.6.6 Water reuse	792
Figure 40.14 Reclaimed water use breakdown by application, 2005	792
40.7 Water in industry	792
40.8 Water finance	793
Figure 40.15 QEWC financial arrangements for water-related projects	794

40.8.1 Tariffs	794
40.8.2 Operating expenditure	795
Figure 40.16 QEWC financial information, 2004-2009	795
40.8.3 Capital expenditure	795
40.8.3.1 Water	795
Figure 40.17 Kahramaa actual and planned water capital expenditure, 2000-2015	795
40.8.3.2 Wastewater	796
40.9 Government's water strategy	796
40.10 Private sector participation	796
40.10.1 Desalination	796
Figure 40.18 Project-specific power and water entities in Qatar	797
40.10.2 Wastewater treatment and reuse	797
40.10.3 Wastewater infrastructure	797
40.10.4 Property development	797
40.10.4.1 Lusail City	797
40.10.4.2 The Pearl - Qatar	797
40.11 Current and future projects	798
40.11.1 Desalination	798
40.11.2 IWPP project timescales	798
40.11.3 Water infrastructure	798
40.11.4 WWTPs, water reuse and wastewater infrastructure	798
Figure 40.19 Ashghal - Doha North WWTP and infrastructure contracts	799
Figure 40.20 Ashghal five year plan - Drainage Affairs projects currently under construction	800
Figure 40.21 Ashghal five year plan - Large projects recently awarded	801
Figure 40.22 Ashghal five year plan - Future projects	801
40.11.5 Tracked projects	802
Figure 40.23 Tracked desalination projects in Qatar	802
Figure 40.24 Tracked reuse projects in Qatar	802
40.12 Market forecast	803
40.12.1 Summary	803
40.12.2 Potential new directions	803
40.12.3 Planned expenditure	803
Figure 40.25 Market forecast, 2007-2016	804
Figure 40.26 Market forecast breakdown, 2010	805
Figure 40.27 Market forecast data, 2007-2016 (\$ million)	806
41. Saudi Arabia	808
41.1 Demographic indicators	808
Figure 41.1 Population indicators, Saudi Arabia	808
Figure 41.2 Economic indicators, Saudi Arabia	808
41.2 Introduction	808
41.3 Overview of challenges	808
41.3.1 Reducing agricultural demand for water	808
41.3.2 Maintaining and increasing urban water supply	808
41.3.3 Managing demand	808
41.3.4 The performance of the public sector	809
41.3.5 Tariff reform	809
41.3.6 The new cities	809
41.4 Water sector organisation and structure	809
41.4.1 Government ministries and agencies	809
41.4.1.1 The Ministry of Water and Electricity	809
41.4.1.2 The National Water Company	809
41.4.1.3 The Saline Water Conversion Corporation	809
Figure 41.3 SWCC water and power production, 2003-2007	810
41.4.1.4 The Water and Electricity Company	810
41.4.1.5 Other water related institutions	810
41.5 Supply and demand details	810
41.5.1 Water supply	810
Figure 41.4 Water resources in Saudi Arabia	811

Figure 41.5 Historical water usage by source in Saudi Arabia, 1990-2004	811
41.5.2 Sectoral water use	811
Figure 41.6 Sectoral water withdrawal, Saudi_Arabia	811
Figure 41.7 Sectoral water demand in Saudi Arabia, 1980-2004	812
41.6 Municipal water and wastewater infrastructure	812
41.6.1 Key performance indicators: water	812
Figure 41.8 Water supply indicators, Saudi Arabia	812
41.6.2 Key performance indicators: wastewater	813
Figure 41.9 Wastewater indicators, Saudi Arabia	813
41.6.3 Water production facilities	813
Figure 41.10 SWCC's water production facilities	814
Figure 41.11 SWCC's principal water transmission pipelines	815
Figure 41.12 WEC's desalination plants	815
Figure 41.13 Marafiq's water production facilities	816
Figure 41.14 Summary of desalination in Saudi Arabia	816
41.6.4 Wastewater treatment plants	816
Figure 41.15 Wastewater treatment facilities in Saudi Arabia's major cities	816
41.6.5 Water reuse	816
Figure 41.16 Wastewater treatment at Marafiq's major facilities	817
41.7 Water in industry	817
41.8 Water finance	817
41.8.1 Tariffs	818
Figure 41.17 Water tariff structure	818
41.8.2 Operating and capital expenditure	819
Figure 41.18 Financial structure of the Shuqaiq IWPP	819
41.9 Government's water strategy	819
41.9.1 SWCC privatisation	819
41.9.2 National Water Company strategy	820
41.9.2.1 Water supply and wastewater collection	820
41.9.2.2 Wastewater treatment and reuse	820
41.9.3 The Economic Cities Programme	820
41.10 Private sector participation	820
Figure 41.19 Privatisation strategy for Saudi Arabia	821
Figure 41.20 Timeline of the privatisation programme	821
Figure 41.21 Private sector participation in the Saudi water sector	821
41.11 Current and future projects	821
41.11.1 Water production facilities	821
Figure 41.22 Water production projects	822
Figure 41.23 Water transmission pipelines	823
41.11.2 Wastewater treatment and water reuse	823
Figure 41.24 WWTPs to be constructed or transferred to the private sector in major cities	823
Figure 41.25 Tentative schedule for tendering of management contracts by NWC in second tier cities	824
41.11.3 Tracked projects	824
Figure 41.26 Tracked desalination projects in Saudi Arabia	824
Figure 41.27 Tracked reuse projects in Saudi Arabia	827
Figure 41.28 Tracked PPP projects in Saudi Arabia	828
41.12 Market forecast	829
Figure 41.29 Market forecast, 2007-2016	830
Figure 41.30 Market forecast breakdown, 2010	831
Figure 41.31 Market forecast data, 2007-2016 (\$ million)	832
42. Turkey	834
42.1 Demographic indicators	834
Figure 42.1 Population indicators, Turkey	834
Figure 42.2 Economic indicators, Turkey	834
42.2 Introduction	834
42.3 Overview of challenges	834
42.4 Water sector organisation and structure	835
42.4.1 National level	835

Figure 42.3 Water management in Turkey	836
42.4.2 Municipal level	837
Figure 42.4 Four models for water and wastewater service suppliers	838
42.5 Supply and demand details	838
42.5.1 Water supply	838
Figure 42.5 Water resources in Turkey	839
Figure 42.6 Allocation of water resources	839
42.5.2 Dams	839
Figure 42.7 General Directorate for State Hydraulic Works (DSI) facilities constructed, 2006-2008	839
42.5.3 Sectoral water use	839
Figure 42.8 Actual and projected sectoral water use, 2008-2023	840
42.6 Municipal water and wastewater infrastructure	840
42.6.1 Key performance indicators: water	840
Figure 42.9 Indicators for improving the quality of water supply	840
Figure 42.10 Water supply indicators, Turkey	840
42.6.2 Key performance indicators: wastewater	840
Figure 42.11 Breakdown of the percentage of Turkey's population connected to sewerage services	841
Figure 42.12 Wastewater indicators, Turkey	841
42.6.3 Water treatment plants	841
42.6.4 Desalination	841
42.6.5 Wastewater treatment plants	841
Figure 42.13 Overview of Istanbul WWTPs	842
42.6.6 Water reuse	842
Figure 42.14 Reuse of treated wastewater in different regions of Turkey	843
42.7 Water in industry	843
Figure 42.15 Sectoral breakdown of industrial water use	843
Figure 42.16 The main sources of water for industrial water supply	844
Figure 42.17 Breakdown of industrial water by type of use	844
Figure 42.18 Annual amount of consumed process water by sector	844
42.8 Water finance	845
Figure 42.19 Total investment requirements for EU Directives, 2007-2023	845
Figure 42.20 Drinking water investment requirements, 2007-2023	845
Figure 42.21 Wastewater investment requirements, 2007-2023	846
Figure 42.22 Foreign investment and finance in the Turkish water sector, 1995-2002	846
42.8.1 Tariffs	846
Figure 42.23 A snapshot of water pricing in Turkey for different uses	846
Figure 42.24 Water and wastewater tariffs in several major Turkish cities	847
42.8.2 Operating expenditure	847
Figure 42.25 Breakdown of national environmental revenues in Turkey	847
42.8.3 Capital expenditure	848
Figure 42.26 Breakdown of Turkish municipalities' environmental expenditure	848
42.9 Government's water strategy	848
42.10 Private sector participation	849
42.11 Current and future projects	849
42.11.1 The Southeastern Anatolia project (GAP)	849
42.11.2 Greater Melen project	850
42.11.3 Manavgat Project	850
42.11.4 Desalination projects	850
42.11.5 Wastewater and water reuse projects	851
Figure 42.27 Water and wastewater projects considered for financing from EU IPA funds	851
Figure 42.28 Reuse capacity of advanced WWTPs under planning and construction in Istanbul, 2009	852
42.11.6 Tracked projects	852
Figure 42.29 Tracked desalination projects in Turkey	852
Figure 42.30 Tracked reuse projects in Turkey	852
42.12 Market forecast	852
Figure 42.31 Estimated budget for the water supply, wastewater and solid waste sector, 2007-2023	853
Figure 42.32 Market forecast, 2007-2016	854
Figure 42.33 Market forecast breakdown, 2010	855

Figure 42.34 Market forecast data, 2007-2016 (\$ million)	856
43. United Arab Emirates - Abu Dhabi	858
43.1 Demographic indicators (all emirates)	858
Figure 43.1 Population indicators, United Arab Emirates	858
Figure 43.2 Economic indicators, United Arab Emirates	858
43.2 Introduction	858
43.2.1 The UAE	858
Figure 43.3 Population and area of each of the United Arab Emirates	858
Figure 43.4 Water resources in the United Arab Emirates	858
43.2.2 Abu Dhabi	859
43.3 Overview of challenges	859
43.4 Water sector organisation and structure	859
43.4.1 Government ministries and agencies	859
43.4.2 Companies	860
Figure 43.5 Organisation of the water and electricity sector in Abu Dhabi	861
43.5 Supply and demand detail	861
43.5.1 Water supply	861
Figure 43.6 Water resources: types, volumes and status in 1960 and 2007	862
43.5.2 Sectoral water use	862
Figure 43.7 Sectoral water use by source in Abu Dhabi, 2007	862
Figure 43.8 Users of desalinated water in Abu Dhabi, 2008	863
43.6 Municipal water and wastewater infrastructure	863
Figure 43.9 Mean water peak demand forecasts	864
43.6.1 Water treatment plants	864
43.6.2 Desalination	864
Figure 43.10 Ownership structure of the Fujairah F2 IWPP	865
Figure 43.11 IWPPs in Abu Dhabi	866
43.6.3 Wastewater treatment plants	866
Figure 43.12 Production of treated wastewater in Abu Dhabi	867
Figure 43.13 Projected generation of treated effluent by population growth scenario, 2010-2030	868
43.6.4 Water reuse	868
43.7 Water in industry	868
Figure 43.14 ADNOC Group company annual water consumption for 2006	869
43.8 Water finance	869
43.8.1 Tariffs	869
Figure 43.15 ADWEA water tariffs	869
43.8.2 Operating expenditure	869
43.8.3 Capital expenditure	870
Figure 43.16 Provisional capex allowance assumptions for water expenditure, 2003-2005	870
43.9 Government's water strategy	870
43.10 Private sector participation	870
43.11 Current and future projects	870
43.11.1 Wastewater infrastructure	870
Figure 43.17 Current and future WWTP projects in Abu Dhabi	871
43.11.2 Desalination	872
Figure 43.18 Current and future desalination projects in Abu Dhabi	872
43.11.3 Tracked projects in the UAE (all Emirates)	873
Figure 43.19 Tracked desalination projects in the United Arab Emirates	873
Figure 43.20 Tracked reuse projects in the United Arab Emirates	875
43.12 Market forecast	877
43.12.1 Abu Dhabi	877
43.12.2 Nuclear energy in desalination	877
43.12.3 First Water Conservation Law	877
Figure 43.21 Market forecast, 2007-2016	878
Figure 43.22 Market forecast breakdown, 2010	879
Figure 43.23 Market forecast data, 2007-2016 (\$ million)	880

44. United Arab Emirates - Dubai	882
44.1 Introduction	882
44.2 Overview of challenges	882
44.3 Water sector organisation and structure	882
44.3.1 Government ministries and agencies	882
44.4 Supply and demand detail	882
44.4.1 Water supply	882
Figure 44.1 Dubai: Water supply sources, 2004-2008	883
44.4.2 Sectoral water use	883
Figure 44.2 Water consumption in Dubai, 2008	883
44.5 Municipal water and wastewater infrastructure	883
44.5.1 Water treatment plants	883
44.5.2 Desalination	883
Figure 44.3 The design capacity of power and desalination plants in Dubai, 2008	883
44.5.3 Wastewater treatment plants	884
44.5.4 Water reuse	884
44.6 Water in industry	884
44.7 Water finance	884
44.7.1 Tariffs	884
Figure 44.4 DEWA's slab tariff system, 2009	885
44.7.2 Operating expenditure	885
44.7.3 Capital expenditure	885
44.8 Government's water strategy	885
44.9 Private sector participation	885
44.10 Current and future projects	886
Figure 44.5 Current and future desalination projects in Dubai	886
Figure 44.6 Future WWTP projects in Dubai	887
44.11 Market forecast	887
45. United Arab Emirates - Sharjah and the Northern Emirates	888
45.1 Introduction	888
45.2 Overview of challenges	888
45.3 Water sector organisation and structure	888
45.3.1 Government ministries and agencies	888
45.3.2 Companies	888
45.4 Supply and demand details	888
45.4.1 Water supply	888
Figure 45.1 Water supply in Sharjah, 2008	889
Figure 45.2 Water production in the Northern Emirates, 2009	890
45.4.2 Sectoral water use	890
Figure 45.3 Drinking water consumption by group in Sharjah, 2008	890
Figure 45.4 Potable water consumers in the Northern Emirates, 2009	891
45.5 Municipal water and wastewater infrastructure	891
45.5.1 Water treatment plants	891
45.5.2 Desalination	891
Figure 45.5 Desalination plants in Sharjah, 2008	891
Figure 45.6 Water production by desalination plant in the Northern Emirates, 2009	892
45.5.3 Wastewater treatment plants	892
45.5.4 Water reuse	892
45.6 Water in industry	892
45.7 Water finance	892
45.7.1 Tariffs	892
Figure 45.7 FEWA and SEWA water tariffs	893
45.8 Government's water strategy	893
45.9 Private sector participation	893
45.10 Current and future projects	893
Figure 45.8 Current and future desalination projects	894
Figure 45.9 Current and future WWTP projects in Sharjah and the Northern Emirates	894

45.11 Market forecast	895
South Asia	
46. India	896
46.1 Demographic indicators	896
Figure 46.1 Population indicators, India	896
Figure 46.2 Economic indicators, India	896
46.2 Introduction	896
46.3 Overview of challenges	896
46.4 Water sector organisation and structure	897
46.4.1 Government ministries and agencies	897
Figure 46.3 Main government ministries for various water issues	897
Figure 46.4 Organisational structure of water and wastewater management in India	898
Figure 46.5 Organisations responsible for water supply and sanitation at state level	899
46.4.2 Companies	899
46.5 Supply and demand details	900
46.5.1 Water supply	900
Figure 46.6 Water resources in India	900
46.5.2 Sectoral water use	900
Figure 46.7 Estimated water demand in India for various sectors	901
Figure 46.8 Groundwater use in India in comparison to other countries (km ³ /yr)	902
46.5.3 Domestic water demand	902
46.5.4 Water demand for electricity production	902
46.6 Municipal water and wastewater infrastructure	903
46.6.1 Key performance indicators: water	903
Figure 46.9 Water supply indicators, India	903
46.6.2 Key performance indicators: wastewater	903
Figure 46.10 Wastewater indicators, India	904
46.6.3 Water treatment plants	904
46.6.4 Desalination	904
Figure 46.11 Major ongoing desalination plants in India	904
46.6.5 Wastewater treatment plants	905
46.6.6 Water reuse	905
46.7 Water in industry	905
46.8 Water finance	906
Figure 46.12 Projected investment for infrastructure including water and wastewater, 2007-2012	906
46.8.1 Tariffs	906
Figure 46.13 Volumetric tariffs for water (INR/m ³) in sample cities/towns	907
Figure 46.14 Water tariffs in sample cities/towns in India	907
46.8.2 Operating expenditure	908
46.8.3 Capital expenditure	908
Figure 46.15 Water supply & sanitation budget, 11th Five Year Plan (2007-2012), by state	908
Figure 46.16 Funding for urban water and sewerage under AUWSP and UIDSSMT	909
Figure 46.17 Total investment for water and wastewater under the JNNURM programme by state	910
46.9 Government's water strategy	910
Figure 46.18 Schematic layout of urban water and sanitation financial mechanisms	911
Figure 46.19 Projected investment in water and sanitation, 11th Five Year Plan, 2007-2012	912
46.10 Private sector participation	912
Figure 46.20 Privatisation of water supply and wastewater services	913
46.11 Current and future projects	914
46.11.1 Desalination	914
46.11.2 Water supply	914
46.11.3 Wastewater treatment and reuse	914
46.11.4 Property development	914
46.11.5 Tracked Projects	915
Figure 46.21 Tracked reuse projects in India	915
Figure 46.22 Tracked desalination projects in India	916

Figure 46.23 Tracked PPP projects in India	918
46.12 Market forecast	919
Figure 46.24 Market forecast, 2007-2016	920
Figure 46.25 Market forecast breakdown, 2010	921
Figure 46.26 Market forecast data, 2007-2016 (\$ million)	922

Asia Pacific

47. Australia	924
47.1 Demographic indicators	924
Figure 47.1 Population indicators, Australia	924
Figure 47.2 Economic indicators, Australia	924
47.2 Introduction	924
Figure 47.3 State-by-state population breakdown	924
47.3 Overview of challenges	924
47.4 Water sector organisation and structure	925
47.4.1 Federal regulatory environment	925
Figure 47.4 National Water regulatory arrangements	925
47.4.2 State regulatory environment	925
Figure 47.5 Water regulatory structure in Queensland and New South Wales	926
Figure 47.6 Water regulatory structure in Victoria and South Australia	926
Figure 47.7 Water regulatory structure in Western Australia	927
47.4.3 Companies	927
Figure 47.8 Australian water and wastewater service providers	928
47.4.4 Industry Associations	928
47.5 Supply and demand details	928
47.5.1 Water supply	928
Figure 47.9 Water resources in Australia	929
47.5.2 Sectoral water use	929
Figure 47.10 Sectoral water use	930
47.5.3 Water markets and trading	930
47.6 Municipal water and wastewater infrastructure	931
47.6.1 Key performance indicators: water	931
Figure 47.11 Water supply indicators, Australia	931
47.6.2 Key performance indicators: wastewater	931
Figure 47.12 Wastewater indicators, Australia	931
47.6.3 Water treatment plants	931
Figure 47.13 Major water treatment facilities	932
47.6.4 Desalination	933
47.6.5 Wastewater treatment plants	933
Figure 47.14 Major wastewater treatment facilities	933
47.6.6 Water reuse	934
Figure 47.15 Reclaimed water use by sector	935
47.7 Water in industry	935
Figure 47.16 Industrial water use in Australia, 2004-05	936
Figure 47.17 National energy production statistics	939
47.8 Water finance	939
Figure 47.18 Water for the Future funding initiatives	939
47.8.1 Tariffs	939
Figure 47.19 Urban water utility tariff information and annual bill estimates	940
Figure 47.20 Pricing structures for high reliability irrigation water	940
47.8.2 Total revenue in the urban water sector	940
Figure 47.21 Total income for large water and sewerage utilities, >100,000+ connections	941
47.8.3 Operating expenditure	942
Figure 47.22 Combined operating cost- water and sewerage (AUD/property)	942
47.8.4 Capital expenditure	942
Figure 47.23 Total capital expenditure for large water and sewerage utilities, >100,000+ connections	943
47.9 Government's water strategy	943

47.9.1 Water reform	943
47.9.2 Water planning and investment	944
47.9.3 Water quality	944
47.9.4 Murray Darling Basin	944
47.10 Private sector participation	944
47.10.1 Desalination	945
47.10.2 Water and wastewater treatment and reuse	945
Figure 47.24 Western Corridor Project alliances	945
47.11 Current and future projects	946
47.11.1 Major desalination projects	946
47.11.2 Major water and wastewater treatment and reuse projects	947
47.12 Market forecast	948
Figure 47.25 Market forecast, 2007-2016	949
Figure 47.26 Market forecast breakdown, 2010	950
Figure 47.27 Market forecast data, 2007-2016 (US\$ million)	951
48. China	953
48.1 Demographic indicators	953
Figure 48.1 Population indicators, China	953
Figure 48.2 Economic indicators, China	953
48.2 Introduction	953
48.3 Overview of challenges	953
Figure 48.3 Water quality of the 7 water systems	954
48.4 Water sector organisation and structure	954
Figure 48.4 Government ministries and agencies	954
48.4.1 Companies	955
48.5 Supply and demand details	956
48.5.1 Water supply	956
Figure 48.5 Water resources	956
48.5.2 Sectoral water use	956
Figure 48.6 Sectoral water use	956
48.6 Municipal water and wastewater infrastructure	957
48.6.1 Key performance indicators: water	957
Figure 48.7 Municipal water demand in China	957
Figure 48.8 Municipal water supply and demand in China	957
Figure 48.9 Key performance indicators: water	958
48.6.2 Key performance indicators: wastewater	958
Figure 48.10 Key performance indicators: wastewater	958
48.6.3 Water treatment plants	958
48.6.4 Desalination	958
48.6.5 Wastewater treatment plants	959
48.6.6 Water reuse	959
48.7 Water in industry	959
Figure 48.11 Value of the main 5 industrial consumers of water in China	960
48.8 Water finance	961
Figure 48.12 Breakdown of sources of water supply investment	961
48.8.1 Tariffs	961
Figure 48.13 Beijing's water tariff structure	962
48.8.2 Operating expenditure	962
Figure 48.14 Water financial information, 2004-2008	962
48.8.3 Capital expenditure	962
Figure 48.15 Breakdown of contribution to capital expenditure by source	962
Figure 48.16 Municipal wastewater investment, 2004-2008	963
48.9 Government's water strategy	963
48.10 Private sector participation	963
Figure 48.17 Profit margins within the water industry in China	964
Figure 48.18 Tax policy by company ownership	964
48.10.1 Water supply	964
48.10.2 Wastewater treatment	965

Figure 48.19 Beijing Enterprises water facilities	965
48.10.3 Water reuse	965
48.10.4 Seawater desalination	965
48.10.5 Property development	965
48.11 Current and future projects	965
48.11.1 Water supply	965
48.11.2 Wastewater treatment	966
48.11.3 Water reuse	966
48.11.4 Desalination	966
48.11.5 Tracked projects	967
Figure 48.20 Tracked desalination projects in China	967
Figure 48.21 Tracked reuse projects in China	968
Figure 48.22 Tracked PPP projects in China	968
48.12 Market forecast	969
Figure 48.23 Market forecast, 2007-2016	970
Figure 48.24 Market forecast breakdown, 2010	971
Figure 48.25 Market forecast data, 2007-2016 (\$ million)	972
49. Indonesia	974
49.1 Demographic indicators	974
Figure 49.1 Population indicators, Indonesia	974
Figure 49.2 Economic indicators, Indonesia	974
49.2 Introduction	974
49.3 Overview of challenges	974
49.4 Water sector organisation and structure	974
49.4.1 Government ministries and agencies	974
Figure 49.3 Organisational structure, Ministry of Public Works, Indonesia	975
Figure 49.4 Organisational structure, Directorate General of Water Resources, Indonesia	975
Figure 49.5 Institutions and their roles in the WSS sector in Indonesia	976
49.4.2 Companies	976
49.5 Supply and demand details	976
49.5.1 Water supply	976
Figure 49.6 Water resources in Indonesia	977
49.5.2 Sectoral water use	977
Figure 49.7 Sectoral water withdrawal, Indonesia	977
49.6 Municipal water and wastewater infrastructure	977
49.6.1 Key performance indicators: water	977
Figure 49.8 Water supply coverage	978
Figure 49.9 Water supply indicators, Indonesia	978
49.6.2 Key performance indicators: wastewater	978
Figure 49.10 Population with access to sewerage coverage, 2001-2004 (%)	979
49.6.3 Water treatment plants	979
Figure 49.11 Details of WTPs in Indonesia	979
-	979
-	979
49.6.4 Desalination	979
Figure 49.12 Desalination plants with a capacity > 3,000 m ³ /d by sector	980
49.6.5 Wastewater treatment plants	980
Figure 49.13 Wastewater treatment in Indonesia	981
49.6.6 Water reuse	981
49.7 Water in industry	981
Figure 49.14 Water withdrawal by sector, 1998-2002	981
Figure 49.15 Agricultural sector contribution to GDP, 2000-2008	982
49.8 Water finance	982
Figure 49.16 Loans and grants for WWTPs	983
Figure 49.17 Investment in the wastewater sector	983
49.8.1 Tariffs	983

Figure 49.18 Average water tariffs for select cities and districts, 2007	984
Figure 49.19 WWTP tariff setup and collection efficiency	984
49.8.2 Operating expenditure	984
Figure 49.20 WWTP operating expenditures of selected utilities	985
49.8.3 Capital expenditure	985
49.9 Government's water strategy	985
Figure 49.21 Progress of debt restructuring of PDAMs	985
49.10 Private sector participation	985
Figure 49.22 Water supply PPPs	986
Figure 49.23 Other PPPs in the water and wastewater sectors as of 2005	986
Figure 49.24 Other past cases of private sector participation in Indonesia	987
49.11 Current and future projects	987
Figure 49.25 Potential future water supply PPPs	987
49.11.1 Tracked projects	988
Figure 49.26 Tracked PPP projects in Indonesia	988
49.12 Market forecast	988
Figure 49.27 Market forecast, 2007-2016	989
Figure 49.28 Market forecast breakdown, 2010	990
Figure 49.29 Market forecast data, 2007-2016 (\$ million)	991
50. Japan	993
50.1 Demographic indicators	993
Figure 50.1 Population indicators, Japan	993
Figure 50.2 Economic indicators, Japan	993
50.2 Introduction	993
50.3 Overview of challenges	993
50.4 Water sector organisation and structure	993
50.4.1 National government	993
Figure 50.3 Main government water resource-related agencies	994
50.4.2 Utilities	995
50.4.3 Companies	995
50.5 Supply and demand details	995
50.5.1 Water supply	995
Figure 50.4 Water resources in Japan	995
50.5.2 Sectoral water use	995
Figure 50.5 Sectoral water withdrawal, Japan	996
50.6 Municipal water and wastewater infrastructure	996
50.6.1 Key performance indicators: water	996
Figure 50.6 Number of management agencies of water supply utilities, 1985-2006	996
Figure 50.7 Top 5 water supply utilities in Japan	997
Figure 50.8 Water supply indicators, Japan	997
50.6.2 Key performance indicators: wastewater	997
Figure 50.9 Prefectures with the highest and lowest sewerage coverage	997
Figure 50.10 Wastewater indicators, Japan	998
50.6.3 Water treatment plants	998
Figure 50.11 Number of WTPs by the treatment technologies employed, 2006	998
50.6.4 Desalination	999
Figure 50.12 The 10 largest desalination plants in Japan	999
50.6.5 Wastewater treatment plants	999
Figure 50.13 Number of municipalities in operation by the population served	999
50.6.6 Water reuse	999
Figure 50.14 Types of wastewater reuse facilities in Japan, 2007	1000
Figure 50.15 Types of municipal wastewater reuse (area circulation) by purpose of use, 2004	1000
50.7 Water in industry	1000
Figure 50.16 Top 10 industries with the highest water consumption in Japan, 2006	1001
Figure 50.17 Production of pollution control equipment by JSIM members, 2004-2006	1002
50.8 Water finance	1002
Figure 50.18 Subsidies as a percentage of total expenditure	1003
50.8.1 Tariffs	1003

Figure 50.19 Water tariff structure in Japan	1003
50.8.2 Operating expenditure	1003
Figure 50.20 Expenditures on the operation, maintenance and management of existing facilities	1004
50.8.3 Capital expenditure	1004
Figure 50.21 Capital expenditure for the development of new facilities	1005
50.9 Government's water strategy	1005
50.10 Private sector participation	1006
Figure 50.22 Examples of major private water companies in Japan	1006
50.11 Current and future projects	1006
Figure 50.23 Large water resources development projects in Japan	1007
50.12 Market forecast	1007
Figure 50.24 Key companies in the water sector in Japan	1007
Figure 50.25 Market forecast, 2007-2016	1008
Figure 50.26 Market forecast breakdown, 2010	1009
Figure 50.27 Market forecast data, 2007-2016 (\$ million)	1010
51. Malaysia	1012
51.1 Demographic indicators	1012
Figure 51.1 Population indicators, Malaysia	1012
Figure 51.2 Economic indicators, Malaysia	1012
51.2 Introduction	1012
51.3 Overview of challenges	1012
51.4 Water sector organisation and structure	1013
51.4.1 Government ministries and agencies	1013
Figure 51.3 Regulatory framework for the water sector	1013
51.4.2 Water and wastewater service providers	1014
Figure 51.4 Water utilities	1014
51.5 Supply and demand details	1015
51.5.1 Water supply	1015
Figure 51.5 Water resources in Malaysia	1015
51.5.2 Sectoral water use	1015
Figure 51.6 Sectoral water withdrawal, Malaysia	1016
51.6 Municipal water and wastewater infrastructure	1016
51.6.1 Key performance indicators: water	1016
Figure 51.7 Population connected to the public water network, 2008	1016
Figure 51.8 Metered domestic and non-domestic consumption	1017
Figure 51.9 Water supply indicators, Malaysia	1017
51.6.2 Key performance indicators: wastewater	1017
Figure 51.10 Sewerage coverage for Peninsular Malaysia in 2008	1018
Figure 51.11 Wastewater indicators, Malaysia	1018
51.6.3 Water treatment plants	1018
Figure 51.12 WTP upgrades by state	1019
51.6.4 Desalination	1019
51.6.5 Wastewater treatment plants	1019
Figure 51.13 Pumping stations and sewage treatment systems, 1994-2008	1019
Figure 51.14 Distribution of sewage treatment systems by state, 2008	1020
Figure 51.15 Breakdown of WWTPs by treatment technology	1020
Figure 51.16 Breakdown of WWTPs by population equivalent	1021
51.6.6 Water reuse	1021
51.7 Water in industry	1021
Figure 51.17 Distribution of water pollution point sources	1021
Figure 51.18 Distribution of industrial water pollution sources by state, 2008*	1022
51.8 Water finance	1022
51.8.1 Tariffs	1022
Figure 51.19 Average domestic water tariffs	1023
Figure 51.20 Industrial water tariffs	1024
51.8.2 Operating expenditure	1025
Figure 51.21 Evolution of total revenues and operating costs, 2000-2008	1025
Figure 51.22 Operating expenditure vs. revenue in the public sewerage system	1025

51.8.3 Capital expenditure	1025
Figure 51.23 Capital expenditure requirements, 2000-2050	1026
Figure 51.24 Capital investment in the public sewerage system	1026
51.9 Government's water strategy	1027
51.10 Private sector participation	1027
51.11 Current and future projects	1027
51.12 Market forecast	1028
Figure 51.25 Market forecast, 2007-2016	1029
Figure 51.26 Market forecast breakdown, 2010	1030
Figure 51.27 Market forecast data, 2007-2016 (\$ million)	1031
52. New Zealand	1033
52.1 Demographic indicators	1033
52.1.1 Key indicators	1033
Figure 52.1 Population indicators, New Zealand	1033
Figure 52.2 Economic indicators	1033
52.2 Introduction	1033
52.3 Overview of challenges	1033
52.4 Water sector organisation and structure	1033
Figure 52.3 New Zealand main water resource-related agencies	1034
Figure 52.4 Example of Auckland and Wellington management structure	1034
52.4.1 Government ministries and agencies	1035
52.4.2 Central Government	1035
52.4.3 Local Government	1035
52.4.4 Companies	1036
Figure 52.5 Watercare shareholders	1036
52.5 Supply and demand details	1036
52.5.1 Water supply	1036
Figure 52.6 Water resources in New Zealand	1036
52.5.2 Sectoral water use	1037
Figure 52.7 Use of allocated water by sector	1037
Figure 52.8 Water allocation by source	1037
52.6 Municipal water and wastewater infrastructure	1037
52.6.1 Key performance indicators: water	1037
Figure 52.9 Projected water consumption	1038
Figure 52.10 Water supply indicators, New Zealand	1038
52.6.2 Key performance indicators: wastewater	1039
Figure 52.11 Wastewater indicators, New Zealand	1039
52.6.3 Water treatment plants	1039
52.6.4 Desalination	1039
52.6.5 Wastewater treatment plants	1039
52.6.6 Water reuse	1040
52.7 Water in industry	1040
52.8 Water finance	1040
52.8.1 Tariffs	1041
52.8.2 Operating expenditure and capital expenditure	1041
Figure 52.12 Planned expenditure on storm water, water supply and wastewater, 2009-2012	1041
Figure 52.13 Planned operating expenditure and capital expenditure by council 2009-2012	1041
52.9 Government's water strategy	1043
52.10 Private sector participation	1043
52.11 Current and future projects	1044
52.12 Market forecast	1044
Figure 52.14 Market forecast, 2007-2016	1045
Figure 52.15 Market forecast breakdown, 2010	1046
Figure 52.16 Market forecast data, 2007-2016 (\$ million)	1047
53. Republic of Korea	1049
53.1 Demographic indicators	1049
Figure 53.1 Population indicators, Republic of Korea	1049

Figure 53.2 Economic indicators, Korea	1049
53.2 Introduction	1049
53.3 Overview of challenges	1049
53.4 Water sector organisation and structure	1049
53.4.1 Government ministries and agencies	1049
Figure 53.3 Main government water resource-related agencies	1050
Figure 53.4 Organisational structure of MLTM (Public Works Authority)	1051
53.4.2 Companies	1051
Figure 53.5 Organisational structure of K-water (Public Works Authority)	1052
53.5 Supply and demand details	1053
53.5.1 Water supply	1053
Figure 53.6 Forecast of water supply and demand, 2006-2020	1053
Figure 53.7 Use of groundwater, 2000-2008	1053
Figure 53.8 Water usage in the Republic of Korea (100 million m ³ /yr)	1054
53.5.2 Sectoral water use	1054
Figure 53.9 The use of water resources in the Republic of Korea, 1960-2020	1055
53.6 Municipal water and wastewater infrastructure	1056
53.6.1 Key performance indicators: water	1056
Figure 53.10 Use of municipal water supply in the Republic of Korea, 2002-2008	1056
Figure 53.11 Water supply indicators, Korea, Rep.	1056
53.6.2 Key performance indicators: wastewater	1057
Figure 53.12 Wastewater indicators, Korea, Rep.	1057
53.6.3 Water treatment plants	1057
53.6.4 Desalination	1057
53.6.5 Wastewater treatment plants	1057
53.6.6 Water reuse	1058
Figure 53.13 Development of water reuse in the Republic of Korea, 1995-1999	1058
Figure 53.14 Water reuse facilities in Republic of Korea, 2008	1058
Figure 53.15 Reclaimed water use breakdown by application, 2008	1059
Figure 53.16 Reuse rate of treated wastewater, 2000-2008	1059
Figure 53.17 Government funding for water reuse facilities, 2006-2008	1060
53.7 Water in industry	1060
53.8 Water finance	1061
Figure 53.18 Subsidies to the water and wastewater sector, 2000-2008	1061
53.8.1 Tariffs	1062
Figure 53.19 Water supply and sewerage charges, 2000-2008	1062
Figure 53.20 Monthly water and wastewater tariffs	1063
53.8.2 Operating expenditure	1064
Figure 53.21 Total revenue from water supply and wastewater treatment, 2004-2008	1064
Figure 53.22 Water and wastewater operating expenditure breakdown, 2004-2008	1065
53.8.3 Capital expenditure	1065
Figure 53.23 Investment plan on water supply and wastewater treatment, 2008-2012	1065
Figure 53.24 MOE Five-year plan for the water industry, 2008-2012	1066
53.9 Government's water strategy	1066
53.10 Private sector participation	1066
53.10.1 Companies	1067
53.10.2 Desalination	1067
53.10.3 Wastewater treatment and reuse	1068
Figure 53.25 Samsung Engineering's sales in the water treatment industry, 2001-2008	1068
53.11 Current and future projects	1068
53.11.1 Desalination	1068
53.11.2 WWTPs and water reuse	1068
53.12 Market forecast	1069
Figure 53.26 Market forecast, 2007-2016	1070
Figure 53.27 Market forecast breakdown, 2010	1071
Figure 53.28 Market forecast data, 2007-2016 (\$ million)	1072
54. Singapore	1074
54.1 Demographic indicators	1074

Figure 54.1 Population indicators, Singapore	1074
Figure 54.2 Economic indicators, Singapore	1074
54.2 Introduction	1074
54.3 Overview of challenges	1074
54.4 Water sector organisation and structure	1074
54.4.1 Government ministries and agencies	1074
Figure 54.3 Regulatory structure of the environment sector	1075
54.5 Supply and demand details	1075
54.5.1 Water supply	1075
Figure 54.4 Water resources in Singapore	1075
54.5.2 Sectoral water use	1076
Figure 54.5 Sectoral water withdrawal, Singapore	1076
54.6 Municipal water and wastewater infrastructure	1076
54.6.1 Key performance indicators: water	1076
Figure 54.6 Water supply indicators, Singapore	1076
54.6.2 Key performance indicators: wastewater	1076
Figure 54.7 Wastewater indicators, Singapore	1076
54.6.3 Water treatment plants	1077
54.6.4 Desalination	1077
54.6.5 Water reuse	1077
Figure 54.8 NEWater process overview	1077
Figure 54.9 Locations of NEWater factories and main industrial customers	1078
54.7 Water in industry	1078
54.8 Water finance	1079
54.8.1 Tariffs	1079
Figure 54.10 Water tariffs in Singapore	1079
Figure 54.11 Wastewater tariffs in Singapore	1079
54.8.2 Operating expenditure	1079
54.8.3 Capital expenditure	1080
Figure 54.12 Capital expenditure on water in Singapore	1080
Figure 54.13 Capital expenditure on wastewater in Singapore	1080
54.9 Government's water strategy	1080
54.10 Private sector participation	1080
54.11 Current and future projects	1081
54.12 Market forecast	1082
Figure 54.14 Market forecast, 2007-2016	1082
Figure 54.15 Market forecast breakdown, 2010	1083
Figure 54.16 Market forecast data, 2007-2016 (US\$ million)	1084
55. Taiwan	1086
55.1 Demographic indicators	1086
Figure 55.1 Population indicators, Taiwan	1086
Figure 55.2 Economic indicators, Taiwan	1086
55.2 Introduction	1086
55.3 Overview of challenges	1086
55.4 Water sector organisation and structure	1086
55.4.1 Public ministries and agencies	1086
Figure 55.3 Main government water resource-related agencies	1087
55.4.2 Companies	1087
55.5 Supply and demand details	1088
55.5.1 Water supply	1088
55.5.2 Sectoral water use	1088
55.6 Municipal water and wastewater infrastructure	1088
55.6.1 Key performance indicators: water	1088
Figure 55.4 Breakdown of water supplied by TWC and TWD	1088
Figure 55.5 Water supply and demand in Taiwan (both industrial and municipal), 2004-2008	1089
Figure 55.6 Water supply indicators, Taiwan	1089
55.6.2 Key performance indicators: wastewater	1089
Figure 55.7 Wastewater indicators, Taiwan	1090

55.6.3 Water treatment plants	1090
55.6.4 Desalination plants	1090
Figure 55.8 Desalination in Pingtung County	1090
Figure 55.9 Desalination in Penghu County	1091
Figure 55.10 Desalination in Chinmen County	1091
Figure 55.11 Desalination in Lienchiang County	1091
55.6.5 Wastewater treatment plants	1091
55.6.6 Water reuse	1092
55.7 Water in industry	1092
55.8 Water finance	1092
55.8.1 Tariffs	1092
Figure 55.12 Monthly basic fee for water consumption (currency: TWD)	1092
Figure 55.13 TWC monthly tariff	1093
Figure 55.14 TWD monthly tariff	1093
55.8.2 Operating expenditure	1094
Figure 55.15 Wastewater treatment operating expenditure, 2004-2008	1094
55.8.3 Capital expenditure	1094
Figure 55.16 Wastewater treatment capital expenditure, 2004-2008	1094
55.9 Government's water strategy	1095
55.10 Private sector participation	1095
55.10.1 Water treatment	1095
55.10.2 Desalination	1095
55.10.3 Wastewater treatment and reuse	1095
Figure 55.17 36 proposed BOT wastewater treatment plants	1096
55.11 Current and future projects	1096
55.11.1 Desalination	1096
Figure 55.18 Tracked desalination projects in Taiwan	1096
55.11.2 Wastewater treatment	1096
55.12 Market forecast	1096
Figure 55.19 Projected water resource requirement by sector, 2021	1097
Figure 55.20 Investment for Taiwan mid-term programmes (TWD 100 million)	1097
Figure 55.21 Market forecast, 2007-2016	1098
Figure 55.22 Market forecast breakdown, 2010	1099
Figure 55.23 Market forecast data, 2007-2016 (\$ million)	1100
56. Thailand	1102
56.1 Demographic indicators	1102
Figure 56.1 Population indicators, Thailand	1102
Figure 56.2 Economic indicators, Thailand	1102
56.2 Introduction	1102
56.3 Overview of challenges	1102
56.4 Water sector organisation and structure	1103
56.4.1 Government ministries and agencies	1103
Figure 56.3 Government bodies relating to water resources management in Thailand	1104
56.4.2 Companies	1104
56.5 Supply and demand details	1105
56.5.1 Water supply	1105
Figure 56.4 Water resources in Thailand	1105
56.5.2 Sectoral water use	1105
Figure 56.5 Sectoral water use, 2008	1105
56.6 Municipal water and wastewater infrastructure	1106
56.6.1 Key performance indicators: water	1106
Figure 56.6 Percentage of population covered by water utility services	1106
Figure 56.7 Water supply indicators, Thailand	1106
56.6.2 Key performance indicators: wastewater	1106
Figure 56.8 Wastewater indicators, Thailand	1107
56.6.3 Water treatment plants	1107
Figure 56.9 MWA WTPs in Bangkok	1107
56.6.4 Desalination	1107

56.6.5 Wastewater treatment plants	1107
Figure 56.10 Wastewater volumes in BMA's WWTPs, 2007	1108
56.6.6 Water reuse	1108
56.7 Water in industry	1108
Figure 56.11 Major water consumers in Thailand's industrial sector, 2008	1109
56.8 Water finance	1109
56.8.1 Tariffs	1109
Figure 56.12 Water pricing structure of MWA	1110
Figure 56.13 Water pricing structure of PWA	1110
Figure 56.14 Pattaya City's wastewater collection and treatment fees	1111
56.8.2 Operating expenditure	1111
56.8.3 Capital expenditure	1111
56.8.3.1 Current capital expenditure	1111
Figure 56.15 Current annual capital expenditures of water utilities in Thailand	1111
56.8.3.2 Medium-term plans for capital expenditures	1112
Figure 56.16 Capital expenditures for water supply: estimations until 2018	1112
Figure 56.17 Capital expenditures for wastewater management: estimations until 2018	1112
56.9 Government's water strategy	1112
Figure 56.18 Investment plan for water resources management and development under the SP2	1113
56.10 Private sector participation	1113
Figure 56.19 Examples of PPPs in PWA activities	1114
56.11 Current and future projects	1114
56.11.1 Current projects	1114
Figure 56.20 PWA projects for FY 2010	1115
56.11.2 Future projects	1115
Figure 56.21 DWR major water resources development projects, 2010 and 2011	1115
Figure 56.22 BMA's major wastewater management projects, 2010-2013	1115
56.12 Market forecast	1115
Figure 56.23 Market forecast, 2007-2016	1117
Figure 56.24 Market forecast breakdown, 2010	1118
Figure 56.25 Market forecast data, 2007-2016 (\$ million)	1119
References	1121