



# Global Markets and Technologies for Water Recycling and Reuse

July 2017

*Robert Eckard*

Report: MST051C

# Table of Contents

<b>Chapter 1: Introduction .....</b>	<b>1</b>
Study Goals and Objectives.....	1
Reasons for Doing This Study.....	1
Contributors to and Use of This Study.....	1
Scope of Report.....	2
Global Markets .....	2
Information Sources.....	3
Methodology.....	4
Analyst's Credentials.....	7
Related BCC Research Reports.....	7
<b>Chapter 2: Summary and Highlights.....</b>	<b>9</b>
<b>Chapter 3: Market and Technology Background .....</b>	<b>13</b>
Global Water and Wastewater .....	13
Global Water Supplies.....	13
Water Shortages and Drought .....	17
Global Wastewater Production and Treatment.....	23
Global Wastewater Reuse and Recycling .....	27
Wastewater Recycling and Reuse Technologies.....	28
Wastewater Reuse, Recycling and Reclamation .....	28
Wastewater Recycling and Reuse History.....	29
Wastewater Recycling and Reuse, End Uses and Benefits .....	30
Wastewater Recycling and Reuse End Uses.....	30
Wastewater Recycling and Reuse Benefits .....	32
Water Supply Enhancement, Augmentation and Beneficial Reuse .....	32
Wastewater Discharge Reduction.....	33
Enhanced Regulatory Compliance.....	33
General Characteristics of Wastewater and Associated Treatment Systems.....	34
Wastewater Recycling and Reuse Techniques and Applications .....	35
Wastewater Recycling and Reuse Drawbacks .....	49
Exposure to Harmful Pollutants .....	49
Public Perception.....	50
Cost and Economic Risk.....	50
Relevant Emerging Techniques and their Potential for Market Readiness .....	50
<b>Chapter 4: Global Wastewater Recycling and Reuse Market .....</b>	<b>53</b>
Global Municipal and Industrial Wastewater Recycling and Reuse Markets .....	54
Global Wastewater Reuse and Recycling, by Technology- Specific Markets.....	57
Global Conventional Treatment Technologies for the Reuse and Recycling Market .....	58
Global Membrane Filtration Technologies for the Reuse and Recycling Market .....	59
Global Membrane Bioreactor Technologies for the Reuse and Recycling Market .....	61
Global Chemical Treatments and Disinfection Technologies for the Reuse and Recycling Market .....	63
Global Demineralization Technologies for the Reuse and Recycling Market .....	64
Global Wastewater Recycling and Reuse Market by End-Use Category .....	66

## Chapter 5: North American Wastewater Reuse and Recycling Technologies Market

.....	70
North American Installed Wastewater Treatment Bases .....	70
North American Wastewater Reuse and Recycling Drivers.....	72
North American Water Scarcity .....	72
North American Water Supply Cost .....	74
North American Regulatory Environment .....	75
Existing North American Wastewater Infrastructure Status.....	80
North American Population Trends .....	82
North American Greening .....	82
North American Wastewater Reuse and Recycling Industry Trends .....	83
Existing North American Wastewater Recycling Plant Status.....	83
North American Recycled Wastewater End Uses .....	83
North American Research and Development Trends .....	85
North American Wastewater Reuse and Recycling Technologies Market .....	86
North American Wastewater Recycling and Reuse Municipal and Industrial Markets .....	87
North American Wastewater Reuse and Recycling: Technology-Specific Markets .....	96
North American Conventional Treatment Technologies for the Reuse and Recycling Market .....	97
North American Membrane Filtration Technologies for the Reuse and Recycling Market .....	99
North American Membrane-Bioreactor Technologies for the Reuse and Recycling Market .....	101
North American Chemical Treatment and Disinfection Technologies for the Reuse and Recycling Market .....	102
North American Demineralization Technologies for the Reuse and Recycling Market .....	103
North American Wastewater Reuse and Recycling, End-User Markets.....	105

## Chapter 6: European Wastewater Reuse and Recycling Technologies Market... 109

European Wastewater – Treatment Installed Bases .....	109
European Wastewater Reuse and Recycling Market Drivers .....	110
European Water Scarcity.....	110
European Water Supply Cost .....	114
European Regulatory Environment.....	115
Existing European Wastewater Infrastructure Status.....	117
European Population Trends.....	118
European Greening .....	119
European Wastewater Reuse and Recycling Industry Trends .....	119
Existing European Wastewater Recycling .....	119
European Recycled Wastewater End Uses.....	120
European Research and Development Trends.....	122
European Wastewater Reuse and Recycling Technologies Market.....	123
European Municipal and Industrial Wastewater Recycling and Reuse Markets .....	123
European Wastewater Reuse and Recycling: Technology-Specific Markets .....	133
European Conventional Treatment Technologies for the Reuse and Recycling Market .....	134
European Membrane Filtration Technologies for the Reuse and Recycling Market .....	136
European Membrane Bioreactor Technologies for the Reuse and Recycling Market.....	138
European Chemical Treatment and Disinfection Technologies for the Reuse and Recycling Market..	139
European Demineralization Technologies for the Reuse and Recycling Market .....	141
European Wastewater Reuse and Recycling: End-Use Markets .....	142

## Chapter 7: Middle Eastern Wastewater Reuse and Recycling Technologies Market

.....	146
-------	-----

Middle Eastern Installed Wastewater Treatment Bases .....	146
Middle Eastern Wastewater Reuse and Recycling Drivers .....	147
Middle Eastern Water Scarcity and Population Trends .....	147
Middle Eastern Water Supply Cost .....	150
Middle Eastern Regulatory Environment .....	151
Existing Middle Eastern Wastewater Infrastructure Status .....	153
Middle Eastern Facility Planning Considerations .....	154
Middle Eastern Greening.....	154
Arab Spring .....	155
Middle Eastern Wastewater Reuse and Recycling Industry Trends .....	155
Existing Middle Eastern Wastewater Recycling Plants.....	155
Middle Eastern Recycled Wastewater End Uses.....	156
Middle Eastern Research and Development Trends.....	158
Middle Eastern Wastewater Reuse and Recycling Technologies Market.....	159
Middle Eastern Municipal and Industrial Markets for Wastewater Recycling and Reuse .....	160
Middle Eastern Wastewater Reuse and Recycling: Technology-Specific Markets .....	168
Middle Eastern Conventional Treatment Technologies for the Reuse and Recycling Market .....	169
Middle Eastern Membrane Filtration Technologies for the Reuse and Recycling Market .....	171
Middle Eastern Membrane Bioreactor Technologies for the Reuse and Recycling Market .....	172
Middle Eastern Chemical Treatment and Disinfection Technologies for the Reuse and Recycling Market .....	174
Middle Eastern Demineralization Technologies for the Reuse and Recycling Market .....	175
Middle Eastern Wastewater Reuse and Recycling: End-Use Markets .....	176

## Chapter 8: Asian and Australian Wastewater Reuse and Recycling Technologies

Market .....	180
Asian and Australian Installed Wastewater Treatment Bases.....	180
Asian and Australian Wastewater Reuse and Recycling Drivers.....	181
Asian and Australian Water Scarcity .....	181
Asian and Australian Water Supply Cost .....	183
Asian and Australian Regulatory Environment .....	185
Existing Asian and Australian Wastewater Infrastructure Status .....	186
Asian and Australian Population Trends .....	187
Asian and Australian Greening .....	187
Asian and Australian Wastewater Reuse and Recycling Industry Trends.....	188
Existing Asian and Australian Wastewater Recycling.....	188
Asian and Australian Recycled Wastewater End Uses .....	188
Asian and Australian Wastewater Reuse and Recycling Technologies Market .....	192
Asian and Australian Municipal and Industrial Wastewater Recycling and Reuse Markets .....	192
Asian and Australian Wastewater Reuse and Recycling: Technology Specific Markets .....	201
Asian and Australian Conventional Treatment Technologies for the Reuse and Recycling Market.....	203
Asian and Australian Membrane Filtration Technologies for the Reuse and Recycling Market.....	204
Asian and Australian Membrane Bioreactor Technologies for the Reuse and Recycling Market .....	206
Asian and Australian Chemical Treatment and Disinfection Technologies for the Reuse and Recycling Market.....	207
Asian and Australian Demineralization Technologies for the Reuse and Recycling Market.....	209
Asian and Australian Wastewater Reuse and Recycling: End-Use Markets.....	210

## Chapter 9: Company Profiles .....

214

## Appendix: References and Acronyms.....

266

References .....	266
Acronyms .....	267
<a href="#">About BCC Research.....</a>	<a href="#">269</a>
About BCC Research.....	270
BCC Membership .....	270
BCC Custom Research .....	270

# List of Tables

Summary Table Global Market for Wastewater Recycling and Reuse, by Type, Through 2021 (\$ Millions)	10
Table 1 Various Water-Consumption Uses (% Water Withdrawn)	15
Table 2 Renewable Water Resources and Total Water Withdrawals, by Region, 2011	16
Table 3 Wastewater-Reuse and Recycling End Uses Considered in this Report	30
Table 4 Common Wastewater Constituents Targeted for Measurement, Removal and Inactivation	36
Table 5 Conventional Primary Wastewater Treatment Methods	38
Table 6 Conventional Secondary Wastewater Treatment Methods	39
Table 7 Conventional Tertiary Wastewater Treatment Methods	40
Table 8 Wastewater Reuse and Recycling Technologies Considered in this Report	42
Table 9 Membrane Filtration Size Categories	43
Table 10 Common Chemical Treatment Applications	46
Table 11 Advanced Treatment Technologies for Direct Potable Reuse	49
Table 12 Select Emerging Technologies Relevant to Wastewater Recycling and Reuse	51
Table 13 Global Market for Wastewater Recycling and Reuse, by Region, Through 2021 (Annual Incremental Treatment Capacity Increase in MGD)	55
Table 14 Global Market for Wastewater Recycling and Reuse, by Region, Through 2021 (\$ Millions)	56
Table 15 Global Market for Wastewater Recycling and Reuse, by Technology, Through 2021 (\$ Millions)	57
Table 16 Global Market for Conventional Treatment Technologies for the Wastewater Recycling and Reuse, by Region, Through 2021 (\$ Millions)	59
Table 17 Global Market for Membrane Filtration Technologies* for the Wastewater Recycling and Reuse, by Region, Through 2021 (\$ Millions)	60
Table 18 Global Market for Membrane Bioreactor Technologies* for the Wastewater Recycling and Reuse, by Region, Through 2021 (\$ Millions)	62
Table 19 Global Market for Chemical-Treatment and Disinfection Technologies for the Wastewater Recycling and Reuse, by Region, Through 2021 (\$ Millions)	63
Table 20 Global Market for Demineralization Technologies for the Wastewater Recycling and Reuse, by Region, Through 2021 (\$ Millions)	65
Table 21 Global Market for Wastewater Recycling and Reuse, by End User, Through 2021 (MGD)	66
Table 22 Global Market for Wastewater Recycling and Reuse, by End User, Through 2021 (\$ Millions)	67
Table 23 U.S. West Cost Ranges for Municipal Water Sources (\$ Per Acre-Foot)	75
Table 24 U.S. Regulations Supporting Wastewater Reuse and Recycling	76
Table 25 Wastewater Infrastructure Component Design Life in North America (Years)	81
Table 26 North American Market for Wastewater Recycling and Reuse, by Country, Through 2021 (Annual Incremental Treatment Capacity Increase in MGD)	88
Table 27 North American Municipal Markets Versus Industrial Markets, Percent of Total Installations, 2015-2021 (%)	89
Table 28 North American Municipal Market for Wastewater Recycling and Reuse, by Country, Through 2021 (Annual Incremental Treatment Capacity Increase in MGD)	90
Table 29 North American Industrial Market for Wastewater Recycling and Reuse, by Country, Through 2021 (Annual Incremental Treatment Capacity Increase in MGD)	91
Table 30 North American Market for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions)	93
Table 31 North American Municipal Market for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions)	94
Table 32 North American Industrial Market for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions)	95

Table 33	North American Market for Wastewater Recycling and Reuse, by Technology, Through 2021 (\$ Millions).....	96
Table 34	North American Market for Conventional Treatment Technologies for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	98
Table 35	North American Market for Membrane-Filtration Technologies* for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	100
Table 36	North American Market for Membrane-Bioreactor Technologies* for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	101
Table 37	North American Market for Chemical-Treatment and Disinfection Technologies for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	103
Table 38	North American Market for Demineralization Technologies for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	104
Table 39	North American Market for the Wastewater Recycling and Reuse, by End User, Through 2021 (MGD) .....	106
Table 40	North American Market for the Wastewater Recycling and Reuse, by End User, Through 2021 (\$ Millions).....	107
Table 41	European Average Municipal Water-Supply Cost, by Country (U.S. Dollars Per Cubic Meter)	114
Table 42	European Regulatory Support for Wastewater Recycling, by Country .....	117
Table 43	Wastewater-Infrastructure Component Design Life in Europe (Years) .....	118
Table 44	European Market for Wastewater Recycling and Reuse, by Country, Through 2021 (Annual Incremental Treatment Capacity Increase in MGD).....	125
Table 45	European Municipal Markets Versus Industrial Markets by Treatment Capacity Increases, 2015-2021 (%).....	126
Table 46	European Municipal Market for Wastewater Recycling and Reuse, by Country, Through 2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	127
Table 47	European Industrial Market for Wastewater Recycling and Reuse, by Country, Through 2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	128
Table 48	European Market for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	130
Table 49	European Municipal Market for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions).....	131
Table 50	European Industrial Market for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions).....	132
Table 51	European Market for Wastewater Recycling and Reuse, by Technology, Through 2021 (\$ Millions) .....	133
Table 52	European Market for Conventional Treatment Technologies for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	135
Table 53	European Market for Membrane-Filtration Technologies*for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions).....	137
Table 54	European Market for Membrane-Bioreactor Technologies for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	138
Table 55	European Market for Chemical-Treatment and Disinfection Technologies for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	140
Table 56	European Market for Demineralization Technologies for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions).....	141
Table 57	European Market for Wastewater Recycling and Reuse, by End User, Through 2021 (MGD)	142
Table 58	European Market for Wastewater Recycling and Reuse, by End User, Through 2021 (\$ Millions).....	143
Table 59	Middle Eastern Wastewater Recycling Guidelines, 2010-2012 .....	152
Table 60	Middle Wastewater Infrastructure Component Design Life (Years).....	154

Table 61	Middle Eastern Market for Wastewater Recycling and Reuse, by Country, Through 2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	160
Table 62	Middle Eastern Municipal Markets Versus Industrial Markets by Treatment Capacity Increase, 2015-2021 (%).....	161
Table 63	Middle Eastern Municipal Market for Wastewater Recycling and Reuse, by Country, Through 2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	162
Table 64	Middle Eastern Industrial Market for Wastewater Recycling and Reuse, by Country, Through 2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	163
Table 65	Middle Eastern Market for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	165
Table 66	Middle Eastern Municipal Market for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions).....	166
Table 67	Middle Eastern Industrial Market for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	167
Table 68	Middle Eastern Market for Wastewater Recycling and Reuse, by Technology, Through 2021 (\$ Millions) .....	168
Table 69	Middle Eastern Market for Conventional Treatment Technologies for Wastewater Recycling and Reuse, by Country, through 2021 (\$ Millions).....	170
Table 70	Middle Eastern Market for Membrane-Filtration Technologies* for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	171
Table 71	Middle Eastern Market for Membrane Bioreactor Technologies for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	173
Table 72	Middle Eastern Market for Chemical Treatment and Disinfection Technologies for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	174
Table 73	Middle Eastern Market for Demineralization Technologies for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	176
Table 74	Middle Eastern Market for Wastewater Recycling and Reuse, by End Use, Through 2021 (MGD) .....	177
Table 75	Middle Eastern Market for Wastewater Recycling and Reuse, by End Use, Through 2021 (\$ Millions) .....	178
Table 76	Asian and Australian Municipal Water Supply Average Cost, by Country (U.S. Dollars per Cubic Meter).....	184
Table 77	Wastewater Infrastructure Component Design Life in Asia and Australia (Years) .....	187
Table 78	Asian and Australian Market for Wastewater Recycling and Reuse, by Country, Through 2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	193
Table 79	Asian and Australian Municipal Markets Versus Industrial Market by Treatment-Capacity Increases, 2016 and 2021 (%).....	194
Table 80	Asian and Australian Municipal Market for Wastewater Recycling and Reuse, by Country, Through 2021 (Annual Incremental Treatment Capacity Increase in MGD).....	195
Table 81	Asian and Australian Industrial Market for Wastewater Recycling and Reuse, by Country, Through 2021 (Annual Incremental Treatment Capacity Increase in MGD).....	196
Table 82	Asian and Australian Market for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions).....	198
Table 83	Asian and Australian Municipal Market for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions).....	199
Table 84	Asian and Australian Industrial Market for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions).....	200
Table 85	Asian and Australian Market for Wastewater Recycling and Reuse, by Technology, Through 2021 (\$ Millions).....	202
Table 86	Asian and Australian Market for Conventional Treatment Technologies for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	203



Table 87 Asian and Australian Market for Membrane-Filtration Technologies* for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	205
Table 88 Asian and Australian Market for Membrane Bioreactor Technologies* for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	206
Table 89 Asian and Australian Market for Chemical Treatment and Disinfection Technologies for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions).....	208
Table 90 Asian and Australian Market for Demineralization Technologies for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	209
Table 91 Asian and Australian Market for Wastewater Recycling and Reuse, by End Use, Through 2021 (MGD) .....	211
Table 92 Asian and Australian Market for Wastewater Recycling and Reuse, by End Use, Through 2021 (\$ Millions).....	212
Table 93 Abeima .....	215
Table 94 Abengoa .....	216
Table 95 Alfa Laval .....	217
Table 96 Amiad Water Systems Ltd. ....	218
Table 97 Aqua-Aerobic Systems Inc.....	219
Table 98 Aqua Systems .....	220
Table 99 Aquatech .....	221
Table 100 Axine Water Technologies Inc.....	222
Table 101 Bio-Microbics Inc.....	223
Table 102 Blue Planet/Ecological Laboratories.....	224
Table 103 BluMetric Environmental, Inc.....	226
Table 104 Calgon Carbon Corporation.....	227
Table 105 Ch <sub>2</sub> M Hill OMI.....	228
Table 106 ChemTreat Inc. ....	229
Table 107 Degremont Technologies Ltd. ....	230
Table 108 Dow Water and Process Solutions .....	231
Table 109 Evoqua Water Technologies.....	232
Table 110 GE Water and Process Technologies (To Become SUEZ) .....	234
Table 111 Graver Technologies LLC .....	235
Table 112 H <sub>2</sub> O Innovation .....	236
Table 113 Hamworthy.....	237
Table 114 Hubbard-Hall .....	238
Table 115 Hydranautics (a Nitto Denko Corporation) .....	239
Table 116 Hyflux Ltd.....	240
Table 117 Inge GmbH (BASF) .....	241
Table 118 Ion Exchange India .....	242
Table 119 Koch Membrane Systems Inc. ....	244
Table 120 Kubota .....	245
Table 121 Kurita Water Industries Ltd. ....	246
Table 122 LG Chem .....	247
Table 123 Mitsubishi Rayon Co. Ltd.....	248
Table 124 Nalco Holding Company .....	250
Table 125 New Logic Research Inc. ....	251
Table 126 Norwalk Wastewater Equipment Company (NORWECO).....	252
Table 127 Ovivo.....	253
Table 128 Pall Corporation.....	254
Table 129 Pentair X-Flow .....	255
Table 130 Saehan Corporation.....	256
Table 131 Severn Trent Services .....	257

Table 132 Suez Environment.....	258
Table 133 TriSep Corporation .....	259
Table 134 TrojanUV (Danaher Corporation) .....	261
Table 135 UV Guard .....	262
Table 136 Veolia Water Solutions and Technologies.....	263
Table 137 Xylem.....	264

# List of Figures

Summary Figure Global Market for Wastewater Recycling and Reuse, by Type, 2015-2021 (\$ Millions)	10
Figure 1 Global Water Distribution .....	14
Figure 2 Global Drought Frequency and Distribution, 1980-2000.....	18
Figure 3 Global Water Demand and Deficit, 2010-2030.....	21
Figure 4 Global Hydrologic Water Scarcity .....	22
Figure 5 Proportion of Population Connected to Wastewater-Treatment Facilities, 2011.....	25
Figure 6 Global Market for Wastewater Recycling and Reuse, by Region, 2015-2021 (Annual Incremental Treatment Capacity Increase in MGD).....	55
Figure 7 Global Market for Wastewater Recycling and Reuse, by Region, 2015-2021 (\$ Millions) .....	56
Figure 8 Global Market for Wastewater Recycling and Reuse, by Technology, 2015-2021 (\$ Millions)..	58
Figure 9 Global Market for Conventional Treatment Technologies for the Wastewater Recycling and Reuse, by Region, Through 2021 (\$ Millions) .....	59
Figure 10 Global Market for Membrane Filtration Technologies* for the Wastewater Recycling and Reuse, by Region, 2015-2021 (\$ Millions) .....	61
Figure 11 Global Market for Membrane Bioreactor Technologies* for the Wastewater Recycling and Reuse, by Region, Through 2021 (\$ Millions) .....	62
Figure 12 Global Market for Chemical Treatment and Disinfection Technologies for the Wastewater Recycling and Reuse, by Region, 2015-2021 (\$ Millions) .....	64
Figure 13 Global Market for Demineralization Technologies for the Wastewater Recycling and Reuse, by Region, Through 2021 (\$ Millions).....	65
Figure 14 Global Market for Wastewater Recycling and Reuse, by End User, 2015-2021 (MGD) .....	67
Figure 15 Global Market for Wastewater Recycling and Reuse, by End User, 2015-2021 (\$ Millions)....	68
Figure 16 North American Wastewater Treatment Plants, Installed Base Type, 2016 .....	71
Figure 17 North American Water-Stress Intensity and Water Supply Risk, 2014.....	73
Figure 18 North American Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	89
Figure 19 North American Municipal Markets Versus Industrial Markets, Percent of Total Installations, 2016 and 2021 (%).....	90
Figure 20 North American Municipal Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (Annual Incremental Treatment Capacity Increase in MGD).....	91
Figure 21 North American Industrial Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (Annual Incremental Treatment Capacity Increase in MGD).....	92
Figure 22 North American Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions).....	93
Figure 23 North American Municipal Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	94
Figure 24 North American Industrial Market for Wastewater Recycling and Reuse, by Country, Through 2021 (\$ Millions) .....	95
Figure 25 North American Market for Wastewater Recycling and Reuse, by Technology, Through 2021 (\$ Millions).....	97
Figure 26 North American Market for Conventional Treatment Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	99
Figure 27 North American Market for Membrane-Filtration Technologies* for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	100
Figure 28 North American Market for Membrane-Bioreactor Technologies * for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	102

Figure 29 North American Market for Chemical-Treatment and Disinfection Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions).....	103
Figure 30 North American Market for Demineralization Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	105
Figure 31 North American Market for the Wastewater Recycling and Reuse, by End User, 2015-2021 (MGD) .....	106
Figure 32 North American Market for the Wastewater Recycling and Reuse, by End User, 2015-2021 \$ Millions).....	107
Figure 33 European Wastewater Treatment Plants, Installed Bases, 2016.....	110
Figure 34 European Water Stress Intensity, 2012 .....	112
Figure 35 Continental European Saline Groundwater Intrusion.....	113
Figure 36 European Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (Annual Incremental Treatment Capacity Increase in MGD).....	125
Figure 37 European Municipal Markets Versus Industrial Markets, by Treatment Capacity Increases, Through 2021 (%) .....	126
Figure 38 European Municipal Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	128
Figure 39 European Industrial Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	129
Figure 40 European Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions).....	130
Figure 41 European Municipal Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	131
Figure 42 European Industrial Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	132
Figure 43 European Market for Wastewater Recycling and Reuse, by Technology, 2015-2021 (\$ Millions) .....	134
Figure 44 European Market for Conventional Treatment Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	136
Figure 45 European Market for Membrane Filtration Technologies* for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	137
Figure 46 European Market for Membrane Bioreactor Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	139
Figure 47 European Market for Chemical Treatment and Disinfection Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	140
Figure 48 European Market for Demineralization Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions).....	142
Figure 49 European Market for Wastewater Recycling and Reuse, by End User, 2015-2021.....	143
Figure 50 European Market for Wastewater Recycling and Reuse, by End User, 2015-2021 (\$ Millions) .....	144
Figure 51 Middle Eastern Wastewater-Treatment Plants, by Country, 2016.....	147
Figure 52 Middle Eastern Water-Stress Intensity, 2012 .....	149
Figure 53 Middle Eastern Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (Annual Incremental Treatment Capacity Increase in MGD).....	161
Figure 54 Middle Eastern Municipal Markets Versus Industrial Markets by Treatment Capacity Increases, 2015-2021 (%).....	162
Figure 55 Middle Eastern Municipal Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	163
Figure 56 Middle Eastern Industrial Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	164
Figure 57 Middle Eastern Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions).....	165

Figure 58 Middle Eastern Municipal Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	166
Figure 59 Middle Eastern Industrial Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	167
Figure 60 Middle Eastern Market for Wastewater Recycling and Reuse, by Technology, 2015-2021 (\$ Millions) .....	169
Figure 61 Middle Eastern Market for Conventional Treatment Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	170
Figure 62 Middle Eastern Market for Membrane-Filtration Technologies* for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	172
Figure 63 Middle Eastern Market for Membrane Bioreactor Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	173
Figure 64 Middle Eastern Market for Chemical Treatment and Disinfection Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	175
Figure 65 Middle Eastern Market for Demineralization Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	176
Figure 66 Middle Eastern Market for Wastewater Recycling and Reuse, by End Use, 2015-2021 (MGD) .....	177
Figure 67 Middle Eastern Market for Wastewater Recycling and Reuse, by End Use, 2015-2021 (\$ Millions) .....	178
Figure 68 Asian and Australian Wastewater-Treatment Plants, 2010.....	181
Figure 69 Asian Water Stress Intensity, 2014 .....	182
Figure 70 Australian and Oceanic Water-Stress Intensity, 2014 .....	183
Figure 71 Asian and Australian Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	194
Figure 72 Asian and Australian Municipal Markets Versus Industrial Market by Treatment-Capacity Increases, 2015-2021 (%).....	195
Figure 73 Asian and Australian Municipal Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	196
Figure 74 Asian and Australian Industrial Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (Annual Incremental Treatment Capacity Increase in MGD) .....	197
Figure 75 Asian and Australian Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	199
Figure 76 Asian and Australian Municipal Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions).....	200
Figure 77 Asian and Australian Industrial Market for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions).....	201
Figure 78 Asian and Australian Market for Wastewater Recycling and Reuse, by Technology, 2015-2021 (\$ Millions) .....	202
Figure 79 Asian and Australian Market for Conventional Treatment Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions).....	204
Figure 80 Asian and Australian Market for Membrane Filtration Technologies* for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions).....	205
Figure 81 Asian and Australian Market for Membrane Bioreactor Technologies* for Wastewater Recycling and Reuse, by Region, 2015-2021 (\$ Millions) .....	207
Figure 82 Asian and Australian Market for Chemical Treatment and Disinfection Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions).....	208
Figure 83 Asian and Australian Market for Demineralization Technologies for Wastewater Recycling and Reuse, by Country, 2015-2021 (\$ Millions) .....	210
Figure 84 Asian and Australian Market for Wastewater Recycling and Reuse, by End Use, 2015-2021 (MGD) .....	211

Figure 85 Asian and Australian Market for Wastewater Recycling and Reuse, by End Use, 2015-2021 (\$ Millions) ..... 212



*About BCC Research*

## *About BCC Research*

With our unparalleled 45-year history, BCC Research provides comprehensive analysis of global market sizing, forecasting and industry intelligence, covering markets where advances in science and technology are improving the quality, standard and sustainability of businesses, economies and lives.

## *BCC Membership*

From market sizing and forecasts, to opportunity assessments and competitive analyses, our ever-expanding library gives you the data, insights and intelligence required to ensure your project is a success. Members benefit from ongoing, unlimited access to the category or collections of their choice, and most membership packages pay for themselves within two to three reports being accessed.

Did you buy this report? You may qualify to apply your purchase price towards a full membership. Call 866/285-7215 or email [info@bccresearch.com](mailto:info@bccresearch.com) to request a demo.

## *BCC Custom Research*

Our experts provide custom research projects to those working to identify new markets, introduce new products, validate existing market share, analyze competition and assess the potential for products to impact existing markets. With impressive academic credentials and broad and deep knowledge of global industrial markets, our independent analysts and consultants develop the facts, figures, analysis and assessments to inform the decisions that will move your company ahead. Confidential inquiries to: [custom@bccresearch.com](mailto:custom@bccresearch.com) or 781-205-2429.



## DISCLAIMER

The information developed in this report is intended to be as reliable as possible at the time of publication and is of a professional nature. This information does not constitute managerial, legal or accounting advice, nor should it be considered as a corporate policy guide, laboratory manual or an endorsement of any product, as much of the information is speculative in nature. BCC Research and the author assume no responsibility for any loss or damage that might result from reliance on the reported information or from its use.

ISBN: 1-62296-531-0  
July 2017