

Table 1 Example of studies on water quality in arid and semi-arid areas

S/n o	Study	Region/Country	Water Quality Indices		Statistical Techniques			The mechanism of controlling water quality	
			WQI	HPI	Correlation (r)	PC A	HC A	Natural	Anthropogenic
1	Kwaya et al. ⁷⁶	Maru town and environs, NW, Nigeria		√	√	√	√	√	√
2	Rasool et al. ⁷⁷	Punjab, Pakistan				√	√	√	√
3	Abbasnia et al. ⁷⁸	Sistan-Baluchistan, Iran	√						
4	Abu Al Naeem et al. ³⁹	Gaza coastal aquifer, Palestine			√	√	√	√	√
5	Abu Khatita et al. ⁷⁹	South Eastern Sinai, Egypt		√					
6	Acikel and Ekmekci ⁵²	Azmak Spring Zone, Mugla, Turkey				√	√	√	
7	Alarcon-Herrera et al. ⁸⁰	Semi-arid regions in Latin America			√			√	√
8	Al-Farraj et al. ⁶⁶	Kharj agricultural area, Riyadh Saudi Arabia			√	√	√	√	√
9	Aminiyan et al. ⁴¹	Rafsanjan plain, Iran			√	√	√		√
10	Aminiyan et al. ³⁷	Karoon river, Iran	√		√	√	√		
11	Amiri et al. ⁸¹	Urmia aquifer, NW Iran			√	√	√	√	
12	Rasool et al. (2016)	Punjab, Pakistan			√	√	√	√	√
13	Ayadi et al. ⁸²	Teboursouk area Northwestern, Tunisian Atlas				√	√	√	√
14	Agoubi and Gzam ⁸³	Ghannouch field, Southeastern Tunisia				√	√	√	√
15	Agoubi et al. ⁸⁴	Marine Jeffara Aquifer, SE Tunisia			√		√	√	
16	Agoubi et al. ⁵⁴	Coastal Arid Area, SE Tunisia			√	√	√	√	
17	Bahloul et al. ⁸⁵	Sfax Solar Saltern, Tunisia				√	√	√	√
18	Barakat et al. ⁶⁷	Oum Er Rbia River, Morocco			√	√	√	√	√
19	Barzegar et al. ⁸⁶	Shabestar Area, Northwestern Iran			√	√	√	√	√
20	Basahi et al. ⁴⁰	Wadi Baysh Basin, Saudi Arabia		√	√	√		√	√

21	Batayneh and Zumlot ⁸⁷	Yarmouk Basin of North Jordan			√		√	
22	Batsaikhan et al. ⁸⁸	Ulaanbaatar City, Mongolia			√	√	√	√
23	Belkhiri and Mouni ⁸⁹	Soummam Basin, Algeria				√		√
24	Bencer et al. ⁵⁴	Ain Djacer area, Eastern of Algeria		√	√	√	√	√
25	Bhakar and Singh ⁹⁰	Rajasthan, India			√	√		
26	Boughariou et al. ⁹¹	Sfax coastal aquifer, Southeast Tunisia			√	√	√	
27	Bouterraa et al. ³⁸	Boumerzoug-El Khroub, NE Algeria	√		√	√	√	
28	Singh et al. ⁹²	Delhi, India			√	√	√	
29	Carlson et al. ⁹³	Tucson Basin, USA						√
30	Chaves et al. ⁹⁴	Brazilian semi-arid region						√
31	Dehghanzadeh et al. ⁹⁵	Eastern Area of Urmia Salt Lake Basin			√	√	√	√
32	Ehya and Marbouti ⁵⁵	Behbahan plain, SW Iran	√	√				
33	El Alfy et al. ¹⁸	Riyadh, Saudi Arabia			√	√	√	√
34	El Yaouti et al. ⁹⁶	Bou-Areg (NE Morocco)			√	√	√	√
35	El-Ameir ⁴⁸	Damietta Branch of Nile River, Egypt		√				
36	Eslami et al. ⁴²	Jiroft, Iran	√		√	√	√	
37	Hamzaoui-Azaza et al. ⁹⁷	Zeuss–Koutine aquifer, SE Tunisia		√	√	√	√	
38	Hamzaoui-Azaza et al. ⁹⁸	Jeffara of Medenine, Southern Tunisia			√	√	√	√
39	Gasmi et al. ⁶⁹	Wadi El Bey, Tunisia			√	√	√	√
40	Gomes et al. ⁹⁹	Iberian Peninsula, Portugal				√		√
41	Gubran et al. ⁵⁶	Wadi Nisah, Central Saudi Arabia		√	√	√	√	√
42	Yu et al. ¹⁰⁰	Wuliangsu Lake, Mongolia			√			√
43	Hamdi et al. ⁴³	Sisseb El Alem Nadhour Saouaf, Tunisia	√		√	√	√	√
44	Wu et al. ⁵	Northwest, China		√			√	√

45	Jampani et al. ¹⁰¹	Hyderabad, India			√	√			√
46	Jassas and Merkel ⁵⁷	Al-Khazir Gomal Basin, Northern Iraq		√		√	√	√	
47	Kaba et al. ¹⁰²	Littoral aquifer, Northern Senegal				√	√	√	√
48	Karroum et al. ¹⁰³	Central Morocco		√				√	
49	Ketata-Rokbani et al. ¹⁰⁴	El Khairat, Tunisian Sahel	√						
50	Khazaala et al. ¹⁰⁵	Lake Habbaniyah, Al-Anbar, Iraq		√					
51	Kolsi et al. ⁵⁸	Hajeb Elyoun–Jelma, Central Tunisia		√		√		√	√
52	Kraiem et al. ¹⁰⁶	Chott Djerid, south-western Tunisia		√		√	√	√	√
53	Krishna et al. ¹⁰⁷	Hydrabad, India				√	√	√	√
54	Kuisi and Abdel-Fattah ¹⁰⁸	Amman Zarqa Basin, Jordan		√		√		√	√
55	Kumar et al. ¹⁰⁹	Delhi, India				√	√	√	√
56	Kumssa et al. ¹¹⁰	North Rift and North Eastern Kenya		√					
57	Kwami et al. ⁵⁹	Gombe and Environs, North-East Nigeria				√	√	√	√
58	Belkhiri et al. ¹¹¹	Ain Azel plain, Algeria				√	√	√	
59	Belkhiri and Mouni ¹¹²	Ain Azel plain, Algeria				√	√	√	
60	Belkhiri et al. ¹¹²	Ain Azel plain, Algeria					√		
61	Kwaya et al. ⁴⁹	Yobe State, NE Nigeria	√	√		√	√	√	√
67	M'nassri et al. ¹¹³	Ouled Chamekh Plain, Tunisia		√		√	√	√	√
68	Ma et al. (2016)	Yellow River, China	√	√			√	√	√
69	Machiwal and Jha ⁴⁴	Aravalli range, western India	√			√		√	√
70	Mahfooz et al. ⁴⁵	Faisalabad, Pakistan	√			√	√	√	√
71	Masoud et al. ⁴⁵	Tanta District, Egypt				√			√

72	Masoud et al. ¹¹⁴	Dakhla Oasis, Egypt			√	√	√	√
73	Maurya and Srivastava ⁵⁰	Agra districts of Uttar Pradesh, India		√	√			√
74	Mehrabi et al. ¹¹⁵	Ahangaran, west of Iran		√	√	√	√	√
75	Merzougui et al. ¹¹⁶	Beni-Ounif syncline, SW Algeria			√	√	√	
76	Modibo Sidibé et al. ¹¹⁷	Sahel Region in Africa			√	√	√	
77	Monjerezi and Ngongondo ¹¹⁸	Lower Shire Valley, Malawi	√				√	
78	Monjerezi et al. ¹¹⁹	Lower Shire River valley, Malawi:			√	√	√	
79	Monjerezi et al. ¹¹⁹	Lower Shire River valley, Malawi			√	√		
80	Mountadar et al. ⁶⁰	Sidi Abed-Ouled Ghanem, Morocco			√	√	√	
81	Murgulet et al. ¹²⁰	Gulf of Mexico, USA			√		√	
82	N Adimalla ¹²¹	Telangana State, India	√					
83	Nadiri et al. ⁶¹	Tasuj plain aquifer, Iran		√	√	√	√	√
84	Narsimha Adimalla and Li ¹²²	Telangana State, India					√	
85	Narsimha Adimalla and Wu ¹²¹	Central Telangana, India					√	√
86	Narsimha Adimalla et al. ¹²²	Nirmal Province, India					√	
87	Noshadi and Ghafourian ¹²³	Fars province, Iran			√	√	√	√
88	Ogwueleka ¹²⁴	Kaduna River, Nigeria			√	√	√	√
89	Ogwueleka ¹²⁴	Kaduna River, Nigeria	√		√	√	√	√
90	Singh et al. ¹²⁵	Bokaro, Central African Republic	√					
91	Pei-yue et al. ¹²⁶	Ningxia, Northwest China	√					

92	Qishlaqi et al. ¹²⁷	Ravar plain, Southeast Iran			√	√	√	
93	Qishlaqi et al. ¹²⁷	Ravar plain, Southeast Iran			√	√	√	
94	R Dehbandi et al. ¹²⁸	Sirjan Plain, SE, Iran				√	√	
95	Rachid et al. ¹²⁹	Wadi Ouazzi Basin, Morocco			√	√	√	
96	Rafiee et al. ⁵¹	Zanjan Province, Tehran Iran	√	√	√	√	√	√
97	Rakotondrabe et al. ⁴⁷	Bétaré-Oya, East-Cameroon	√	√	√	√		√
98	Reza Dehbandi et al. ¹²⁸	Southeast of Iran				√	√	
99	Rocha et al. ¹³⁰	Upper Jaguaribe River, Brazil	√		√			
100	Sadat-Noori et al. ¹³¹	Saveh-Nobaran aquifer, Iran	√	√				
101	Sahu et al. ¹³²	Lalganj Tehsil, Raebareli, India		√	√	√	√	
102	Sajil Kumar ⁶²	Tamil Nadu, India		√	√	√	√	√
103	Sakram et al. ¹³³	Zaheerabad area, Telangana, India		√	√	√	√	√
104	Singh. et al. ¹³⁴	Shiwaliks of Punjab, India			√		√	
105	Soltani et al. ¹³⁵	Kordkandi-Duzduzan plain, NW Iran:		√	√	√	√	√
106	Subba Rao et al. ⁴⁶	Wanaparthy District, Telangana, India,	√		√		√	√
107	Sudheer Kumar et al. ¹³⁶	Nalgonda District, India		√	√	√	√	√
108	Tlili-Zrelli et al. ¹³⁷	Grombalia, Northeastern Tunisia			√	√	√	
109	Trabelsi and Zouari ¹³⁸	Takelsa syncline, NE Tunisia			√	√	√	√
110	Trabelsi et al. ¹³⁹	Djeffara, Southeastern Tunisia		√	√	√	√	
111	Vasanthavigar et al. ¹⁴⁰	Tamilnadu, India	√					
112	Vasanthavigar et al. ¹⁴¹	Thirumanimuthar sub-basin, Tamil Nadu, India			√	√	√	√
113	Vesali Nasch et al. ¹⁴²	Ghaen Plain, Iran		√				
114	Wilson et al. ¹⁴³	Mayo Tsanaga River Basin, Cameroon	√	√				

115	Woocay and Walton ¹⁴⁴	Amargosa Desert, Nevada			√	√	√	√
116	Xiao et al. ¹⁴⁵	Tarim River Basin, NW China	√	√				
117	Yu et al. ¹⁴⁶	Miyun County, Northern China			√	√	√	
118	Yazidi et al. ¹⁴⁷	Ichkeul Lake, Northern Tunisia		√	√			
119	Yu et al. ¹⁴⁸	Northwestern China		√	√	√	√	
120	Zhang et al. ⁷⁵	Yinchuan plain, in northwest China			√	√	√	√
121	Zhang et al. ⁷⁵	Yinchuan plain, in northwest China		√	√	√	√	√
122	Zhu et al. ⁶³	Jungar region, Northwestern China			√	√	√	√