

Contents of this file:

Figures S1 to S5

Tables S1 to S10

Introduction

The Supporting Information below addresses the correlation coefficients between various principle variables to estimate the capital cost (Figure S1), validation of capital cost (Figure S2), capacity (Table S6) and water price (Figure S3). Figure S4 show the future projections of plant capacity of SWRO desalination plants under SSP2. Figure S5 indicates the water price in individual country. Table S1 contains the data items and selection criteria of desalination data. Table S2–S5, S7 and S8 indicate the process of model simulation for capital cost and water price, respectively. Table S9 and S10 describe the feasibility index in past and future simulations, respectively.

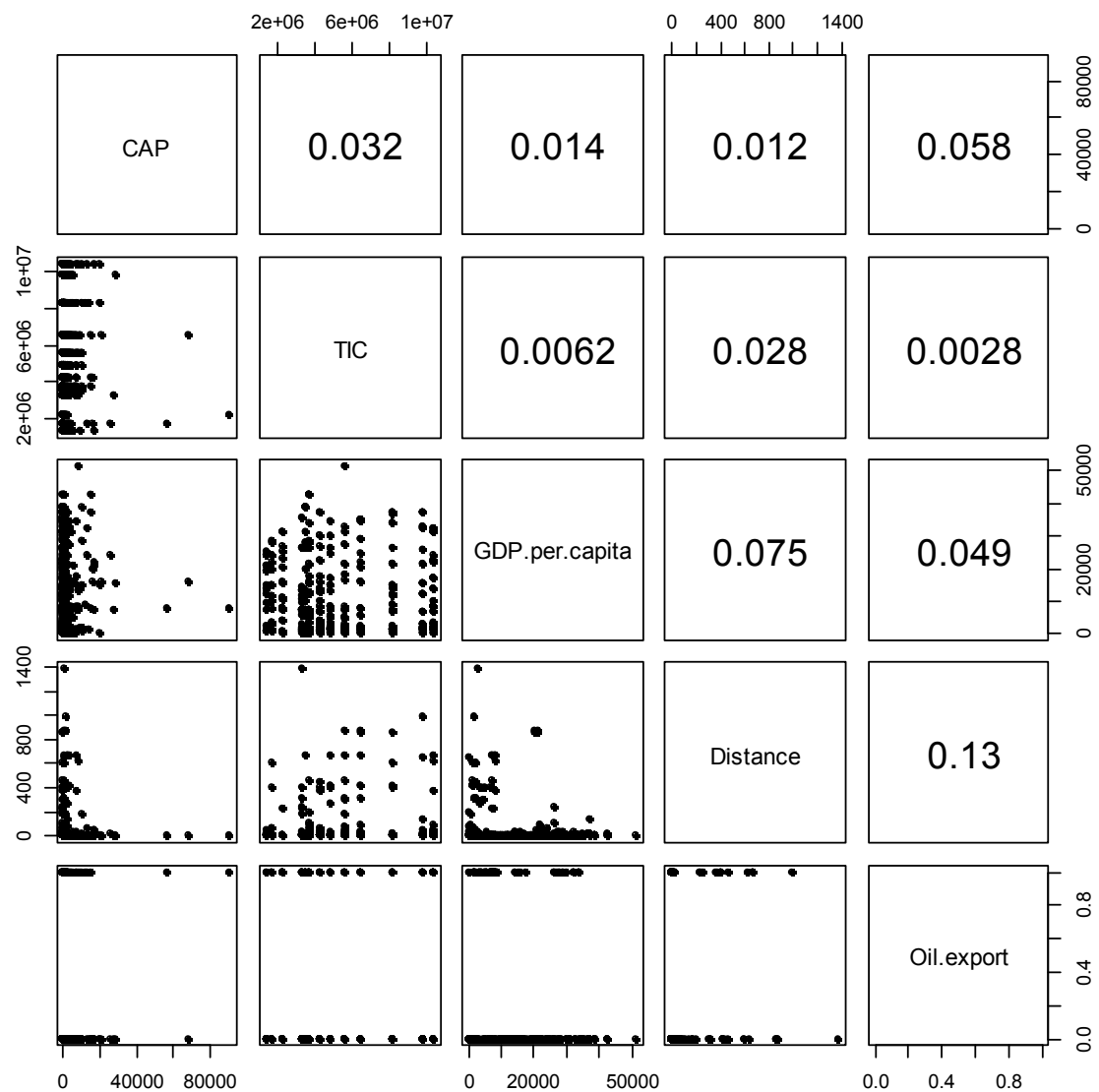


Figure. S1. Correlation coefficients between various principle variables to estimate the capital cost. The lower/left panels show pairwise scatterplots between each variable, and the upper/right panels contain correlation coefficients.

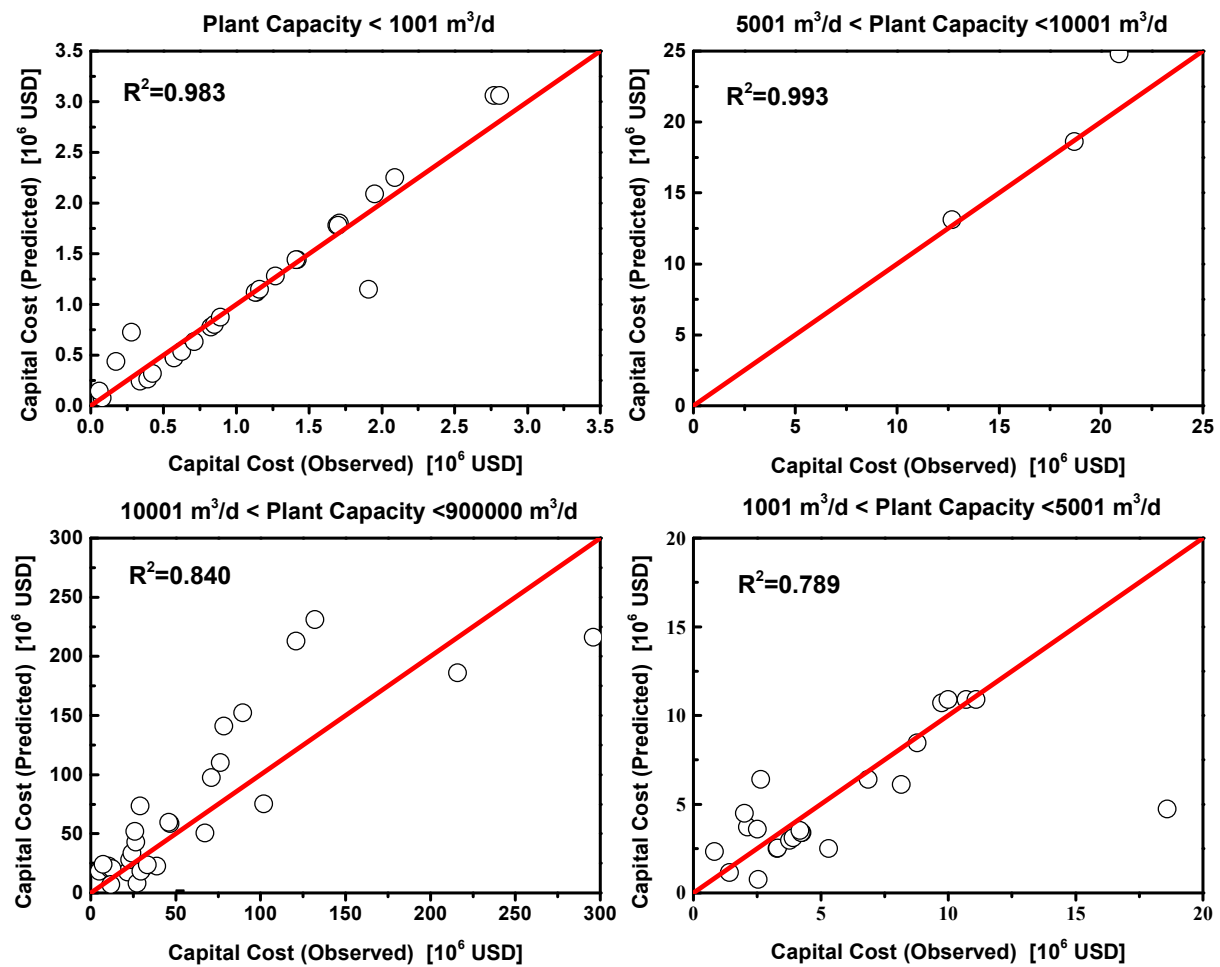


Figure. S2. Plotting the function-predicted capital cost values against with the actual observed values ranging from 2003 to 2014. R^2 is a measure to evaluate how well the models fit the data. The higher value of R^2 shows that variables included in the line are good.

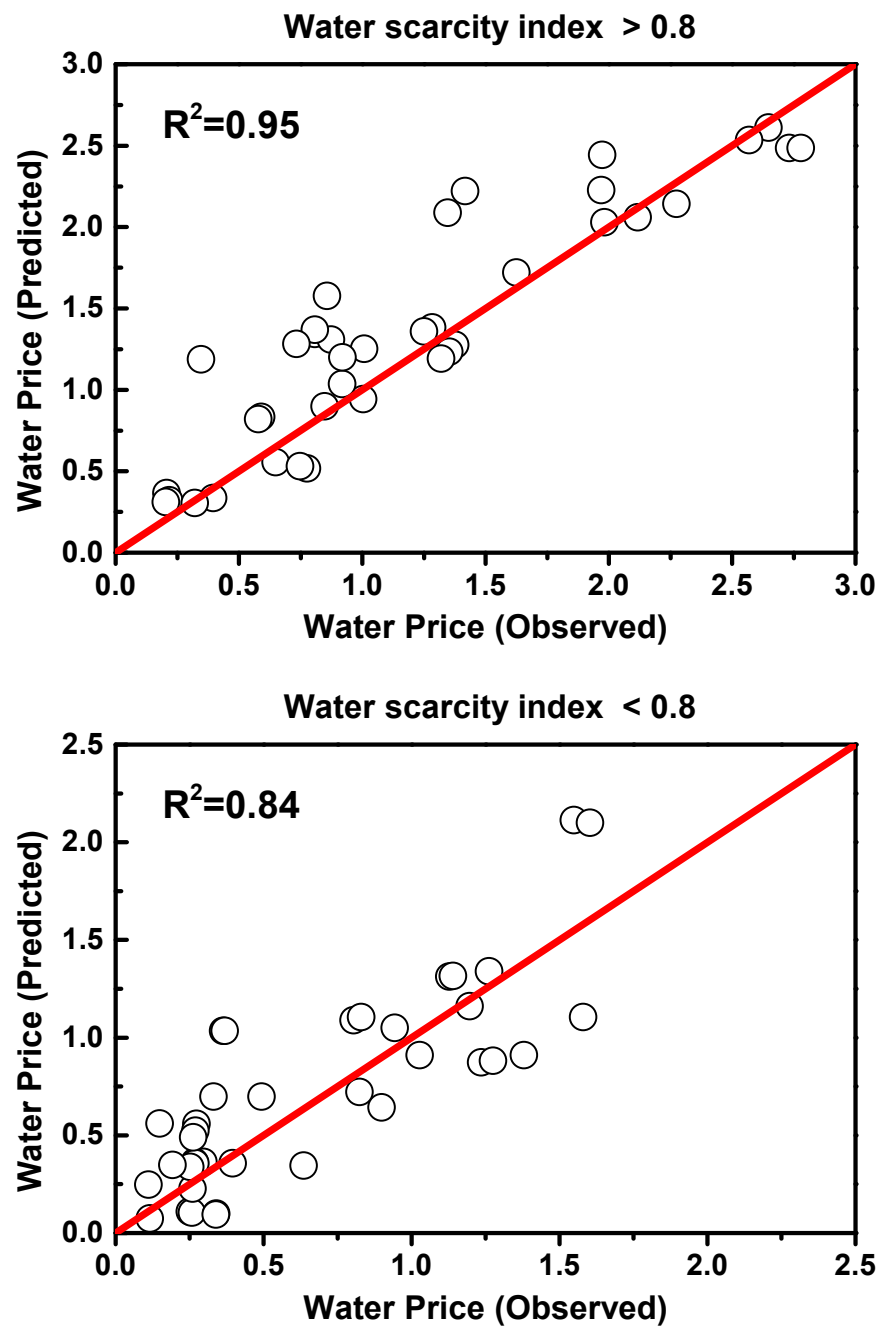


Figure. S3. Plotting the predicted water price by the best model values against with the actual observed values from 2011 to 2014. R^2 is a measure to evaluate how well the models fit the data. The higher value of R^2 shows that variables included in the line are good.

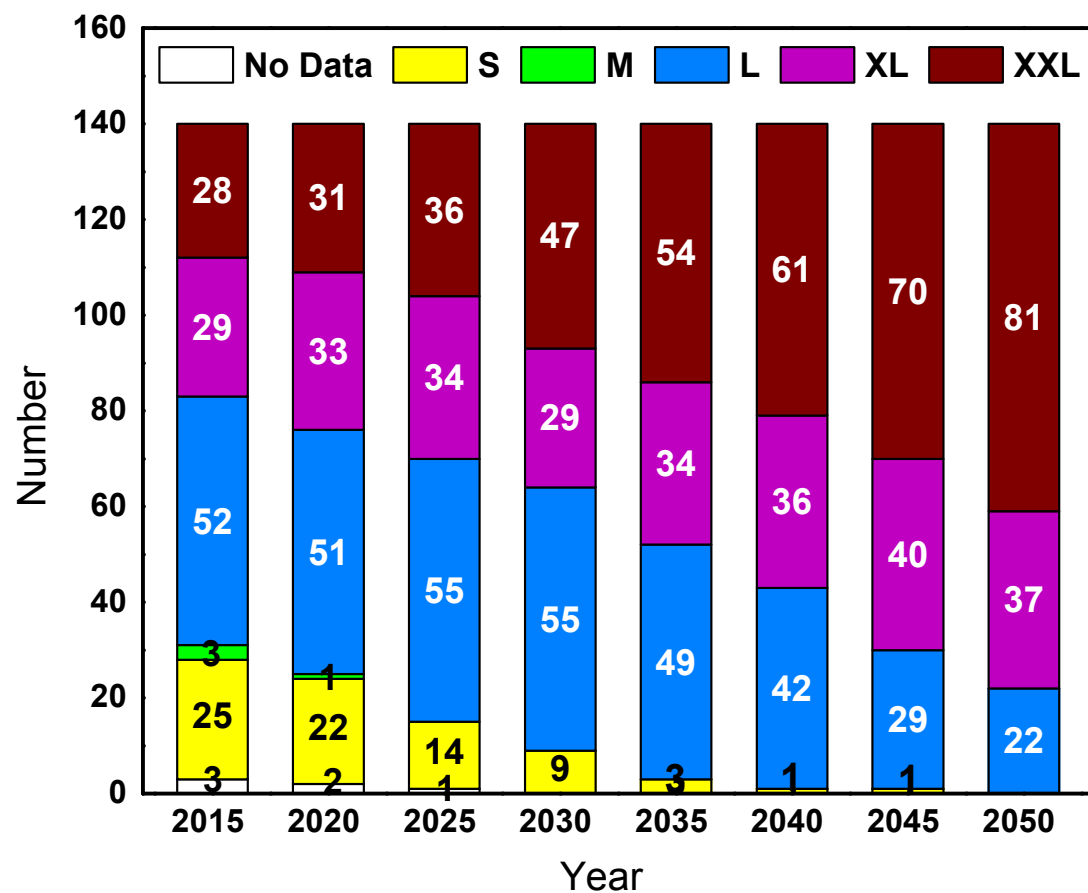


Fig.S4. Future projections of plant capacity of SWRO desalination plants under SSP2. Yellow, green, blue, pink, and red bars indicate S (capacity of plants < 1,000 m³/d), M (1,000-5,000 m³/d), L (5,000-10,000 m³/d), XL (10,000-50,000 m³/d), and XXL (50,000-100,000 m³/d) plants. The countries with the GDP per capita lower than 800 UDS is defined as no data. The value on each stack bar indicates the number of countries that are likely to install a SWRO plant with the corresponding capacity.

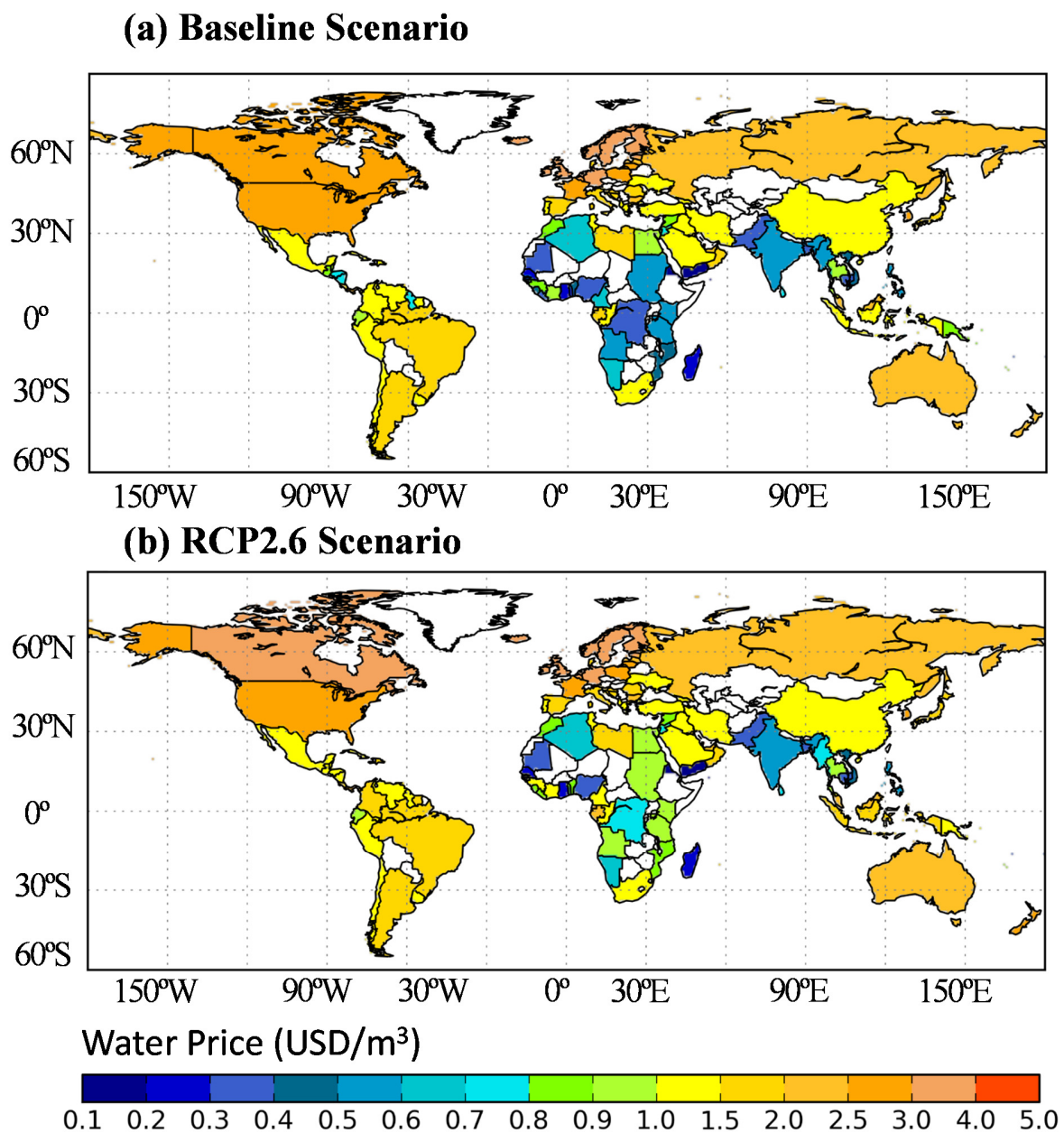


Figure. S5. A world map of the projected water prices for different countries in 2050 under the baseline and RCP2.6 scenarios. Colors change at national boundaries. The unit water price for the baseline year of 2050 was high for the US, Canada, Europe, and Australia, medium for countries around the Mediterranean belt, South America, China, and Russia, and low for South-east Asia and Africa.

Table S1. Data items and selection criteria.

Items	Options	Selection
Plant status	Online	Included
	Construction, Planned, Cancelled, On hold, Offline, Unknown	
Water type	Seawater (TDS 20,000 ppm–5000 ppm)	Included
	Brine of concentrated seawater (TDS > 50,000 ppm)	Excluded
	Brackish water or inland water (TDS 3000 ppm – <20,000 ppm)	
	River water or low concentrated saline water (TDS 500 ppm – <3000 ppm)	
	Pure water or tap water (TDS < 500ppm)	
	Waste water, Unknown	
User category	Municipalities as drinking water (TDS 10 ppm – <1000ppm)	Included
	Tourist facilities as drinking water (TDS 10 ppm – <1000 ppm)	
	Industry (TDS < 10 ppm)	
	Military purposes (TSD 10 ppm – < 1000 ppm)	
	Power stations (TDS < 10 ppm)	
	Irrigation (TDS < 1000 ppm)	
Plant size	Demonstration, Discharge, Process, Water injection, Unknown	Included
	Extra-large (Capacity $\geq$ 50,000 m ³ /d)	
	Large (50,000 > Capacity $\geq$ 10,000 m ³ /d)	
	Medium (10,000 > Capacity $\geq$ 1000 m ³ /d)	
Private finance	Small (1000 m ³ /d > Capacity)	Included
	EPC	
Selected countries	BOT, DB, DBO, IWP	Excluded
	Algeria, Australia, Belgium, Brazil, Canada, Chile, China, Colombia, Cuba, Cyprus, Denmark, Ecuador, Egypt, Fiji, Finland, France, Germany, Greece, Honduras, India, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Libya, Malaysia, Mexico, Morocco, Netherlands, Nigeria, Norway, Oman, Pakistan, Peru, Philippines, Portugal, Russia, Saudi Arabia, South Africa, South Korea, Spain, Sweden, Thailand, Tunisia, Turkey, United Arab Emirates, United Kingdom, United States of America, Venezuela, Vietnam	Included

Note: BOT (Build-Operate-Transfer), DB (Design-Build), DBO (Design-Build-Operate), IWP (International Water Project)

Table S2. Model's parameters and performance results of capital cost (<1001 m³/day).

Variable	Dependent Variable: EPC cost (Capacity < 1001 m ³ /day)											
	Model 1			Model 2			Model 3			Model 4		
Constant	1.E+04	(1.0)	**	3.E+06	(18.8)	***	3.E+06	(18.9)	***	3.E+06	(18.9)	***
Capacity	3.E+03	(114.0)	***	3.E+03	(155.3)	***	3.E+03	(156.3)	***	3.E+03	(155.1)	***
log(TIC)				-2.E+05	(-18.8)	***	-2.E+05	(-18.9)	***	-2.E+05	(-18.8)	***
Income							1.E+00	(2.50)	*			
Distance										3.E+00	(-0.2)	
Region											-1.E+04	(-1.4)
AIC	11201			10946			10942			10948		10946
R ²	0.97			0.98			0.98			0.98		0.98

***indicates a 99% significance level, ** indicates a 95% significance level,* indicates a 90% significance level

Akaike's Information Criterion (AIC) is a measure of the relative quality of a statistical method for a given set of data. A model having the lower AIC is considered to be the better model.

R² is a measure to evaluate how well the models fit the data. The higher value of R² shows that variables included in the line are good.

The t-value are in parentheses.

Table S3. Model's parameters and performance results of capital cost (1001–5001 m³/day).

	Dependent Variable: EPC cost (1001 m³/day < Capacity < 5001 m³/day)														
Variable	Model 1			Model 2			Model 3			Model 4			Model5		
Constant	−3.E+04	(-0.1)	***	2.E+07	(6.5)	***	2.E+07	(6.4)	***	2.E+07	(6.5)	***	2.E+07	(6.3)	***
Capacity	3024.80	(26.2)	***	3.E+03	(29.3)	***	3.E+03	(29.2)	***	3.E+03	(29.1)	***	3.E+03	(28.9)	***
log(TIC)				−1.E+06	(−6.5)	***	−1.E+06	(−6.4)	***	−1.E+06	(−6.5)	***	−1.E+06	(−6.3)	***
Income							6.E+00	(0.5)							
Distance										2.E+02	(0.3)				
Region													−2.E+05	(−0.8)	
AIC	4934			4897			4899			4899			4898		
R²	0.81			0.85			0.85			0.85			0.85		

***indicates a 99% significance level, ** indicates a 95% significance level,* indicates a 90% significance level

Akaike's Information Criterion (AIC) is a measure of the relative quality of a statistical method for a given set of data. A model having the lower AIC is considered to be the better model.

R² is a measure to evaluate how well the models fit the data. The higher value of R² shows that variables included in the line are good. The t-value are in parentheses.

Table S4. Model's parameters and performance results of capital cost (5001–10,001 m³/day).

Variable	Dependent Variable: EPC cost (5001 m ³ /day < Capacity < 10,001 m ³ /day)											
	Model 1			Model 2			Model 3			Model 4		
Constant	4.E+06	(1.2)	*	5.E+07	(4.8)	***	5.E+07	(4.6)	***	5.E+07	(4.7)	***
Capacity	2248.90	(7.3)	***	2.E+03	(9.6)	***	2.E+03	(9.4)	***	2.E+03	(9.4)	***
log(TIC)				−3.E+06	(−4.6)	***	−3.E+06	(−4.4)	***	−3.E+06	(−4.5)	***
Income							2.E+01	(0.8)				
Distance										2.E+02	(1.1)	
Region												8.E+05 (0.8)
AIC	1073			1057			1059			1059		1059
R ²	0.62			0.77			0.77			0.76		0.77

***indicates a 99% significance level, ** indicates a 95% significance level, * indicates a 90% significance level

Akaike's Information Criterion (AIC) is a measure of the relative quality of a statistical method for a given set of data. A model having the lower AIC is considered to be the better model.

R² is a measure to evaluate how well the models fit the data. The higher value of R² shows that variables included in the line are good.

The t-value are in parentheses.

Table S5. Model's parameters and performance results of capital cost (10,001–90,000 m³/day).

Variable	Dependent Variable: EPC cost (10,001 m ³ /day < Capacity < 90,000 m ³ /day)									
	Model 1		Model 2		Model 3		Model 4		Model 5	
Constant	2.E+07	(2.5) *	3.E+08	(4.7) ***	3.E+08	(4.7) ***	3.E+08	(4.4) ***	3.E+08	(4.8) ***
Capacity	1818.00	(9.3) ***	2.E+03	(11.9) ***	2.E+03	(10.9) ***	2.E+03	(11.0) ***	2.E+03	(10.7) ***
log(TIC)			−2.E+07	(−4.4) ***	−2.E+07	(−4.4) ***	−2.E+07	(−4.2) ***	−2.E+07	(−4.5) ***
Income					−2.E+02	(−0.7)				
Distance							−4.E+04	(−0.3)		
Region									7.E+06	
AIC	802		788		790		790		789	
R ²	0.80		0.90		0.90		0.89		0.90	

***indicates a 99% significance level, ** indicates a 95% significance level, * indicates a 90% significance level

Akaike's Information Criterion (AIC) is a measure of the relative quality of a statistical method for a given set of data. A model having the lower AIC is considered to be the better model.

R² is a measure to evaluate how well the models fit the data. The higher value of R² shows that variables included in the line are good. The t-value are in parentheses.

Table S6. Error matrix for capacity predictions of SWRO desalination plant.

	S	M	L	XL	XXL	Total sample	Accuracy (%)
S	3	0	0	0	0	3	100
M	1	5	0	0	0	6	83
L	1	1	3	0	0	5	60
XL	0	0	0	7	5	12	58
XXL	0	0	0	4	3	7	57
Total accuracy(%): 64							

The total accuracy of the decision process in correctly attributing locations to their respective capacity classes was 64%. It was found that success rate for each group has a contrary trend with its capacity volume, in which the accuracy for predicting S to XXL size was ranging 100% to 57%. For instance, among the 6 samples with M size capacity, 5 samples were correctly simulated for M size, while 1 for S size. The accuracy for predicting M was 83%. Among the 7 samples with XXL size, only 3 were correctly simulated into XXL, while 4 for XL. The accuracy for predicting XXL was 57%. These results suggested that the proposed method of making preference was appropriate for simulating the future capacity selection in each country, especially for those countries with preference to build SWRO plant with a smaller capacity size.

Table S7. Model's parameters and performance results of conventional water price

(Low water scarcity: water scarcity index > 0.8)

Dependent Variable: Conventional water price (water scarcity index > 0.8)							
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Constant	2.9E-01 (1.8)	-4.1E-01 (-1.7)	4.1E-01 (2.4) *	-3.0E-01 (-1.1)	-4.8E-01 (-1.8)	-3.6E-01 (-1.2)	3.2E-01 (-1.4)
Income	5.1E-05 (8.9) ***	5.1E-05 (9.8) ***	5.6E-05 (8.9) ***	5.3E-05 (9.0) ***	5.2E-05 (9.3) ***	5.4E-05 (8.6) ***	5.8E-05 (8.7) ***
Energy price		8.0E+00 (3.7) ***		7.3E+00 (3.1) **	7.9E+00 (3.6) **	7.3E+00 (3.1) **	
Wpc			-2.7E-03 (-1.9)	-1.2E-03 (-0.9)		-1.2E-03 (-0.9)	-2.7E-03 (-1.9)
PD					7.2E-05 (0.6)	7.1E-05 (0.6)	9.2E-05 (0.7)
AIC	88.47	86.73	77.79	78.97	79.45	80.63	88.25
R2	0.59	0.67	0.61	0.67	0.67	0.68	0.67

***indicates a 99% significance level, ** indicates a 95% significance level, * indicates a 90% significance level

Akaike's Information Criterion (AIC) is a measure of the relative quality of a statistical method for a given set of data. A model having the lower AIC is considered to be the better model.

R² is a measure to evaluate how well the models fit the data. The higher value of R² shows that variables included in the line are good.

The t-value are in parentheses.

Table S8. Model's parameters and performance results of conventional water price

(High water scarcity: water scarcity index < 0.8)

Dependent Variable: Conventional water price (water scarcity index < 0.8)							
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Constant	1.1E-01 (0.9)	1.6E-01 (-0.9)	-6.1E-02 (-0.4)	-3.1E-02 (-0.2)	2.2E-01 (1.0)	5.5E-02 (0.2)	3.8E-02 (0.2)
Income	4.2E-05 (8.5) ***	4.2E-05 (8.4) ***	2.7E-05 (2.7) ***	2.8E-05 (2.7) **	4.1E-05 (6.6) ***	2.5E-05 (2.2) *	2.4E-05 (2.2) *
Energy price		-5.5E-01 (-0.4)		-3.0E-01 (-0.2)	-4.9E-01 (-0.4)	-2.0E-01 (3.1)	
Wpc			4.4E-03 (1.7)	4.3E-03 (1.6)		4.5E-03 (-0.2)	4.5E-03 (1.7)
PD					-3.8E-05 (-0.4)	-5.4E-05 (-0.6)	-5.6E-05 (-0.6)
AIC	56.51	58.30	55.557	57.49	60.10	59.08	57.11
R2	0.61	0.61	0.64	0.63	0.61	0.64	0.64

***indicates a 99% significance level, ** indicates a 95% significance level, * indicates a 90% significance level

Akaike's Information Criterion (AIC) is a measure of the relative quality of a statistical method for a given set of data. A model having the lower AIC is considered to be the better model.

R2 is a measure to evaluate how well the models fit the data. The higher value of R2 shows that variables included in the line are good.

The t-value are in parentheses.

Table S9. The feasibility index (Fi) and TIC in major SWRO countries.

Country	1990		1995		2000		2005		2010		2015	
	Fi	TIC ¹⁾	Fi	TIC	Fi	TIC	Fi	TIC	Fi	TIC	Fi	TIC
UAE ²⁾	1.83	1.21	NA ³⁾	1.97	NA ³⁾	3.54	1.88	6.04	NA ³⁾	8.10	2.01	8.23
Saudi Arabia	0.43	2.51	0.46	3.56	0.48	3.64	0.61	4.93	0.80	7.15	0.85	7.46
Spain	0.61	0.08	0.68	0.09	0.82	0.84	1.17	1.27	1.25	2.98	1.29	2.99
Kuwait	NA ³⁾	0.97	1.50	1.10	1.51	1.23	2.07	1.68	NA ³⁾	2.02	2.28	2.02
Israel	0.49	0.02	0.60	0.02	0.72	0.02	0.80	0.45	1.11	1.57	1.18	1.72
Qatar	NA ³⁾	0.14	NA ³⁾	0.29	2.73	0.29	3.00	0.74	3.28	1.40	4.14	1.42
Bahrain	0.61	0.12	0.81	0.12	1.06	0.34	1.14	0.38	NA ³⁾	0.88	NA ³⁾	0.88
Oman	0.48	0.11	0.56	0.14	0.66	0.26	0.71	0.42	0.92	0.76	1.20	0.78
Libya	NA ³⁾	0.16	NA ³⁾	0.23	0.31	0.31	0.51	0.42	0.72	0.58	0.76	0.58
Average	0.74	0.59	0.77	0.83	1.04	1.16	1.32	1.82	1.35	2.83	1.71	2.90

Note: 1) TIC: Total cumulative installed capacity (10⁶m³/day); 2) United Arab Emirates (UAE); 3) NA: No data

Table S10. Feasibility index (F_i) in 2015 and 2050 under two climate policies scenarios. Red numbers indicate feasibility index in major countries using SWRO.

		Baseline	RCP2.6	Baseline
		$(F_i = W_{p-2015}/C_p)$	$(F_i = W_{p-2015}/C_p)$	$(F_i = W_p/C_p)$
Country	2015	2050	2050	2050
Congo Dem. Rep.	NA	0.15	0.12	0.35
Eritrea	NA	0.01	0.01	0.09
Liberia	NA	0.16	0.13	0.38
Qatar	3.17	4.31	3.79	5.33
Argentina	3.09	4.71	4.11	5.21
Singapore	2.68	3.33	3.25	4.10
Brunei	2.66	3.30	2.86	5.19
Barbados	2.46	3.20	2.89	4.27
Sweden	2.15	2.74	2.73	3.79
Ireland	2.13	2.73	2.45	3.99
Norway	2.12	2.88	2.53	4.06
United States of America	2.09	2.67	2.66	3.53
Germany	2.08	2.65	2.65	3.65
Netherlands	2.05	2.76	2.38	3.53
Iceland	2.04	2.61	2.60	3.48
Finland	1.99	2.54	2.54	3.60
Belgium	1.98	2.46	2.40	4.06
United Kingdom	1.97	2.52	2.51	3.41
Australia	1.95	2.49	2.49	3.43
New Zealand	1.81	2.25	1.77	3.29
Slovenia	1.81	2.31	2.30	3.07
Kuwait	1.80	2.47	2.14	3.18
Canada	1.72	2.33	2.05	3.25
Israel	1.61	2.21	1.92	3.09
Lithuania	1.42	2.11	2.11	3.09
France	1.36	1.77	1.60	3.14
Panama	1.28	1.95	1.70	2.60
Spain	1.21	1.80	1.80	3.26
Croatia	1.21	1.96	1.72	2.71
Japan	1.19	1.76	1.76	2.78
Puerto Rico	1.16	1.57	1.38	2.42
Denmark	1.15	1.70	1.70	2.66
South Korea	1.14	1.44	1.26	1.94

Italy	1.13	1.72	1.50	2.52
Bahrain	1.09	1.39	1.39	1.81
Malaysia	1.05	1.56	1.56	2.54
Malta	1.02	1.53	1.20	2.31
Estonia	1.00	1.27	1.27	1.57
United Arab Emirates	1.00	1.33	1.09	1.76
Libya	0.97	1.42	1.39	2.17
Equatorial Guinea	0.97	1.23	1.23	1.72
Poland	0.93	1.26	1.11	2.00
Iraq	0.89	1.38	1.25	2.72
Greece	0.89	1.14	1.02	1.49
Gabon	0.88	1.34	1.17	3.28
Bulgaria	0.87	1.28	1.14	2.02
Uruguay	0.85	1.30	1.14	2.07
Romania	0.81	1.31	1.11	3.05
Costa Rica	0.78	1.21	1.18	2.68
Mauritius	0.78	1.26	1.11	1.84
East Timor	0.77	0.98	0.89	1.15
Portugal	0.76	1.14	0.90	2.16
Cuba	0.76	1.16	1.01	1.92
Albania	0.74	0.94	0.95	1.49
Lebanon	0.74	1.15	1.12	2.17
China	0.63	0.81	0.73	1.07
Latvia	0.63	0.94	0.94	1.37
Trinidad and Tobago	0.63	0.93	0.93	1.62
Chile	0.63	0.96	0.84	1.51
Bosnia and Herzegovina	0.62	1.01	0.88	1.99
Brazil	0.62	0.94	0.82	1.75
Bahamas	0.60	0.89	0.89	1.50
Mexico	0.60	0.97	0.86	1.77
Colombia	0.60	0.75	0.74	1.20
Dominican Republic	0.60	0.75	0.73	1.53
Saudi Arabia	0.56	0.86	0.83	1.46
Jamaica	0.56	0.89	0.70	1.47
Suriname	0.54	0.68	0.61	1.37
Ecuador	0.53	0.68	0.61	1.39
South Africa	0.50	0.67	0.61	1.04

St. Lucia	0.49	0.63	0.56	0.82
West Bank	0.49	0.64	0.57	1.16
Indonesia	0.47	0.60	0.54	1.53
Egypt	0.46	0.59	0.53	0.93
Oman	0.45	0.56	0.55	0.74
New Caledonia	0.45	0.59	0.54	1.35
Ukraine	0.45	0.58	0.52	0.91
Namibia	0.43	0.52	0.48	0.99
Venezuela	0.41	0.60	0.52	1.17
Morocco	0.40	0.51	0.46	0.97
Cyprus	0.40	0.51	0.46	0.81
French Polynesia	0.39	0.69	0.55	1.98
Syria	0.37	0.47	0.42	0.73
Russia	0.35	0.42	0.37	0.61
Georgia	0.35	0.41	0.34	0.53
Iran	0.35	0.56	0.49	1.36
Cote D'Ivoire	0.34	0.42	0.38	0.91
Guatemala	0.34	0.46	0.42	0.90
Belize	0.32	0.50	0.44	1.37
Myanmar	0.31	0.40	0.33	1.04
Congo, Rep	0.31	0.39	0.35	0.63
Philippines	0.31	0.37	0.34	0.79
Gambia	0.31	0.49	0.45	0.69
Jordan	0.30	0.39	0.35	1.33
Nicaragua	0.30	0.37	0.33	0.73
Sri Lanka	0.29	0.35	0.31	0.76
India	0.29	0.35	0.31	0.75
Djibouti	0.28	0.34	0.31	0.75
Turkey	0.27	0.44	0.40	1.21
Fiji	0.26	0.41	0.38	0.54
Peru	0.26	0.32	0.29	0.51
Angola	0.25	0.34	0.30	0.75
Kenya	0.24	0.29	0.26	0.75
Algeria	0.23	0.29	0.24	0.61
El Salvador	0.22	0.28	0.25	0.74
Tonga	0.20	0.28	0.23	0.67
St. Vincent and the Grenadines	0.19	0.24	0.21	0.56
Sudan	0.18	0.22	0.20	0.37
Togo	0.16	0.25	0.21	0.75

Nigeria	0.16	0.24	0.20	0.63
Papua New Guinea	0.15	0.18	0.16	0.36
Bangladesh	0.15	0.23	0.19	0.58
Guinea Bissau	0.15	0.23	0.19	0.55
Cape Verde	0.14	0.24	0.20	0.96
Vanuatu	0.14	0.21	0.18	0.48
Madagascar	0.13	0.20	0.17	0.42
Senegal	0.13	0.20	0.17	0.50
Ghana	0.12	0.20	0.17	0.90
Yemen	0.12	0.18	0.15	0.41
Comoros	0.12	0.18	0.15	0.44
Solomon Island	0.12	0.18	0.15	0.38
Guinea	0.11	0.13	0.11	0.32
Benin	0.09	0.11	0.10	0.29
Mozambique	0.09	0.14	0.11	0.31
Tunisia	0.08	0.10	0.09	0.41
Cambodia	0.07	0.10	0.08	0.27
Pakistan	0.05	0.06	0.05	0.30
Samoa	0.05	0.08	0.07	0.27
Guyana	0.04	0.05	0.05	0.22
Honduras	0.04	0.06	0.05	0.30
Thailand	0.04	0.05	0.05	0.22
Sao Tome and Principe	0.04	0.06	0.05	0.20
Haiti	0.04	0.06	0.05	0.20
Mauritania	0.04	0.06	0.05	0.24
Maldives	0.03	0.05	0.05	0.28
Tanzania	0.03	0.05	0.05	0.17
Aruba	0.02	0.03	0.03	0.18
Cameroon	0.01	0.02	0.01	0.19
Vietnam	0.01	0.02	0.02	0.16
Sierra Leone	0.01	0.01	0.01	0.53