

## **APPENDIX I: METEOROLOGICAL DATA**

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Table 1. Coordinates of meteorological stations in the Arab Region frequently used in the book

Ser. No.	Code No.	Station Name	Latitude ° ' N/S	Longitude ° ' W/E	Height, m
1	Mrt	1 Atar	20 31 N	13 04 W	225
2		2 Tidjika	18 32	11 26	399
3		3 Nouakchott	18 07	15 36	21
4		4 Boutilimit	17 32	14 41	77
5		5 Kiffa	16 38	11 24	115
6		6 Nema	16 37	07 16	269
7	Mor	1 Tanger	35 43	05 54	35
8		2 Melilla	35 20	03 00	32
9		3 Oudja	34 47	01 56	470
10		4 Rabat	34 03	06 40	75
11		5 Meknes	33 53	05 32	549
12		6 Casablanca	33 34	07 40	58
13		7 Ifrane	33 31	05 07	1640
14		8 Marrakech	31 37	08 02	466
15		9 Ouarzazate	30 56	06 54	1136
16		10 Agadir	30 23	09 39	19
17	Alg	1 Alger	36 46	03 03 E	60
18		2 Cap Carbon	36 45	05 06	767
19		3 Maison Blanche	36 43	03 15	28
20		4 Miliana	36 20	02 14	722
21		5 Beni Abbes	36 08	02 10 W	498
22		6 Biskra	34 48	05 44 E	56
23		7 Oran	35 38	00 37 W	99
24		8 Tebessa	35 26	08 08 E	816
25		9 Laghouat	33 46	00 56	767
26		10 C. Bechar	31 38	02 15 W	806
27		11 El-Golea	30 34	02 52E	398
28		12 In Salah	27 12	02 28	393
29	Tun	13 Ouallen	24 36	01 17	347
30		14 Tamanrasset	22 48	05 32	1378
31		1 Bizerte	37 14	09 49	3
32		2 Kelibia	36 51	11 05	29
33		3 Tunis	36 50	10 14	4
34		4 Jendouba	36 29	08 48	143
35		5 Kairouan	35 40	10 06	60
36		6 Monastir	35 40	10 45	2
37		7 Sfax	34 43	10 41	21
38		8 Gafsa	34 25	08 49	313
39		9 Tozeur	33 55	08 10	45
40		10 Gabes	33 53	10 06	5
41	Lib	11 Djerba Mellita	33 35	10 47	6
42		12 Remada	32 19	10 24	300
43		1 Tripoli City	32 57	13 12	25
44		2 Shahat	32 49	21 51	625
45		3 Garian	32 44	13 01	725
46		4 Derna	32 44	22 38	9
47		5 Aziziyah	32 33	13 12	145
48		6 Misurata	32 25	15 06	6
49		7 Benina	32 06	20 16	132

50		8 Nalut	31 52	10 59	620
51		9 Abdel-.Nasser A.P.	31 51	23 55	155
52		10 Mizda	31 27	13 00	400
53		11 Sirte	31 12	16 35	22
54		12 Ajdabiyah	30 43	20 10	5
55		13 Ghadames	30 08	09 30	338
56		14 Hon	29 08	15 57	261
57		15 Gilao	29 02	21 34	52
58		16 Sebha	27 01	14 26	444
59	Lib	17 Kufrah	24 13	23 20	382
60	Egy	1 Sidi Barrani	31 38	25 58	27
61		2 Sallum	31 33	25 11	7
62		3 Damietta	31 25	31 49	3
63		4 Rosetta	31 24	30 25	2
64		5 Mersa Matruh	31 22	27 14	7
65		6 Port said	31 17	32 15	1
66		7 Alexandria	31 12	29 53	32
67		8 El Arish	31 07	33 46	10
68		9 El Mansurah	31 03	31 23	7
69		10 Damanhour	31 02	30 28	6
70		11 Tanta	30 47	31 00	14
71		12 Zagazig	30 35	31 30	11
72		13 Delta Barrage	30 11	31 08	20
73		14 Cairo (Ezbekiyah)	30 05	31 17	26
74		15 Giza	30 02	31 13	21
75		16 Suez (Pt. Tewfik)	29 56	32 23	8
76		17 Helwan	29 52	31 20	112
77		18 Faiyum	29 18	30 51	28
78		19 Siwa	29 12	25 19	17
79		20 Beni Suef	29 04	31 08	28
80		21 El Tor	28 14	33 37	3
81		22 El Minya	28 05	30 44	39
82		23 Hurghada	27 17	33 46	1
83		24 Asyut	27 11	31 06	71
84		25 Qena	26 10	32 43	73
85		26 Quseir	26 08	34 18	6
86		27 El Dakhla	25 29	29 00	110
87		28 El Kharga	25 26	30 34	70
88		29 Deadalus Island	24 55	35 52	3
89		30 Aswan	24 02	35 23	108
90	Sud	1 Wadi Halfa	21 55	31 20	125
91		2 Port Sudan	19 37	37 13	6
92		3 Tokar	18 25	37 45	18
93		4 Atbara	17 42	33 58	348
94		5 Khartoum (G.C.)	15 37	32 33	385
95		6 Kassala	15 28	36 24	501
96		7 Wad medani	14 24	33 30	407
97		8 Gedaref	14 02	35 24	599
98		9 Ed-Dueim	13 59	33 20	379
99		10 El Fasher (A.P.)	13 38	25 20	790
100		11 Sennar	13 33	34 37	419
101		12 Geneina	13 29 N	22 27 E	779

(Continued)

Table 1. (Continued)

Ser. No.	Code No.	Station Name	Latitude ° ' N/S	Longitude ° ' W/E	Height, m
102		13 Obeid, El (A.P.)	13 10	30 14	570
103		14 Singa	13 09	33 57	433
104		15 En Nahud	12 42	28 26	540
105		16 Er Roseires	11 51	34 23	467
106		17 Renk	11 45	32 47	382
107		18 Malakal	09 32	31 39	389
108		19 Raga	08 28	25 41	460
109		20 Akobo Post	07 48	33 03	403
110		21 Wau	07 42	28 01	433
111		22 Juba	04 51	31 37	462
112		23 Torit	04 25	32 33	625
113	Djb	1 Djibouti-Serpent	11 30	43 09	7
114	Som	1 Cape Guardafui	11 49	51 17	80
115		2 Bender Cassim	11 17	49 11	6
116		3 Erigavo	10 37	47 22	1730
117		4 Berbera	10 26	45 02	8
118		5 Hargeisa	09 31	44 06	1370
119		6 Gallaciao	06 51	47 16	302
120		7 Obbia	05 20	48 34	10
121		8 Lugh Ferrandi	03 45	42 35	193
122		9 Mogadiscio	02 02	45 21	9
123		10 Chisimaio	00 22 S	42 26	10
C.I.	Com	1 Moroni	11 42 S	43 14	6
124	Syr	1 El Qamishli	37 03 N	41 13	451
125		2 El Haseke	36 31	40 39	N.A.
126		3 Aleppo	36 11	37 13	392
127		4 Raqqa	35 58	39 02	N.A.
128		5 Lattakia	35 33	35 45	8
129		6 Deir ez Zor	35 20	40 09	203
130		7 Hama	35 08	36 45	309
131		8 Palmyra	34 33	38 18	404
132		9 Abu kamal	34 28	40 55	N.A.
133		10 Damascus	33 29	36 14	729
134	Leb	1 Tripoli	34 35	36 00	8
135		2 Rayack	33 52	36 00	921
136		3 Kasara Observatory	33 50	35 53	918
137		4 Beyrouth/Khaldeh	33 49	35 29	24
138	Jor	1 Irbid School	32 33	35 51	585
139		2 Salt	32 02	35 44	796
140		3 Amman A.P.	31 57	35 57	777
141		4 Madaba	31 43	35 48	785
142		5 Shaubak School	30 32	35 33	1300
143	Pal	1 Nablus	32 13	35 14	925
144		2 Ramallah	31 53	35 11	N.A.
145		3 Jericho	31 51	35 24	N.A.
146		4 Jerusalem (Pal/Isr)	31 47	34 59	10
147		5 Hebron	31 31	35 07	N.A.

148		6 Gaza	31 29	34 26	48
149	Irq	1 Mosul	36 19	43 09	223
150		2 Sulaymaniyah	35 33	45 27	853
151		3 Kirkuk	35 28	44 24	331
152		4 Baghdad	33 14	44 14	34
153		5 Ar Rutba	33 02	40 17	946
154		6 Kut al Hai	32 10	46 03	15
155		7 An Najaf	31 59	44 19	670
156		8 Ad Dywaniyah	31 59	44 59	20
157		9 Al Amarah	31 51	47 10	9
158		1 An Nasiriyah	31 05	46 14	3
159		11 Basrah	30 34	47 47	2
160	Kuw	1 Failaka Island	29 28	48 17	5
161		2 Shuwaikh	29 20	48 03	3
162		3 El Omariyah	29 17	47 56	21
163		4 Kuwait A.P.	29 13	47 59	55
164		5 Al Ahmadi	29 06	48 08	122
165		6 Al ahmadi Port	29 04	48 09	16
166	Bah	1 Al Manamah	26 12	50 30	5
167	Qat	1 R. al Faras	25 49	51 20	14
168		2 Al Utoriyah	25 31	51 12	34
169		9 Abu Samra	24 44	50 50	3
170	S.A.	1 Tabouk	28 22	36 35	769
171		2 Hail	27 30	42 02	971
172		3 Dahrhan	26 16	50 10	21
173		4 Er Riyadh	24 39	46 42	591
174		5 Medina	24 33	39 43	632
175		6 Yanbu	24 07	38 03	6
176		7 Jidda	21 28	39 10	6
177		8 At Taif	21 29	40 32	1457
178		9 Gizan	16 52	42 35	3
179	UAE	1 Sharja	25 20	55 26	5
180	Oman	1 Muscat	23 37	58 35	5
181		2 Sur	22 35	59 31	14
182		3 Al Masirah	20 41	58 54	16
183		4 Salalah	17 03	54 06	17
184	Yem	1 Hajjah	15 41	43 36	1300
185		2 Marib	15 27	45 19	1100
186		3 Sana'a A.P.	15 22	44 13	2240
187		4 Kamaran Island	15 20	42 37	6
188		5 Dahi	15 13	43 03	70
189		6 Al Hodeydah A.P.	14 46	42 57	10
190		7 Riyan	14 39	49 23	25
191		8 Yarim	14 18	44 23	2400
192		9 Rihab	14 13	44 11	1500
193		10 Zabid (Gerba)	14 09	43 36	1300
194		11 Ibb	13 59	44 11	1800
195		12 El Barh	13 27	43 42	600
196		13 Al Mokha	13 19	43 15	5
197		14 Al Khod	13 05	45 20	5
198		15 Aden Khormaksar	12 50	45 01	7
199		16 Barim Island	12 39	43 24	27

Table 2. Average number of daytime hours

Ser. No.	Average number of daytime hours for											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	10.93	11.24	11.88	12.47	12.97	13.21	13.09	12.67	12.12	11.53	11.04	10.79
2	11.04	11.32	11.89	12.43	12.86	13.08	12.98	12.60	12.11	11.58	11.15	10.91
3	11.06	11.34	11.89	12.42	12.85	13.06	12.95	12.58	12.11	11.59	11.17	10.93
4	11.10	11.35	11.89	12.41	12.81	13.02	12.92	12.56	12.11	11.60	11.20	10.97
5	11.15	11.38	11.90	12.38	12.77	12.96	12.87	12.53	12.10	11.63	11.24	11.04
6	11.15	11.38	11.90	12.38	12.77	12.96	12.87	12.53	12.10	11.63	11.24	10.04
7	9.90	10.65	11.81	12.91	13.84	14.33	14.10	13.28	12.21	11.11	10.14	9.65
8	9.93	10.67	11.81	11.87	13.82	14.29	14.07	13.27	12.21	11.12	10.16	9.69
9	10.02	10.70	11.81	12.88	13.78	14.24	14.02	13.24	12.21	11.15	10.20	9.74
10	10.04	10.72	11.81	12.86	13.73	14.17	13.97	13.21	12.20	11.17	10.26	9.80
11	10.05	10.72	11.81	12.86	13.72	14.16	13.96	13.21	12.20	11.17	10.27	9.81
12	10.08	10.74	11.81	12.84	13.70	14.14	13.93	13.19	12.20	11.19	10.29	9.84
13	10.09	10.75	11.81	12.84	13.70	14.14	13.93	13.19	12.20	11.19	10.29	9.85
14	10.22	10.83	11.82	12.77	13.57	13.99	13.78	13.09	12.19	11.25	10.42	10.01
15	10.27	10.85	11.82	12.75	13.53	13.93	13.73	13.07	12.18	11.27	10.47	10.06
16	10.31	10.87	11.82	12.74	13.51	13.89	13.70	13.04	12.17	11.29	10.49	10.09
17	9.82	10.60	11.80	12.95	13.91	14.42	14.18	13.33	12.22	11.08	10.07	9.56
18	9.82	10.60	11.80	12.95	13.91	14.42	14.18	13.33	12.22	11.08	10.07	9.56
19	9.83	10.61	11.81	12.95	13.90	14.42	14.18	13.33	12.22	11.08	10.07	9.56
20	9.85	10.61	11.81	12.94	13.88	14.37	14.14	13.32	12.21	11.09	10.10	9.61
21	9.86	10.62	11.81	12.94	13.87	14.36	14.13	13.31	12.21	11.09	10.11	9.62
22	10.02	10.70	11.81	12.88	13.78	14.24	14.02	13.24	12.21	11.15	10.20	9.74
23	9.91	10.65	11.81	12.92	13.83	14.32	14.09	13.28	12.21	11.11	10.15	9.67
24	9.92	10.66	11.81	12.91	13.82	14.30	14.08	13.27	12.21	11.12	10.16	9.68
25	10.06	10.75	11.81	12.85	13.71	14.15	13.95	13.20	12.20	11.18	10.28	9.82
26	10.21	10.83	11.82	12.77	13.58	14.01	13.79	13.10	12.19	11.25	10.42	10.00
27	10.30	10.87	11.83	12.74	13.52	13.90	13.71	13.05	12.18	11.28	10.49	10.08
28	10.52	11.00	11.84	12.65	13.32	13.65	13.49	12.93	12.16	11.36	10.69	10.24
29	10.69	11.09	11.85	12.58	13.18	13.47	13.32	12.83	12.15	11.44	10.84	10.52
30	10.80	11.16	11.87	12.53	13.08	13.36	13.22	12.76	12.13	11.47	10.93	10.64
31	9.78	10.57	11.80	12.96	13.95	14.47	14.22	13.35	12.22	11.06	10.03	9.52
32	9.81	10.59	11.80	12.96	13.92	14.42	14.19	13.34	12.22	11.07	10.06	9.55
33	9.81	10.59	11.80	12.96	13.92	14.42	14.19	13.34	12.22	11.07	10.06	9.56
34	9.83	10.61	11.80	12.94	13.90	14.40	14.16	13.32	12.21	11.09	10.09	9.61
35	9.90	10.65	11.81	12.92	13.84	14.33	14.10	13.29	12.21	11.11	10.14	9.65
36	9.90	10.65	11.81	12.92	13.84	14.33	14.10	13.29	12.21	11.11	10.14	9.65
37	10.02	10.70	11.81	12.88	13.78	14.24	14.02	13.24	12.21	11.15	10.20	9.74
38	10.00	10.71	11.81	12.87	13.76	14.21	14.00	13.22	12.20	11.16	10.23	9.76
39	10.05	10.73	11.81	12.85	13.72	14.16	13.96	13.20	12.20	11.18	10.27	9.81
40	10.05	10.73	11.81	12.85	13.72	14.16	13.96	13.20	12.20	11.18	10.30	9.81
41	10.08	10.74	11.81	12.84	13.70	14.14	13.92	13.19	12.20	11.19	10.29	9.84
42	10.16	10.80	11.82	12.79	13.62	14.05	13.83	13.13	12.19	11.23	10.37	9.95
43	10.12	10.77	11.81	12.82	13.66	14.10	13.89	13.16	12.20	11.21	10.33	9.89
44	10.13	10.78	11.81	12.81	13.65	14.09	13.88	13.15	12.20	11.21	10.34	9.90
45	10.14	10.78	11.81	12.81	13.64	14.08	13.87	13.15	12.20	11.21	10.35	9.91
46	10.14	10.78	11.81	12.81	13.64	14.08	13.87	13.15	12.20	11.21	10.40	9.91
47	10.15	10.79	11.81	12.80	13.63	14.07	13.85	13.14	12.20	11.22	10.36	9.93
48	10.16	10.79	11.82	12.79	13.62	14.06	13.84	13.13	12.19	11.23	10.38	9.96

49	10.17	10.80	11.82	12.78	13.61	14.04	13.82	13.13	12.19	11.24	10.38	9.96
50	10.19	10.81	11.82	12.78	13.59	14.02	13.80	13.11	12.19	11.24	10.40	9.98
51	10.19	10.81	11.82	12.78	13.59	14.02	13.80	13.11	12.19	11.24	10.40	9.98
52	10.22	10.83	11.82	12.76	13.57	13.98	13.77	13.09	12.18	11.25	10.42	10.01
53	10.24	10.84	11.82	12.75	13.55	13.95	13.75	13.08	12.18	11.27	10.45	10.04
54	10.28	10.86	11.82	12.73	13.53	13.92	13.72	13.06	12.18	11.28	10.47	10.06
55	10.33	10.88	11.83	12.73	13.50	13.87	13.68	13.03	12.17	11.30	10.51	10.11
56	10.39	10.92	11.83	12.70	13.44	13.80	13.61	12.99	12.17	11.32	10.57	10.18
57	10.40	10.93	11.83	12.70	13.43	13.79	13.60	12.99	12.17	11.32	10.58	10.19
58	10.53	11.01	11.84	12.64	13.31	13.64	13.48	12.92	12.16	11.37	10.70	10.35
59	10.70	11.10	11.86	12.57	13.16	13.30	12.82	12.14	11.45	11.85	10.86	10.55
60	10.21	10.83	11.82	12.77	13.58	13.99	13.78	13.10	12.18	11.25	10.42	10.00
61	10.22	10.83	11.82	12.76	13.57	13.99	13.78	13.10	12.18	11.25	10.42	10.01
62	10.23	10.83	11.82	12.76	13.56	13.98	13.76	13.09	12.18	11.25	10.43	10.02
63	10.23	10.83	11.82	12.76	13.56	13.98	13.76	13.09	12.18	11.25	10.43	10.02
64	10.24	10.84	11.82	12.76	13.55	13.97	13.75	13.08	12.18	11.26	10.44	10.03
65	10.24	10.84	11.82	12.76	13.55	13.96	13.75	13.08	12.18	11.26	10.45	10.03
66	10.25	10.84	11.82	12.76	13.55	13.95	13.75	13.08	12.18	11.26	10.45	10.04
67	10.26	10.85	11.82	12.75	13.54	13.95	13.75	13.08	12.18	11.26	10.45	10.04
68	10.26	10.85	11.82	12.75	13.54	13.94	13.74	13.07	12.18	11.27	10.46	10.05
69	10.26	10.85	11.82	12.75	13.54	13.94	13.74	13.07	12.18	11.27	10.46	10.05
70	10.28	10.86	11.83	12.74	13.53	13.92	13.72	13.05	12.18	11.28	10.47	10.06
71	10.30	10.87	11.83	12.74	13.52	13.90	13.70	13.04	12.18	11.28	10.49	10.08
72	10.33	10.89	11.83	12.73	13.50	13.87	13.68	13.03	12.17	11.29	11.51	10.10
73	10.33	10.89	11.83	12.73	13.49	13.86	13.68	13.03	12.17	11.29	11.51	10.11
74	10.34	10.89	11.83	12.73	13.49	13.86	13.67	13.02	12.17	11.30	10.52	10.11
75	10.34	10.89	11.83	12.73	13.50	13.87	13.68	13.02	12.17	11.30	10.52	10.12
76	10.35	10.90	11.83	12.73	13.48	13.85	13.66	13.01	12.17	11.30	10.53	10.13
77	10.38	10.92	11.83	12.71	13.45	13.81	13.62	13.00	12.17	11.31	10.56	10.17
78	10.39	10.93	11.83	12.70	13.44	13.80	13.61	12.99	12.17	11.31	10.57	10.18
79	10.40	10.93	11.83	12.70	13.43	13.79	13.60	12.99	12.17	11.32	10.58	10.19
80	10.45	10.96	11.83	12.68	13.39	13.73	13.55	12.97	12.16	11.34	10.63	10.27
81	10.46	10.97	11.83	12.67	13.83	13.72	13.54	12.97	12.16	11.34	10.64	10.28
82	10.51	11.00	11.84	12.65	13.33	13.66	13.50	12.93	12.16	11.36	10.69	10.33
83	10.52	11.00	11.84	12.65	13.32	13.65	13.49	12.93	12.16	11.37	10.69	10.34
84	10.58	11.04	11.85	12.62	13.26	13.58	13.43	12.89	12.16	11.40	10.74	10.41
85	10.59	11.05	11.85	12.62	13.25	13.57	13.42	12.88	12.16	11.40	10.75	10.42
86	10.63	11.07	11.85	12.61	13.22	13.53	13.38	12.86	12.15	11.42	10.78	10.46
87	10.63	11.07	11.85	12.60	13.22	13.53	13.38	12.86	12.15	11.41	10.79	10.46
88	10.67	11.08	11.85	12.59	13.20	13.49	13.35	12.84	12.15	11.43	10.81	10.49
89	10.72	11.11	11.86	12.56	13.15	13.43	13.29	12.81	12.14	11.45	10.87	10.56
90	10.84	11.19	11.88	12.51	13.04	13.31	13.18	12.74	12.13	11.49	10.97	10.69
91	10.98	11.28	11.89	12.45	12.92	13.15	13.03	12.63	12.11	11.56	11.10	10.85
92	11.05	11.32	11.89	12.43	12.86	13.08	12.97	12.59	12.11	11.58	11.16	10.91
93	11.09	11.35	11.89	12.41	12.83	13.04	12.94	12.57	12.11	11.60	11.19	10.95
94	11.20	11.42	11.90	12.36	12.72	12.90	12.81	12.49	12.10	11.65	11.30	11.10
95	11.21	11.42	11.90	12.35	12.71	12.90	12.81	12.49	12.09	11.66	11.31	11.11
96	11.26	11.46	11.92	12.33	12.66	12.84	12.76	12.45	12.08	11.68	11.36	11.18
97	11.28	11.47	11.92	12.32	12.64	12.81	12.72	12.44	12.08	11.69	11.38	11.21
98	11.29	11.47	11.92	12.32	12.64	12.80	12.72	12.44	12.08	11.69	11.38	11.22
99	11.31	11.48	11.90	12.31	12.63	12.78	12.69	12.43	12.08	11.70	11.40	11.24

(Continued)

Table 2. (Continued)

Ser. No.	Average number of daytime hours for											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
100	11.31	11.49	11.90	12.30	12.62	12.78	12.69	12.43	12.08	11.70	11.40	11.24
101	11.31	11.48	11.90	12.30	12.62	12.77	12.68	12.42	12.08	11.71	11.41	11.25
102	11.33	11.49	11.89	12.29	12.60	12.76	12.67	12.41	12.08	11.71	11.42	11.26
103	11.33	11.49	11.89	12.29	12.60	12.76	12.67	12.41	12.08	11.71	11.42	11.26
104	11.36	11.51	11.87	12.29	12.58	12.74	12.65	12.41	12.08	11.72	11.44	11.29
105	11.41	11.53	11.85	12.27	12.53	12.69	12.60	12.38	12.07	11.75	11.48	11.34
106	11.42	11.54	11.85	12.26	12.53	12.68	12.59	12.38	12.07	11.75	11.49	11.35
107	11.53	11.60	11.89	12.22	12.44	12.52	12.46	12.28	12.05	11.81	11.61	11.50
108	11.58	11.64	11.93	12.19	12.38	12.49	12.43	12.25	12.05	11.82	11.64	11.54
109	11.62	11.66	11.95	12.18	12.35	12.45	12.40	12.23	12.05	11.84	11.67	11.58
110	11.63	11.66	11.95	12.18	12.34	12.44	12.40	12.23	12.05	11.84	11.68	11.59
111	11.78	11.77	11.97	12.12	12.23	12.28	12.26	12.15	12.03	11.90	11.79	11.74
112	11.80	11.79	11.98	12.11	12.21	12.25	12.24	12.13	12.03	11.91	11.81	11.77
113	11.43	11.54	11.85	12.26	12.52	12.67	12.59	12.37	12.06	11.76	11.50	11.36
114	11.41	11.53	11.85	12.27	12.53	12.69	12.60	12.38	12.07	11.75	11.48	11.34
115	11.43	11.55	11.86	12.25	12.51	12.65	12.57	12.37	12.06	11.76	11.51	11.38
116	11.48	11.57	11.87	12.24	12.48	12.61	12.54	12.33	12.05	11.77	11.53	11.41
117	11.49	11.58	11.87	12.24	12.48	12.60	12.53	12.32	12.05	11.78	11.54	11.42
118	11.53	11.60	11.89	12.22	12.44	12.52	12.46	12.28	12.05	11.81	11.61	11.50
119	11.67	11.68	11.95	12.16	12.30	12.39	12.35	12.21	12.05	11.86	11.70	11.64
120	11.75	11.75	11.97	12.12	12.24	12.30	12.27	12.16	12.03	11.90	11.78	11.72
121	11.83	11.82	11.98	12.09	12.18	12.22	12.21	12.11	12.02	11.92	11.84	11.80
122	11.92	11.87	12.00	12.05	12.09	12.11	12.12	12.06	12.01	11.96	11.92	11.90
123	12.02	11.96	12.00	12.01	12.00	12.01	12.02	11.96	12.00	12.01	12.00	12.01
C.I.	12.60	12.38	12.07	11.75	11.48	11.34	11.41	11.53	11.85	12.27	12.53	12.69
124	9.80	10.58	11.80	12.96	13.93	14.44	14.20	13.34	12.22	11.07	10.05	9.54
125	9.83	10.60	11.80	12.95	13.90	14.40	14.16	13.32	12.22	11.08	10.08	9.58
126	9.86	10.62	11.81	12.94	13.87	14.36	14.13	13.31	12.21	11.09	10.11	9.62
127	9.87	10.63	11.81	12.93	13.86	14.35	14.12	13.30	12.21	11.10	10.12	9.63
128	9.91	10.66	11.81	12.91	13.83	14.31	14.08	13.28	12.21	11.12	10.16	9.67
129	9.93	10.67	11.81	11.87	13.82	14.29	14.07	13.27	12.21	11.12	10.16	9.69
130	9.95	10.68	11.81	12.89	13.80	14.31	14.05	13.26	12.21	11.13	10.18	9.70
131	10.00	10.72	11.81	12.88	13.76	14.22	14.01	13.23	12.21	11.15	10.23	9.76
132	10.00	10.71	11.81	12.87	13.76	14.21	14.00	13.22	12.20	11.16	10.23	9.76
133	10.09	10.75	11.81	12.84	13.70	14.14	13.93	13.19	12.20	11.19	10.29	9.85
134	10.00	10.70	11.81	12.88	13.77	14.22	14.01	13.23	12.21	11.15	10.22	9.76
135	10.05	10.72	11.81	12.86	13.72	14.16	13.96	13.21	12.20	11.17	10.27	9.81
136	10.05	10.73	11.81	12.85	13.72	14.16	13.95	13.20	12.20	11.18	10.27	9.82
137	10.06	10.73	11.81	12.85	13.71	14.16	13.95	13.20	12.20	11.18	10.27	9.82
138	10.15	10.79	11.81	12.80	13.63	14.07	13.85	13.14	12.20	11.22	10.36	9.93
139	10.18	10.81	11.82	12.78	13.60	14.03	13.81	13.12	12.19	11.24	10.39	9.97
140	10.19	10.81	11.82	12.78	13.59	14.02	13.81	13.12	12.19	11.24	10.40	9.97
141	10.20	10.82	11.82	12.77	13.59	14.01	13.79	13.11	12.19	11.25	10.41	9.99
142	10.30	10.87	11.83	12.74	13.52	13.90	13.71	13.05	12.18	11.28	10.49	10.08
143	10.16	10.80	11.82	12.79	13.61	14.05	13.83	13.13	12.19	11.23	10.37	9.95
144	10.19	10.81	11.82	12.78	13.59	14.02	13.80	13.11	12.19	11.24	10.40	9.98
145	10.20	10.82	11.82	12.77	13.59	14.01	13.79	13.11	12.19	11.25	10.40	9.98
146	10.21	10.83	11.82	12.77	13.57	13.99	13.77	13.09	12.18	11.26	10.41	10.01



147	10.22	10.83	11.82	12.76	13.57	13.99	13.78	13.10	12.18	11.25	10.42	10.01
148	10.40	10.93	11.83	12.70	13.43	13.79	13.60	12.99	12.17	11.32	10.58	10.19
149	9.85	10.61	11.81	12.94	13.88	14.38	14.14	13.32	12.21	11.09	10.10	9.60
150	9.91	10.66	11.81	12.91	13.83	14.31	14.08	13.28	12.21	11.12	10.15	9.67
151	9.92	10.66	11.81	12.91	13.82	14.30	14.08	13.27	12.21	11.12	10.16	9.68
152	10.10	10.75	11.81	12.83	13.68	14.12	13.91	13.17	12.20	11.20	10.31	9.87
153	10.12	10.77	11.81	12.82	13.66	14.10	13.89	13.16	12.20	11.21	10.33	9.89
154	10.17	10.80	11.82	12.79	13.61	14.04	13.82	13.13	12.19	11.24	10.38	9.96
155	10.18	10.81	11.82	12.78	13.60	14.03	13.81	13.12	12.19	11.24	10.39	9.97
156	10.18	10.81	11.82	12.78	13.60	14.03	13.81	13.12	12.19	11.24	10.39	9.97
157	10.19	10.81	11.82	12.78	13.59	14.02	13.80	13.11	12.19	11.24	10.40	9.98
158	10.26	10.85	11.82	12.75	13.54	13.95	13.74	13.08	12.18	11.26	10.46	10.04
159	10.30	10.87	11.83	12.74	13.52	13.90	13.70	13.04	12.18	11.28	10.49	10.08
160	10.37	10.91	11.83	12.71	13.46	13.82	13.63	13.00	12.17	11.31	10.55	10.16
161	10.38	10.92	11.83	12.71	13.45	13.81	13.62	13.00	12.17	11.31	10.56	10.17
162	10.38	10.91	11.83	12.71	13.45	13.81	13.62	13.00	12.17	11.32	10.56	10.17
163	10.39	10.92	11.83	12.70	13.44	13.79	13.61	12.99	12.17	11.32	10.57	10.18
164	10.39	10.92	11.83	12.70	13.44	13.80	13.61	12.99	12.17	11.32	10.57	10.18
165	10.40	10.93	11.83	12.70	13.43	13.79	13.60	12.99	12.17	11.32	10.58	10.19
166	10.58	11.04	11.85	12.62	13.26	13.58	13.43	12.89	12.16	11.40	10.74	10.41
167	10.61	11.06	11.85	12.61	13.26	13.55	13.40	12.87	12.16	11.41	10.77	10.44
168	10.62	11.06	11.85	12.61	13.23	13.54	13.39	12.86	12.16	11.41	10.78	10.45
169	10.68	11.09	11.86	12.58	13.19	13.48	13.33	12.83	12.15	11.44	10.83	10.51
170	10.44	10.95	11.83	12.68	13.40	13.74	13.56	12.98	12.16	11.33	10.61	10.25
171	10.49	10.99	11.84	12.65	13.35	13.68	13.51	12.95	12.16	11.35	10.67	10.32
172	10.56	11.04	11.85	12.62	13.26	13.59	13.43	12.89	12.16	11.39	10.74	10.40
173	10.68	11.09	11.85	12.58	13.19	13.48	13.33	12.83	12.15	11.44	10.83	10.51
174	10.69	11.10	11.86	12.58	13.17	13.47	13.32	12.82	12.14	11.44	10.84	10.53
175	10.71	11.11	11.86	12.56	13.15	13.44	13.30	12.81	12.14	11.45	10.86	10.55
176	10.87	11.21	11.88	12.50	13.01	13.28	13.15	12.72	12.12	11.50	10.99	10.72
177	10.87	11.21	11.88	12.49	13.01	13.27	13.15	12.71	12.12	11.50	11.00	10.73
178	11.14	11.38	11.90	12.39	12.78	12.98	12.88	12.54	12.10	11.62	11.24	11.02
179	10.64	11.07	11.85	12.60	13.21	13.52	13.37	12.85	12.15	11.42	10.79	10.47
180	10.76	11.13	11.86	12.55	13.13	13.41	13.27	12.79	12.14	11.46	10.89	10.59
181	10.81	11.17	11.88	12.52	13.07	13.34	13.20	12.75	12.13	11.48	10.94	10.66
182	10.92	11.24	11.88	12.47	12.97	13.22	13.10	12.68	12.12	11.56	11.04	10.78
183	11.13	11.37	11.90	12.39	12.79	12.99	12.89	12.54	12.10	11.62	11.23	11.01
184	11.19	11.41	11.90	12.36	12.71	12.91	12.82	12.50	12.10	11.65	11.29	11.08
185	11.20	11.42	11.90	12.35	12.71	12.90	12.81	12.49	12.10	11.65	11.30	11.10
186	11.21	11.43	11.91	12.35	12.71	12.89	12.80	12.48	12.09	11.66	11.31	11.12
187	11.21	11.43	11.91	12.35	12.71	12.89	12.80	12.48	12.09	11.66	11.31	11.12
188	11.22	11.43	11.91	12.35	12.71	12.89	12.80	12.48	12.09	11.66	11.31	11.12
189	11.24	11.45	11.91	12.34	12.67	12.85	12.76	12.46	12.09	11.68	11.34	11.16
190	11.25	11.45	11.91	11.33	12.67	12.84	12.75	12.46	12.09	11.68	11.35	11.17
191	11.26	11.46	11.92	12.31	12.66	12.83	12.74	12.45	12.08	11.68	11.36	11.19
192	11.27	11.46	11.92	11.32	12.65	12.82	12.73	12.44	12.08	11.69	11.37	11.19
193	11.27	11.47	11.92	12.32	12.65	12.82	12.73	12.44	12.08	11.69	11.37	11.20
194	11.28	11.47	11.92	12.32	12.64	12.81	12.72	12.44	12.08	11.69	11.38	11.21
195	11.31	11.48	11.90	12.31	12.62	12.78	12.69	12.43	12.08	11.70	11.40	11.24
196	11.32	11.49	11.89	12.30	12.61	12.77	12.68	12.42	12.08	11.71	11.41	11.25
197	11.33	11.50	11.88	12.29	12.59	12.75	12.66	12.41	12.08	11.72	11.42	11.26
198	11.35	11.50	11.88	12.29	12.58	12.75	12.66	12.41	12.08	11.72	11.44	11.28
199	11.36	11.51	11.87	12.29	12.58	12.74	12.65	12.40	12.08	11.73	11.45	11.29

Table 3. Mean daily air temperature

Ser. No.	Jan	Feb	Mar	Apr	Mean air temperature, °C, for									Year
					May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
<i>Mauritania</i>														
1	20.0	22.6	26.0	28.7	31.4	34.6	35.6	35.2	33.7	31.0	25.6	21.3	28.8	
2	19.6	21.8	26.6	29.9	33.3	34.7	33.9	32.5	32.5	31.2	25.7	21.7	28.6	
3	21.1	22.0	23.9	25.1	26.9	27.1	27.2	28.0	29.0	28.1	24.8	20.9	25.3	
4	21.8	25.4	27.7	29.7	33.0	33.1	29.9	30.5	31.0	32.2	26.9	23.0	28.7	
5	22.2	25.7	29.5	33.3	36.4	36.9	33.6	32.1	29.6	32.2	28.0	23.1	30.3	
6	23.0	26.2	30.4	33.3	37.0	35.8	33.4	31.8	32.3	33.7	29.2	23.5	30.7	
<i>Morocco</i>														
7	12.0	12.5	13.6	14.4	17.5	20.2	22.2	23	21.4	18.6	14.7	12.5	17.2	
8	13.8	13.8	14.9	16.2	18.9	21.4	24.6	25.3	23.2	20.0	16.6	13.8	18.6	
9	9.4	10.3	12.8	15.1	17.8	22.1	25.7	26.0	23.0	18.4	13.5	10.4	17.0	
10	12.5	13.3	14.7	16.4	18.0	20.6	22.5	23.0	22.0	19.7	16.4	13.6	17.7	
11	10.2	11.3	12.8	14.3	17.9	21.2	25.0	25.3	22.4	18.4	13.9	10.7	17.0	
12	12.8	13.3	14.3	15.4	17.8	20.3	22.2	22.6	21.5	19.1	15.9	13.3	17.4	
13	2.1	3.9	6.1	9.5	11.3	16.6	21.8	20.9	16.3	11.4	7.6	2.9	10.9	
14	11.8	13.5	15.4	17.2	20.9	23.8	28.2	28.3	25.0	20.9	16.2	12.3	19.5	
15	9.3	11.4	14.5	17.4	21.7	25.8	29.5	28.5	24.5	19.2	13.5	9.2	18.7	
16	14.3	15.1	16.4	16.8	18.9	20.2	22.0	22.0	21.4	20.2	17.7	14.5	18.3	
<i>Algeria</i>														
17	10.9	11.4	13.3	14.9	18.1	21.5	24.3	25.0	22.9	18.9	15.0	11.9	17.3	
18	11.9	12.5	14.4	15.0	18.4	21.7	24.4	25.6	23.6	19.6	16.3	13.9	18.1	
19	10.7	11.1	12.5	15.0	17.9	21.5	24.4	24.9	22.8	18.8	14.8	11.5	17.2	
20	7.8	8.8	11.6	13.1	17.6	22.6	26.6	26.9	23.1	16.7	12.3	9.2	16.4	
21	10.8	13.6	18.0	22.3	26.7	32.2	35.8	34.5	30.1	23.0	16.6	11.5	22.9	
22	11.2	13.1	16.5	19.7	24.6	29.8	32.8	32.4	28.1	21.2	16.1	12.0	21.4	
23	10.9	11.8	13.8	15.4	18.9	22.0	25.0	25.5	23.2	18.9	14.8	11.5	17.6	
24	6.1	7.5	10.5	13.7	17.7	23.1	26.4	25.9	22.1	16.2	11.1	7.2	15.6	
25	8.0	9.7	12.8	15.8	21.2	26.1	29.9	29.1	24.4	17.9	12.2	8.3	17.9	
26	10.1	12.5	16.4	19.3	24.8	29.3	33.6	33.5	28.0	21.0	14.9	10.1	21.1	
27	9.8	12.4	16.5	20.7	25.6	31.2	33.8	33.1	29.1	22.0	15.4	10.3	21.6	
28	12.6	15.2	19.9	24.5	29.8	34.6	37.4	36.1	33.1	26.7	20.1	14.3	25.4	
29	16.1	19.6	23.6	28.0	32.1	37.2	38.1	37.4	35.2	29.5	23.1	17.2	28.1	
30	12.8	15.4	18.7	22.3	26.0	28.9	28.8	28.2	26.7	22.7	18.1	13.8	21.9	
<i>Tunisia</i>														
31	11.0	11.5	12.3	14.0	17.5	21.8	24.6	25.5	23.1	18.8	14.4	11.9	17.2	
32	12.0	12.1	12.8	14.3	17.7	21.6	24.3	25.3	23.2	19.4	15.5	13.1	17.6	
33	11.5	12.0	13.2	15.3	19.1	22.9	25.8	26.6	24.1	19.9	15.7	12.5	18.2	
34	10.3	10.9	11.9	13.7	18.8	23.4	26.5	26.9	23.6	18.6	13.5	10.6	17.4	
35	10.6	12.2	13.9	17.2	20.6	25.6	28.8	28.8	26.1	21.1	16.1	11.7	19.4	
36	11.6	12.5	13.9	16.0	20.8	25.4	28.3	28.5	25.0	20.0	15.0	12.3	19.1	
37	11.2	12.3	13.8	15.7	19.6	23.2	25.5	26.3	24.4	20.2	15.1	12.1	18.3	
38	9.4	11.2	13.2	16.2	21.3	26.1	28.7	28.4	24.8	19.1	13.0	9.8	18.4	
39	11.1	12.8	16.1	20.0	25.0	28.8	32.2	31.1	27.8	22.2	15.0	11.1	21.1	
40	11.7	13.0	15.0	17.4	20.6	24.0	26.5	27.3	25.5	21.2	16.4	12.5	19.3	
41	12.5	13.4	15.1	17.4	20.9	24.1	26.5	27.3	25.5	21.5	16.7	13.6	19.5	
42	11.6	13.3	15.6	18.8	23.0	27.2	28.9	28.8	26.3	21.1	15.4	12.4	20.2	
<i>Libya</i>														
43	12.3	13.4	15.6	18.5	21.9	25.9	27.6	27.6	26.1	22.1	17.6	13.7	20.1	
44	9.4	9.9	11.4	14.5	18.5	21.9	22.7	23.1	21.3	18.1	14.8	11.0	16.4	

45	8.8	10.7	12.9	16.1	20.6	25.3	26.5	26.9	23.8	19.4	15.1	10.3	18.0
46	14.1	14.7	15.9	17.9	20.4	23.7	25.4	26.2	24.8	22.6	19.6	15.9	20.1
47	11.7	13.3	15.6	19.4	23.3	27.2	28.8	28.8	27.8	23.3	18.3	12.8	21.1
48	13.3	14.1	15.7	18.0	20.9	24.2	26.1	26.8	25.6	22.4	18.4	14.5	20.0
49	12.6	13.4	15.2	18.9	22.5	25.9	25.9	26.4	25.1	22.4	18.2	14.2	20.1
50	9.2	11.3	13.8	17.5	21.8	25.9	27.5	27.7	25.1	20.1	15.0	10.4	18.8
51	11.7	12.8	14.8	18.1	21.5	24.7	25.5	25.7	24.0	21.1	17.0	12.9	19.2
52	10.2	12.4	15.3	19.1	23.4	27.5	28.8	28.9	25.9	21.1	16.5	11.4	20.3
53	13.7	14.9	16.5	18.7	21.3	24.3	25.2	26.3	25.4	22.9	19.1	15.7	20.3
54	12.8	16.4	17.2	20.6	24.4	25.6	26.1	26.7	25.6	22.8	20.0	15.0	21.1
55	10.8	13.4	17.0	21.1	25.3	30.1	30.5	31.0	27.7	21.8	16.6	11.2	21.4
56	10.8	12.9	15.9	20.6	24.5	28.3	27.9	27.7	26.2	21.8	16.5	12.1	20.4
57	13.1	14.9	18.0	22.3	26.3	29.7	29.6	29.5	27.6	23.7	18.5	14.5	22.3
58	11.6	14.5	18.1	23.2	27.5	31.0	30.1	30.1	28.7	24.0	18.3	12.9	22.5
59	12.9	15.4	19.3	24.2	28.3	30.6	30.3	30.2	28.0	24.2	18.3	14.1	23.1
<i>Egypt</i>													
60	12.3	13.2	14.2	16.6	19.3	22.0	23.8	24.5	23.5	20.9	17.4	13.6	18.4
61	12.2	13.3	15.6	17.8	20.6	23.3	25.0	24.4	23.3	22.2	16.7	14.4	19.4
62	15.2	15.2	16.7	19.0	22.0	24.5	26.3	27.2	26.3	24.5	21.2	17.2	21.3
63	15.0	15.0	17.2	18.9	22.2	23.9	26.1	27.2	26.1	25.0	20.6	17.2	21.1
64	13.3	13.9	15.6	17.8	20.0	23.3	25.0	25.6	25.0	22.8	19.4	15.6	20.0
65	13.9	13.9	16.1	18.9	22.2	25.0	26.1	27.2	26.1	23.9	20.0	16.1	21.1
66	14.4	15.0	17.2	19.3	21.7	24.4	26.1	26.7	26.7	24.4	20.6	16.7	21.1
67	12.2	12.8	15.0	17.8	21.1	22.8	25.0	26.1	25.0	22.8	17.8	13.9	18.9
68	13.4	14.0	16.2	19.8	23.8	26.3	27.8	27.8	26.1	24.0	20.3	15.4	21.1
69	13.9	13.9	17.2	18.9	22.8	25.0	26.1	27.2	25.0	22.8	20.0	16.1	21.1
70	12.2	12.2	14.4	18.9	22.8	25.0	26.1	26.1	23.9	22.2	17.8	13.9	20.0
71	12.2	12.3	15.0	18.9	22.2	26.1	27.2	27.2	23.9	22.2	17.8	15.0	20.0
72	13.0	14.0	16.0	19.8	23.7	26.2	27.7	27.4	25.2	23.2	19.2	14.8	20.8
73	13.3	15.0	17.8	21.1	25.0	27.8	28.3	28.3	26.1	23.9	20.0	15.0	22.2
74	11.2	12.5	15.4	19.2	23.3	26.0	26.9	26.7	24.3	22.0	18.0	13.2	19.9
75	14.4	15.6	18.3	21.7	25.6	27.7	29.4	29.4	27.2	25.0	21.1	16.1	22.8
76	12.2	12.3	16.1	20.0	23.9	27.2	27.2	27.2	25.0	22.2	18.9	13.9	21.1
77	12.2	12.8	16.1	20.0	25.0	27.8	27.8	26.1	26.1	22.8	18.9	12.8	21.1
78	11.7	13.3	16.7	20.6	21.1	28.3	29.4	28.8	26.7	23.9	18.3	13.3	21.7
79	12.4	14.1	16.9	20.2	23.7	26.6	27.4	27.6	24.6	22.6	18.5	13.5	20.7
80	15.0	15.6	18.3	21.7	25.6	28.3	29.4	29.4	27.2	23.9	20.6	16.1	22.8
81	12.2	14.1	17.1	21.4	26.1	28.0	29.0	28.7	26.1	23.8	19.2	14.0	21.6
82	15.8	16.2	18.7	22.2	26.2	28.5	29.5	30.0	28.0	25.2	21.2	17.7	23.3
83	11.7	13.3	17.1	22.2	26.6	28.8	29.4	29.1	26.5	23.8	18.6	13.6	21.7
84	13.2	15.0	19.4	24.6	29.8	31.7	32.0	32.1	29.1	26.0	20.3	15.0	24.0
85	18.3	18.9	20.6	23.9	27.2	29.4	29.4	30.6	28.8	27.2	23.9	20.6	25.0
86	12.3	14.1	18.1	23.4	28.2	30.4	30.8	30.5	28.1	24.9	19.2	13.8	22.8
87	13.1	14.9	19.1	23.9	29.0	31.0	31.4	31.1	28.6	26.0	20.2	15.0	23.6
88	22.2	21.7	22.8	24.4	27.2	28.3	30.0	30.0	28.8	27.8	26.1	23.3	26.1
89	15.5	17.2	21.3	26.2	30.5	32.9	33.2	33.0	30.9	28.3	22.6	17.4	25.8
<i>The Sudan</i>													
90	15.9	17.5	21.9	26.7	30.5	32.2	32.2	32.2	30.5	28.2	22.6	17.6	25.7
91	23.5	23.2	24.2	26.6	29.4	32.3	34.5	34.8	32.2	29.4	27.4	25.0	28.6
92	24.4	24.4	26.1	27.8	31.1	33.3	35.0	35.0	33.3	30.6	27.8	25.6	29.4
93	22.2	23.4	26.6	30.4	33.4	34.8	33.6	32.7	33.6	31.6	27.5	28.2	29.5

(Continued)

Table 3. (Continued)

Ser. No.	Jan	Feb	Mar	Apr	Mean air temperature, °C, for									Year
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
94	23.6	25.0	28.2	31.4	33.6	33.6	31.7	30.6	32.2	32.1	28.4	25.0	29.6	
95	25.0	26.1	28.8	31.6	33.2	32.1	29.1	28.0	29.6	31.2	29.4	26.2	29.2	
96	24.2	25.2	28.2	31.0	32.5	31.9	29.1	27.8	28.9	30.2	27.7	25.0	28.5	
97	25.9	27.5	30.3	32.3	32.7	30.1	27.1	26.3	27.4	29.3	28.9	26.6	28.7	
98	23.7	25.0	27.8	30.9	32.1	31.8	29.6	28.4	29.5	30.8	28.2	24.8	28.6	
99	20.6	22.2	25.3	28.4	30.1	30.5	28.7	27.0	28.1	27.8	23.8	21.1	26.1	
100	25.0	26.1	29.1	32.0	32.4	31.2	28.4	27.4	28.2	29.9	28.4	26.0	28.7	
101	22.4	24.5	25.8	29.1	29.6	29.4	27.1	25.4	26.1	26.1	24.2	23.2	26.1	
102	21.0	22.6	25.8	29.3	30.7	30.2	28.0	27.0	27.9	28.7	25.3	22.0	26.6	
103	25.7	26.8	29.6	32.0	32.1	30.3	27.8	26.8	27.6	29.4	28.5	26.4	28.6	
104	23.4	24.2	25.6	30.4	30.4	30.0	27.4	26.6	27.6	28.4	24.8	23.7	26.9	
105	26.2	27.5	29.8	31.6	31.0	28.6	26.8	26.4	26.9	28.0	27.8	26.5	28.1	
106	24.7	26.5	28.1	31.9	31.2	29.3	27.1	26.3	26.9	28.5	27.3	26.5	27.9	
107	27.0	28.4	30.4	31.0	29.4	27.4	26.3	26.2	27.0	27.8	27.6	27.0	28.0	
108	24.2	25.8	27.4	28.8	28.0	26.6	25.5	25.2	25.8	26.6	25.3	24.2	26.1	
109	28.4	29.8	30.9	30.2	28.0	27.1	26.1	26.1	26.9	27.4	28.2	27.8	28.1	
110	26.7	28.0	29.5	29.8	28.4	27.2	26.2	26.0	26.6	27.4	27.5	26.8	27.5	
111	28.8	29.6	29.5	28.8	27.4	26.5	25.5	25.6	26.4	27.2	27.7	28.1	27.6	
112	28.3	28.9	28.8	28.1	26.8	25.9	24.8	24.8	25.8	26.4	27.0	26.9	26.9	
<i>Djibouti</i>														
113	25.6	26.1	27.2	28.8	31.1	33.9	35.0	34.4	32.8	29.4	27.2	26.1	30.0	
<i>Somalia</i>														
114	23.3	25.0	25.6	27.2	27.8	27.2	27.2	26.7	27.0	25.6	25.0	23.3	25.6	
115	25.0	25.0	26.7	28.8	31.1	35.6	35.6	36.1	33.3	27.8	25.6	25.6	30.0	
116	15.0	16.5	17.0	18.5	19.5	19.5	19.5	19.5	19.0	16.7	15.5	14.6	17.1	
117	25.0	25.0	26.1	28.3	31.1	35.5	36.1	35.6	33.3	28.8	26.7	26.7	30.0	
118	18.0	20.0	22.5	23.1	24.5	24.5	23.6	23.6	24.1	21.4	20.6	18.5	21.6	
119	25.9	27.0	28.1	28.7	28.4	27.9	27.5	27.5	28.4	27.5	27.1	26.3	27.5	
120	25.6	26.7	28.3	30.0	28.3	26.7	25.6	25.6	26.1	26.7	27.8	26.7	26.7	
121	31.7	33.3	33.9	32.8	31.1	30.6	29.4	29.4	30.6	31.1	31.1	31.1	31.1	
122	27.2	28.3	27.8	28.8	27.8	26.7	26.1	26.1	26.7	27.2	27.8	27.2	27.2	
123	26.9	27.1	27.9	28.0	27.0	26.2	25.7	25.8	25.9	26.9	27.0	27.2	26.8	
<i>Comoro Islands</i>														
	27.0	27.0	26.9	26.5	25.6	24.2	23.3	23.2	23.7	24.8	26.0	26.7	25.4	
<i>Syria</i>														
124	6.9	8.2	10.7	16.8	22.3	28.5	32.2	32.3	27.4	21.4	13.6	8.9	19.1	
125	7.0	8.8	11.5	17.1	22.6	28.8	32.5	32.6	28.0	22.1	14.1	9.1	19.5	
126	5.6	8.1	10.9	16.4	21.4	25.9	26.7	26.7	24.7	19.7	13.3	7.8	17.3	
127	6.8	9.0	11.8	17.2	21.8	26.3	26.9	26.2	23.8	20.5	14.6	8.4	17.9	
128	11.7	12.8	14.7	17.7	20.8	23.8	26.2	27.0	25.5	22.3	17.4	13.2	19.4	
129	6.7	8.9	13.3	18.9	24.7	29.1	33.1	32.2	28.1	21.7	15.0	8.7	20.0	
130	7.6	9.5	14.2	18.8	23.9	28.7	32.2	32.0	27.4	22.8	16.2	9.6	20.2	
131	7.5	8.6	12.8	17.9	22.8	27.3	29.3	29.5	25.4	20.5	12.6	8.4	18.5	
132	6.1	8.4	11.5	16.6	22.2	26.6	30.5	30.8	25.2	18.4	12.5	8.4	18.1	
133	7.0	8.9	12.0	16.7	20.9	24.4	26.7	27.5	24.2	19.7	13.9	8.9	17.6	
<i>Lebanon</i>														
134	12.0	12.9	14.1	17.2	20.3	24.0	23.4	26.0	25.5	22.3	17.8	13.6	19.1	
135	5.1	6.2	9.0	12.9	17.5	21.3	23.8	24.2	21.5	17.4	11.9	6.9	14.8	

136	5.7	6.7	9.7	14.0	18.6	21.8	24.0	24.3	21.8	18.0	12.7	7.8	15.4
137	13.6	13.9	15.6	18.3	21.7	24.4	26.2	27.5	26.4	23.9	19.4	15.6	20.5
<i>Jordan</i>													
138	7.5	9.9	12.8	13.9	19.9	22.8	24.9	25.2	23.6	20.0	15.0	9.6	17.1
139	7.9	10.1	13.6	12.6	20.7	22.7	25.1	25.5	23.9	20.7	15.2	9.7	17.3
140	8.1	10.0	13.1	11.9	21.7	23.3	25.0	25.3	23.9	20.6	15.6	10.3	17.4
141	8.2	10.3	13.6	13.4	21.5	24.0	25.8	25.6	23.8	20.8	16.2	10.5	17.8
142	6.2	8.7	12.5	14.1	20.8	22.6	24.1	23.9	21.8	19.5	13.3	9.4	16.3
<i>Palestine</i>													
143	9.0	8.8	11.9	16.6	20.7	24.0	24.8	24.4	22.5	20.5	17.5	13.1	18.2
144	9.6	11.1	14.9	18.5	22.2	25.6	25.8	25.8	23.4	21.5	17.2	13.3	19.1
145	10.7	12.6	16.3	22.4	26.6	30.4	30.9	30.4	28.6	25.8	22.8	16.9	22.9
146	8.9	9.4	13.1	16.4	20.6	22.5	23.9	24.2	23.1	21.1	16.4	11.1	17.6
147	8.7	9.0	11.2	16.8	20.8	23.7	24.4	24.4	22.0	20.9	17.5	12.6	17.7
148	13.3	15.0	18.9	23.9	28.3	31.1	31.7	31.1	28.3	25.6	20.6	15.0	23.3
<i>Iraq</i>													
149	6.5	8.6	12.0	17.3	23.9	30.2	33.7	32.7	26.9	20.1	13.1	7.9	19.4
150	4.0	6.3	10.5	15.6	21.9	28.6	32.5	32.1	27.8	21.3	12.8	6.6	18.3
151	8.6	10.2	13.3	19.4	26.4	32.3	35.1	34.8	30.4	24.2	16.5	10.6	22.0
152	9.7	11.7	15.3	21.7	27.8	31.7	33.9	33.9	30.6	24.7	17.8	11.7	22.5
153	7.0	8.9	11.4	17.8	23.3	27.2	29.7	30.0	26.7	21.4	14.4	8.6	18.9
154	11.2	13.2	17.0	23.1	31.3	34.3	35.8	35.4	32.0	26.5	17.9	12.6	24.2
155	10.0	13.2	17.8	23.7	29.8	34.1	36.2	35.5	32.5	25.9	17.3	11.4	24.0
156	10.4	12.7	16.5	22.8	29.8	31.8	33.9	33.6	31.9	26.0	17.6	12.3	23.4
157	10.4	13.5	17.7	23.7	30.0	34.1	36.0	35.1	32.2	25.5	17.8	12.1	24.0
158	11.8	13.7	16.9	23.7	29.6	32.7	34.1	34.2	31.6	25.9	18.8	12.6	23.8
159	12.0	13.7	18.2	24.1	29.2	32.5	33.8	33.4	31.4	25.7	19.3	13.6	23.9
<i>Kuwait</i>													
160	12.8	14.6	19.4	24.9	29.8	35.6	36.9	36.8	34.4	28.0	20.3	14.6	25.7
161	13.9	15.6	20.0	25.6	30.6	35.0	36.7	36.7	33.3	27.2	20.6	15.0	25.9
162	13.5	15.2	19.8	25.5	30.8	34.8	36.1	36.3	32.9	27.5	20.9	14.8	25.7
163	12.8	14.4	18.6	24.2	29.7	32.2	34.7	35.0	32.5	27.8	20.6	15.0	24.8
164	13.8	16.2	20.8	25.6	30.4	34.7	35.9	36.6	34.0	28.2	21.6	16.2	26.2
165	13.5	15.8	20.6	26.1	31.2	35.2	36.8	36.4	33.9	28.6	22.0	16.6	26.4
<i>Bahrain</i>													
166	17.0	18.1	20.6	25.0	29.4	31.7	33.3	33.6	31.4	28.1	31.7	18.6	26.5
<i>Qatar</i>													
167	16.6	17.3	20.6	25.4	30.6	32.9	34.3	34.0	31.9	28.1	23.0	18.5	26.1
168	15.8	18.0	22.9	28.3	31.5	33.1	36.1	34.0	32.9	28.0	24.1	18.4	26.9
169	15.1	17.4	22.3	26.7	29.7	31.0	33.5	31.1	30.9	26.3	22.9	17.6	25.4
<i>Saudi Arabia</i>													
170	11.4	13.9	17.7	22.4	26.2	30.1	31.5	31.1	28.4	24.8	18.3	13.3	22.5
171	9.3	12.8	16.8	20.9	26.2	29.4	30.5	31.0	29.6	24.0	16.7	11.7	21.6
172	15.4	16.9	20.7	25.0	30.5	33.8	35.2	34.5	31.8	27.7	21.7	17.0	25.9
173	14.1	16.2	20.5	25.3	30.2	33.0	34.2	33.8	30.9	25.5	19.8	15.4	24.9
174	17.9	20.2	23.9	27.9	32.3	35.9	35.9	35.8	34.7	29.5	23.4	19.1	28.0
175	19.6	21.3	22.8	26.1	29.0	30.4	30.8	30.6	29.9	28.4	24.5	21.6	26.2
176	23.9	23.6	24.4	27.0	29.2	30.0	31.7	32.0	30.3	28.9	27.2	24.7	27.7

(Continued)

Table 3. (Continued)

Ser.	Mean air temperature, °C, for												
No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
177	15.6	16.4	19.3	21.6	25.4	28.6	28.4	27.8	27.2	22.6	18.1	15.7	22.2
178	26.2	26.7	28.2	30.6	32.2	33.8	33.6	33.1	32.2	31.4	28.8	26.4	30.2
United Arab Emirates													
179	17.8	18.9	21.1	24.2	28.1	30.6	32.8	33.6	31.1	27.5	24.4	20.0	25.8
Oman													
180	21.1	21.9	24.8	29.4	33.8	35.7	34.6	31.2	31.2	29.4	25.9	23.0	28.5
181	21.7	22.6	25.5	29.8	34.2	35.2	33.9	31.4	31.0	29.1	25.5	22.8	28.8
182	23.1	24.6	25.9	28.0	29.4	29.3	27.4	25.3	26.4	26.7	26.3	22.8	26.3
183	22.5	23.3	25.3	27.0	28.6	28.9	25.9	25.3	26.1	25.6	25.0	23.9	25.6
Yemen													
184	20.5	22.1	24.0	24.2	25.0	26.2	26.5	26.5	25.5	24.3	18.1	19.9	23.6
185	17.9	22.2	25.6	26.3	27.9	31.7	33.3	33.0	29.6	25.0	21.2	19.0	26.1
186	12.8	15.9	18.6	17.3	21.3	22.8	22.5	21.3	20.1	16.6	15.9	14.4	18.3
187	25.6	25.9	27.5	28.9	31.4	32.5	33.1	32.8	32.5	30.9	28.1	26.1	29.6
188	25.1	25.5	27.7	29.3	32.3	34.1	34.0	34.0	33.0	30.9	28.0	26.8	30.1
189	25.1	25.9	27.7	29.5	31.3	32.6	33.0	32.6	32.0	30.3	27.2	25.5	29.4
190	23.6	24.2	25.3	27.2	28.9	30.6	29.2	28.6	28.9	27.6	25.3	24.2	27.0
191	12.3	15.0	17.3	18.5	20.7	21.4	23.2	22.6	20.4	17.6	14.2	12.1	17.9
192	13.2	14.8	18.0	19.3	21.8	23.6	24.8	28.6	22.5	19.5	17.3	11.8	19.6
193	25.2	26.1	29.2	31.0	31.8	33.7	33.0	32.6	31.2	29.5	26.9	25.4	29.6
194	16.1	17.8	18.6	20.3	20.3	19.4	21.3	20.3	19.3	16.5	15.1	14.1	18.3
195	25.3	25.4	27.6	28.5	28.8	30.1	31.2	31.6	30.1	29.3	27.7	25.8	28.5
196	25.4	25.8	27.4	29.1	31.1	32.0	32.4	32.2	32.2	29.4	27.5	25.7	29.2
197	25.3	26.2	26.7	28.4	29.6	31.7	32.0	31.2	31.1	27.7	26.6	25.6	28.5
198	25.0	25.6	27.2	28.3	30.6	32.8	32.2	31.7	32.0	28.6	26.4	25.6	28.8
199	26.4	26.7	27.8	29.2	31.7	33.1	33.6	33.3	32.5	30.3	28.3	27.0	30.0

Table 4. Mean daily maximum temperature at selected stations

Ser. No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
<i>Mauritania</i>													
1	27.6	30.3	33.4	35.3	39.1	41.8	41.7	40.7	39.6	36.8	32.5	27.3	35.5
2	27.8	30.7	33.9	36.0	39.8	41.1	39.0	37.3	37.8	36.6	32.9	27.7	35.1
3	29.2	31.1	33.1	33.6	34.3	34.2	32.1	32.7	34.7	35.6	34.2	29.3	32.8
4	29.9	32.7	35.7	37.8	40.6	40.7	37.5	35.9	36.6	37.5	35.1	30.1	35.8
5	30.7	33.8	37.0	38.1	40.4	40.1	37.2	34.8	37.1	39.0	36.4	30.6	35.4
6	30.0	33.0	37.0	40.0	42.0	42.0	38.0	35.0	37.0	59.0	36.0	31.0	36.7
<i>Morocco</i>													
7	16.2	16.8	17.9	19.2	21.9	24.9	28.3	28.6	27.3	23.7	19.6	17.0	21.8
8	16.6	17.6	18.8	20.7	22.9	26.0	28.6	28.5	27.1	23.9	19.9	17.5	22.3
9	15.7	17.0	18.7	20.2	23.8	28.0	32.7	33.1	29.9	24.7	19.8	16.3	23.3
10	17.2	17.7	19.2	20.0	22.1	24.1	26.8	27.1	26.4	24.0	20.6	17.7	21.9
12	17.1	17.5	18.3	19.5	21.1	23.3	25.4	25.9	25.4	23.3	20.3	17.8	21.2
13	9.0	11.0	13.0	16.0	18.0	24.0	31.0	30.0	25.0	18.0	14.0	9.0	18.0
14	18.4	19.9	22.3	23.7	27.5	31.3	36.8	36.5	32.5	27.5	22.2	18.7	26.4
15	16.6	19.3	22.2	25.1	29.6	34.1	37.8	37.0	32.2	26.5	20.4	16.7	26.5
16	20.4	21.0	22.4	21.9	23.2	24.0	26.1	26.1	26.4	25.3	23.5	20.7	23.4
<i>Algeria</i>													
17	16.5	17.3	18.5	20.4	23.5	27.0	30.6	31.2	29.2	25.1	20.7	17.2	23.1
19	16.4	17.2	19.0	20.8	23.9	27.5	30.7	31.6	29.4	25.1	20.7	17.2	23.3
20	11.7	12.9	15.2	17.4	22.0	27.4	32.1	32.2	28.0	21.9	16.4	12.3	20.8
21	17.7	21.2	24.5	28.3	33.2	39.0	41.9	41.5	36.6	29.5	22.9	17.8	29.5
22	16.6	18.8	21.8	25.6	30.7	36.2	39.7	38.9	33.8	27.3	21.1	17.1	27.3
23	16.5	17.5	19.0	20.8	23.8	27.2	30.5	31.4	29.2	25.0	20.6	17.1	23.2
24	11.7	13.5	15.7	19.2	24.6	30.7	34.2	33.3	28.6	22.6	16.5	12.9	22.0
26	16.2	19.0	22.0	25.6	30.3	35.9	39.7	39.0	33.9	27.1	20.6	16.3	27.1
27	17.0	20.2	23.4	28.0	32.9	38.6	40.5	40.1	35.5	28.8	22.3	17.5	28.7
28	21.6	25.1	28.6	33.2	38.0	43.5	44.7	44.0	40.3	34.1	27.1	21.9	33.5
30	20.3	22.6	25.4	29.5	32.9	35.2	34.6	34.1	32.5	28.8	24.3	21.0	28.4
<i>Tunisia</i>													
31	14.6	15.4	17.1	19.4	23.3	27.4	30.5	30.7	28.6	24.3	20.0	15.6	22.2
33	15.7	16.5	18.1	20.7	24.9	29.0	32.6	32.7	29.7	25.2	20.5	16.7	23.5
35	16.1	18.3	20.6	24.4	28.3	33.9	37.8	37.2	33.3	27.8	22.2	17.2	26.7
36	15.8	16.9	18.5	20.0	22.5	28.0	30.0	30.7	29.4	24.9	21.4	17.9	23.0
37	16.7	18.0	19.5	21.8	25.4	28.9	32.0	32.2	29.8	26.0	21.4	17.6	24.1
38	14.7	17.0	19.7	23.6	28.7	33.7	36.8	36.2	31.6	25.7	19.8	15.4	25.2
40	16.5	18.1	19.7	21.8	24.6	27.3	30.6	31.3	29.5	26.0	21.5	17.5	23.7
42	15.9	19.4	22.3	26.3	31.2	35.7	37.2	37.5	33.8	27.3	22.3	16.9	27.2
<i>Libya</i>													
43	17.0	18.0	20.0	23.0	25.0	29.0	30.0	31.0	30.0	28.0	23.0	18.0	24.3
44	12.7	13.7	15.7	19.6	23.8	27.5	27.7	27.8	25.2	22.2	19.4	14.8	20.8
46	17.7	18.2	19.7	21.7	24.3	27.5	28.4	29.0	27.6	26.7	23.7	19.2	23.6
47	17.2	20.0	22.8	27.2	31.1	36.1	37.8	37.8	36.1	31.1	24.4	18.9	28.3
48	18.8	20.1	20.9	23.1	26.3	29.8	31.9	32.4	30.6	28.1	24.9	20.2	25.6
49	17.0	18.0	20.0	25.0	29.0	32.0	32.0	32.0	31.0	28.0	24.0	19.0	25.6

(Continued)

Table 4. (Continued)

Ser. No.	Mean daily maximum temperature, °C, for												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
50	14.1	16.9	19.7	22.9	27.5	32.2	34.1	34.2	30.6	25.5	20.6	15.0	24.4
51	16.5	17.9	20.4	24.1	27.3	30.0	30.3	31.1	29.0	26.1	22.2	18.0	24.4
53	18.0	19.0	22.0	23.0	26.0	28.0	29.0	31.0	31.0	28.0	24.0	19.0	24.8
54	17.9	19.3	22.0	25.9	29.8	33.3	32.1	32.6	31.6	29.2	24.7	19.6	26.5
55	18.0	21.0	26.0	32.0	37.0	42.0	43.0	42.0	38.0	32.0	24.0	19.0	31.2
56	19.2	21.7	24.8	29.0	33.3	37.6	37.3	36.7	34.7	30.1	25.8	20.1	29.2
57	20.0	22.2	25.6	30.0	35.0	37.8	37.2	37.2	36.1	32.8	27.2	21.7	30.2
58	17.8	22.2	26.1	31.7	36.1	40.0	38.9	37.8	36.1	32.8	26.7	16.7	30.2
59	21.0	23.0	27.0	33.0	37.0	39.0	38.0	38.0	36.0	32.0	27.0	22.0	31.1
<i>Egypt</i>													
60	17.5	18.1	19.5	22.2	25.1	27.0	28.0	28.7	28.5	26.4	22.9	18.8	23.6
61	18.6	19.6	21.4	24.2	26.8	30.0	31.3	31.0	29.6	27.4	23.9	20.2	25.3
62	18.1	18.8	19.7	22.7	26.6	28.4	30.5	30.5	28.9	27.3	23.7	20.0	24.6
63	17.8	17.8	20.0	22.2	25.0	27.2	27.8	28.9	28.9	27.2	23.9	20.0	23.9
64	17.7	18.5	19.6	22.9	25.3	28.1	28.6	29.5	28.5	26.5	22.8	19.3	23.9
65	17.4	17.9	19.4	22.5	25.1	28.2	30.0	30.3	28.8	26.7	23.0	19.4	24.1
66	18.3	18.9	21.1	23.3	26.1	28.3	29.4	30.6	30.0	28.3	25.0	20.6	25.0
67	17.8	20.0	21.1	23.9	27.2	28.9	30.0	31.1	30.0	27.8	22.8	21.1	25.0
68	19.7	20.5	23.1	27.4	31.6	33.9	35.1	34.8	32.9	30.5	26.2	21.5	28.1
69	20.0	20.0	22.8	27.2	30.0	32.2	32.8	32.8	31.1	30.0	26.1	21.1	27.2
70	20.0	21.1	23.9	27.8	32.2	33.9	35.0	35.0	32.8	30.0	26.1	21.1	27.8
71	20.0	21.1	23.9	27.8	32.2	33.9	35.0	33.9	32.2	30.0	26.1	22.2	27.8
72	20.0	21.1	23.9	27.8	32.2	35.0	36.1	35.0	32.2	30.0	26.1	21.1	27.8
73	18.8	20.5	23.4	28.4	32.0	34.2	34.4	33.9	32.6	29.6	24.7	20.2	27.7
74	19.3	21.0	24.1	29.5	32.3	35.0	35.6	34.7	31.9	29.9	25.8	21.0	28.3
75	19.8	21.4	25.3	29.0	32.6	35.9	37.1	36.8	34.3	31.4	26.7	21.5	29.3
76	18.5	20.4	23.4	28.5	32.2	34.3	35.0	34.6	32.6	29.3	24.5	19.5	27.7
77	21.1	22.2	25.0	30.0	33.9	36.1	37.2	36.1	32.8	31.1	27.2	22.2	30.0
78	19.3	21.5	24.5	29.9	34.0	37.5	37.5	37.0	34.6	30.5	25.0	20.5	29.3
79	19.6	21.8	25.3	29.2	32.8	35.5	35.6	35.2	32.2	30.0	25.8	20.4	28.6
80	20.9	21.9	24.2	28.0	31.0	32.3	33.2	33.3	31.0	28.2	25.3	22.3	27.6
81	20.4	22.4	25.8	31.2	35.4	36.9	36.6	35.9	34.0	31.3	25.9	21.4	29.8
82	21.6	22.4	24.9	28.4	32.3	34.0	34.7	35.0	33.0	30.7	26.8	23.4	28.9
83	19.3	21.7	25.1	31.4	35.2	37.1	36.5	36.0	34.2	30.5	25.1	20.3	29.4
84	22.7	25.3	30.5	35.3	38.8	41.0	41.0	40.7	38.1	35.1	30.1	24.4	33.6
85	21.9	22.6	24.5	27.1	29.8	31.8	32.6	32.7	31.6	29.3	26.2	23.2	27.8
86	21.5	24.0	28.1	33.6	37.3	38.9	39.0	38.4	36.4	32.9	27.1	22.8	31.7
87	22.1	24.7	28.8	34.5	38.2	40.2	39.9	39.5	37.1	33.9	28.1	23.5	32.5
88	24.0	23.7	25.0	27.0	29.4	30.6	32.4	33.1	31.3	30.2	28.3	25.4	28.4
89	21.0	25.0	29.5	35.0	38.7	41.0	41.0	40.3	38.5	34.2	28.3	24.2	33.1
<i>The Sudan</i>													
90	23.3	25.7	30.5	36.1	39.6	41.1	40.7	40.1	39.2	36.1	29.2	24.8	33.9
91	26.8	27.0	28.8	31.4	35.0	38.5	40.1	40.2	37.4	33.4	30.8	28.8	33.2
92	28.2	28.7	30.9	33.7	37.7	42.3	42.9	42.4	41.3	36.8	33.1	29.8	35.7
93	29.7	31.9	35.8	39.4	42.1	42.8	40.7	40.1	41.2	39.3	34.6	30.8	37.4
94	30.8	33.0	36.8	40.1	41.9	41.3	38.4	37.3	39.1	39.3	35.2	31.8	37.1
95	33.7	35.2	38.3	40.8	41.6	39.8	36.1	34.9	36.8	38.7	37.0	34.4	37.3
96	32.9	34.8	38.2	40.9	41.6	39.6	36.3	34.7	35.9	38.0	36.2	33.4	36.9
97	34.7	36.4	39.2	41.0	40.6	37.5	33.4	32.2	34.1	36.8	37.1	35.2	36.5



102	29.9	32.2	35.7	38.6	39.4	37.5	33.9	32.7	34.8	36.4	33.6	30.5	34.6
105	37.0	38.0	40.0	41.0	38.0	35.0	32.0	31.0	32.0	36.0	38.0	37.0	36.0
107	36.0	37.0	39.0	39.0	36.0	33.0	31.0	31.0	32.0	34.0	36.0	35.0	35.0
108	34.2	35.8	37.3	37.5	35.1	32.5	30.7	30.8	31.8	33.2	34.6	34.2	34.0
110	36.0	37.0	38.0	37.0	35.0	33.0	32.0	32.0	33.0	34.0	36.0	36.0	35.0
111	37.0	38.0	37.0	35.0	33.0	32.0	31.0	31.0	32.0	34.0	35.0	36.0	31.0
<i>Djibouti</i>													
113	28.7	29.0	30.2	32.0	34.9	39.0	41.7	41.2	37.2	33.1	30.8	29.3	33.9
<i>Somalia</i>													
114	26.7	27.8	28.3	30.6	31.7	31.1	31.1	30.6	28.9	29.4	28.3	27.2	29.4
115	29.0	30.0	31.0	34.0	37.0	41.0	41.0	40.0	39.0	33.0	30.0	29.0	35.0
116	24.0	26.0	26.0	27.0	27.0	26.0	26.0	26.0	26.0	25.0	24.0	23.0	25.0
117	27.9	29.2	30.7	31.0	35.7	42.8	42.9	41.9	39.7	33.1	30.0	28.6	34.5
118	24.5	26.4	28.9	29.5	30.6	30.9	29.5	29.4	30.1	28.3	25.5	24.0	28.1
119	32.4	33.1	34.7	35.1	34.5	33.7	32.3	33.0	34.1	33.0	33.2	32.6	33.5
120	29.7	29.8	30.4	31.6	31.6	29.7	29.2	28.9	29.0	29.5	29.9	29.9	29.9
121	32.0	33.0	35.0	36.0	35.0	34.0	33.0	33.0	34.0	34.0	34.0	33.0	34.0
122	30.0	30.0	31.0	32.0	31.0	30.0	29.0	29.0	29.0	30.0	31.0	31.0	30.3
123	30.0	30.0	31.0	32.0	30.0	28.0	28.0	28.0	29.0	30.0	31.0	31.0	29.8
<i>Comoro Islands</i>													
C.I.	30.2	30.3	30.6	30.3	29.4	28.1	27.5	27.4	27.9	28.9	30.6	30.6	29.3
<i>Syria</i>													
124	10.6	12.6	16.9	22.0	29.1	36.0	40.3	39.5	35.3	27.7	19.5	12.6	25.2
125	11.1	13.5	18.0	23.6	30.7	36.7	40.3	40.1	35.5	28.5	20.4	13.7	26.0
126	10.0	12.5	16.5	22.2	28.8	33.5	36.0	35.9	33.1	26.6	18.5	12.1	23.8
128	15.4	16.4	18.3	21.5	24.1	25.8	28.8	29.6	29.0	26.3	21.9	17.6	22.9
129	12.2	15.1	19.5	25.4	31.7	36.9	39.9	39.3	35.3	28.8	20.7	14.0	26.6
131	11.9	14.7	19.1	24.9	30.5	35.2	37.9	37.6	34.4	28.0	19.9	13.6	25.6
132	14.0	16.3	21.1	26.5	32.8	38.0	40.4	40.3	36.1	29.7	22.3	16.2	27.8
133	12.4	14.8	18.7	24.1	29.4	33.9	36.2	35.9	33.3	27.7	20.3	14.2	25.1
<i>Lebanon</i>													
134	17.0	17.0	19.0	21.0	25.0	27.0	29.0	30.0	30.0	27.0	24.0	19.0	23.8
135	10.1	11.4	15.0	19.9	25.2	29.7	32.3	33.0	30.1	25.6	19.5	12.9	22.1
136	11.6	12.1	15.3	20.8	25.7	29.4	32.2	32.7	29.6	25.5	19.3	13.4	22.3
137	16.7	17.2	18.9	22.2	25.6	28.3	30.6	31.7	30.0	27.2	22.8	18.3	24.1
<i>Jordan</i>													
140	12.2	14.0	17.3	22.5	27.0	30.7	31.9	32.1	30.6	26.6	20.0	14.1	23.3
142	9.1	10.3	14.3	19.0	22.5	26.5	27.5	28.3	25.9	22.7	17.1	12.2	19.6
<i>Plestine</i>													
143	12.4	12.1	16.1	20.8	25.5	28.1	29.6	28.0	26.6	25.7	21.6	16.4	21.9
145	19.0	20.6	24.4	29.5	34.4	37.0	38.6	37.9	35.8	32.7	28.1	21.4	29.4
146	11.9	13.3	15.9	21.0	25.2	27.5	28.8	28.8	27.9	24.8	18.9	13.7	21.5
148	18.3	18.9	21.1	24.4	27.2	29.4	30.6	31.7	30.6	28.9	25.0	20.6	25.6
<i>Iraq</i>													
149	12.8	15.3	19.0	25.4	32.9	39.6	43.4	43.0	38.7	31.2	22.3	15.0	28.2
151	13.7	15.5	19.3	25.5	32.9	39.2	42.8	42.5	38.3	31.6	23.0	16.1	28.4
152	15.6	17.8	21.7	29.4	36.1	40.6	43.3	43.3	40.0	33.3	25.0	17.8	30.3
153	12.8	15.6	20.0	25.6	31.7	36.1	38.3	38.9	36.1	30.0	21.7	14.4	26.8
154	17.5	20.0	24.0	29.8	36.9	41.5	43.5	43.8	40.8	35.0	26.2	19.2	31.5

(Continued)

Table 4. (Continued)

Ser. No.	Mean daily maximum temperature, °C, for												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
156	17.1	19.7	24.4	30.1	34.8	41.0	42.7	42.9	40.1	34.5	25.6	18.6	31.0
158	17.8	20.4	24.9	30.7	36.9	40.2	42.8	43.6	41.3	35.4	26.0	18.9	31.6
159	18.6	21.0	25.3	30.8	36.1	38.8	40.5	41.3	39.7	35.0	26.7	20.0	31.1
<i>Kuwait</i>													
163	18.0	20.7	25.6	31.5	38.5	43.5	45.4	44.6	42.0	35.3	26.6	19.8	32.6
<i>Bahrain</i>													
166	20.0	21.2	24.7	29.2	34.1	36.4	37.9	38.0	36.5	33.1	27.8	22.3	30.1
<i>Qatar</i>													
167	21.5	23.1	26.9	32.9	39.0	41.0	42.4	41.9	40.6	36.1	29.8	24.1	33.3
168	21.0	20.8	24.6	30.7	36.6	38.1	39.9	39.3	37.7	33.1	27.3	21.6	30.9
169	20.5	21.9	25.8	31.6	35.8	37.0	38.7	38.7	37.6	33.8	27.8	23.1	31.0
<i>Saudi Arabia</i>													
170	25.6	28.7	32.7	36.3	39.2	41.0	42.7	42.3	40.5	35.4	29.9	27.1	35.1
171	16.7	18.9	23.9	27.8	33.3	38.3	38.3	38.9	36.7	32.8	23.9	17.2	28.9
172	29.5	28.0	35.1	36.8	43.1	45.3	45.2	45.6	44.2	39.5	33.4	27.7	37.8
173	20.2	22.9	27.6	32.3	38.7	41.5	42.8	42.5	40.1	34.6	27.4	21.7	32.7
174	28.4	30.1	34.8	37.8	42.0	43.9	44.3	44.3	43.1	39.1	33.2	28.8	37.5
175	31.5	31.9	33.3	35.7	38.8	40.7	39.5	39.1	38.7	37.1	35.1	32.3	36.1
176	29.0	28.8	31.1	33.4	35.4	36.9	37.6	37.2	36.1	35.0	32.3	29.8	33.6
177	26.6	28.1	31.5	32.2	36.1	37.2	38.2	37.6	32.2	32.7	28.0	25.5	32.2
178	30.5	32.2	33.8	36.0	39.0	38.2	39.4	38.3	38.2	36.9	34.9	31.7	36.0
<i>United Arab Emirates</i>													
179	24.2	25.2	28.8	34.0	38.5	40.8	42.2	41.7	39.8	36.0	30.9	26.2	34.0
<i>Oman</i>													
180	25.0	25.0	28.9	32.2	36.6	37.8	36.1	33.3	33.9	33.9	30.0	26.1	32.4
181	26.2	27.3	31.1	36.1	41.1	42.0	40.8	38.1	38.2	35.5	31.1	28.0	34.6
182	27.2	27.8	30.0	31.1	32.2	31.7	27.8	27.2	28.9	30.6	30.0	28.3	29.4
183	27.2	27.8	30.0	31.1	32.2	31.6	27.8	27.2	28.9	30.5	30.0	28.3	29.3
<i>Yemen</i>													
184	29.6	31.0	33.9	32.3	33.7	34.2	36.3	33.9	35.0	35.1	33.1	31.4	33.3
185	26.2	29.0	32.5	33.7	36.4	39.6	38.8	39.3	36.7	32.9	29.6	26.6	23.4
186	22.1	23.9	25.4	24.4	26.2	27.5	27.8	26.7	26.3	24.0	22.1	20.8	24.7
187	27.8	28.3	30.0	31.7	35.0	36.1	36.7	36.1	36.1	33.9	30.6	28.3	32.6
188	29.9	30.6	32.7	35.2	37.0	38.9	39.3	39.4	38.1	35.3	33.0	31.2	35.0
189	28.8	29.2	30.4	32.6	34.3	35.9	36.7	36.4	35.7	35.7	31.4	29.1	33.0
190	27.8	28.3	29.4	31.1	32.8	34.4	33.3	32.8	32.2	31.1	30.0	28.3	31.0
194	24.4	25.5	27.6	26.5	28.8	28.0	27.6	27.7	26.6	25.9	25.1	25.7	26.6
198	27.8	28.3	30.0	31.7	33.9	36.7	36.1	35.6	35.6	32.8	30.0	28.3	32.2
199	28.9	29.4	30.6	32.2	35.0	36.7	37.2	36.7	36.1	33.3	31.1	29.4	32.8

Table 5. Mean daily minimum temperature at selected stations

Ser. No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
<i>Mauritania</i>													
1	12.5	14.0	16.3	18.6	22.7	26.3	27.0	26.6	25.9	22.2	18.0	13.1	20.3
2	12.2	14.4	16.9	19.4	23.8	26.5	25.9	24.8	24.5	22.0	17.5	12.8	20.1
3	13.4	14.5	16.3	17.5	19.4	21.8	23.8	24.6	24.7	22.3	18.4	14.0	19.2
4	15.4	17.0	18.7	20.3	22.8	24.0	23.9	24.0	24.3	23.4	20.4	16.0	20.9
5	14.9	16.1	18.4	19.5	21.6	22.3	23.6	24.5	23.7	23.0	18.8	15.3	20.1
6	17.0	19.0	23.0	26.0	29.0	28.0	26.0	24.0	25.0	26.0	23.0	18.0	23.7
<i>Morocco</i>													
7	8.8	9.4	10.1	11.2	13.4	16.2	18.7	19.1	18.3	15.6	12.2	9.7	13.6
8	8.8	9.3	10.9	12.1	15.1	18.4	20.8	21.7	19.6	15.9	12.7	10.1	14.6
9	3.9	5.0	5.8	7.4	10.1	13.8	16.8	17.4	15.1	11.3	7.6	4.8	9.9
10	8.0	8.6	9.2	10.4	12.7	15.4	17.6	17.7	16.7	14.1	11.1	8.7	12.5
12	8.4	9.2	9.9	11.5	14.0	17.1	19.3	19.5	18.2	15.2	11.8	9.3	13.6
13	-5.0	-3.0	-1.0	3.0	4.0	9.0	12.0	12.0	8.0	5.0	1.0	-3.0	3.0
14	5.9	7.6	9.4	11.0	13.8	16.3	19.9	20.1	18.2	14.7	10.4	6.5	12.8
15	1.9	4.5	7.4	10.0	13.8	17.7	21.3	20.7	17.1	12.3	6.9	2.4	11.3
16	7.9	9.4	10.9	12.0	14.2	16.4	18.0	18.2	17.3	15.2	12.3	8.5	13.4
<i>Algeria</i>													
17	5.9	6.4	7.0	9.0	12.0	15.6	18.5	19.1	17.1	13.7	9.6	7.0	11.7
19	5.8	6.0	7.2	9.1	12.0	15.7	18.4	19.3	17.4	13.7	9.7	7.1	11.9
20	5.5	6.2	7.4	9.0	12.5	17.0	21.0	21.1	17.7	13.3	9.2	6.2	12.2
21	4.3	7.6	11.3	15.0	19.8	24.6	27.9	27.6	23.5	16.8	10.4	5.2	16.2
22	6.9	8.6	10.9	14.2	18.8	23.6	26.6	26.5	22.6	17.1	11.4	7.8	16.3
23	5.7	6.8	7.8	9.9	12.9	16.3	19.0	19.6	17.4	13.5	9.2	6.3	12.0
24	1.1	1.9	3.4	5.9	10.0	14.2	16.5	16.4	13.7	9.5	4.8	2.0	8.3
26	3.7	6.4	9.6	13.2	18.1	22.7	26.3	26.1	21.6	15.2	9.1	4.3	14.7
27	2.4	4.9	8.0	12.6	17.4	22.7	24.7	24.3	21.1	14.6	8.1	3.4	13.7
28	7.1	10.0	13.3	17.1	22.1	27.6	29.2	28.8	25.8	19.7	13.0	7.8	18.5
30	5.3	7.5	10.7	14.9	19.5	22.6	22.7	22.2	20.5	15.9	10.3	6.7	14.9
<i>Tunisia</i>													
31	7.4	7.5	9.0	10.9	13.8	17.4	20.21	121.1	19.6	16.0	12.2	9.8	13.7
33	7.2	7.4	8.3	10.4	13.7	17.3	20.0	20.8	19.0	15.5	11.3	8.2	13.3
35	4.4	5.6	7.2	9.4	12.8	16.7	19.4	20.0	18.3	14.4	9.4	5.6	11.7
36	6.3	7.4	9.5	11.8	15.0	19.8	21.8	22.3	21.0	16.4	11.8	8.9	14.3
37	5.8	6.5	8.4	11.0	14.4	17.8	19.9	21.1	19.8	16.1	10.6	6.7	13.2
38	4.1	5.4	7.7	10.7	14.8	18.7	21.3	21.5	18.8	14.0	8.4	4.7	12.5
40	7.5	8.4	10.4	13.6	16.9	20.7	22.6	23.5	21.7	17.4	12.1	8.4	15.3
42	5.9	7.9	9.6	12.5	15.8	19.5	21.2	21.9	20.2	15.9	11.3	6.9	14.1
<i>Libya</i>													
43	8.0	9.0	10.0	13.0	16.0	19.0	21.0	22.0	21.0	18.0	13.0	9.0	14.9
44	6.5	6.7	7.8	9.8	12.8	16.6	17.9	18.3	16.3	14.3	11.7	8.2	12.2
46	10.7	10.9	11.9	13.8	16.1	19.8	22.4	23.1	21.5	18.9	15.9	12.3	16.4
47	5.6	6.7	8.3	10.6	15.0	18.3	20.0	20.0	19.4	16.1	11.7	6.7	13.3
48	8.8	9.2	11.2	13.5	16.3	19.9	21.8	22.4	21.4	18.1	14.1	10.1	15.6
49	8.0	8.0	9.0	12.0	16.0	19.0	20.0	21.0	19.0	17.0	14.0	10.0	13.7

(Continued)

Table 5. (Continued)

Ser. No.	Mean daily minimum temperature, °C, for												Year
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
50	5.4	6.9	8.6	11.2	15.9	19.1	21.2	21.3	19.0	14.9	10.7	6.3	13.4
51	6.4	7.0	8.6	11.7	15.1	18.4	19.8	20.3	18.9	15.4	11.9	7.7	13.4
53	8.0	9.0	11.0	14.0	17.0	19.0	22.0	23.0	21.0	18.0	14.0	10.0	15.5
54	7.8	8.3	10.3	12.9	16.1	19.3	19.4	19.7	18.6	16.3	12.8	9.3	14.2
55	3.0	4.0	8.0	13.0	18.0	22.0	22.0	22.0	19.0	15.0	9.0	4.0	13.3
56	2.9	3.9	6.7	11.3	14.6	18.6	18.5	18.4	17.4	13.6	8.9	4.6	11.6
57	5.6	7.2	9.4	13.3	18.9	20.6	21.7	21.7	20.6	16.7	12.2	7.8	14.6
58	5.0	7.8	10.6	15.6	19.4	23.3	23.3	23.3	21.1	17.8	12.8	7.2	15.6
59	5.0	7.0	10.0	15.0	20.0	22.0	23.0	23.0	21.0	16.0	11.0	6.0	14.9
<i>Egypt</i>													
60	6.9	7.6	8.8	11.2	13.5	17.0	19.6	20.2	18.6	16.0	12.2	8.3	13.3
61	9.1	8.9	11.3	13.5	17.2	19.7	21.2	21.4	20.2	17.8	14.8	10.7	15.5
62	8.3	9.2	10.9	13.9	17.8	20.1	21.5	21.8	20.3	19.0	15.8	10.7	15.8
63	12.3	11.9	13.6	15.7	19.2	22.2	24.2	24.9	23.8	21.6	18.3	14.1	18.5
64	8.5	9.0	10.7	13.1	16.0	19.1	21.2	21.9	20.9	18.4	15.1	10.6	15.4
65	10.6	11.2	13.3	15.7	18.6	21.5	23.2	23.8	22.8	21.1	17.6	12.6	17.7
66	10.6	11.0	12.8	15.0	18.0	20.8	23.0	23.6	22.6	20.2	16.9	12.6	17.3
67	7.3	7.9	10.1	12.7	14.9	17.7	20.2	20.9	19.5	17.4	13.2	8.8	14.2
68	7.1	7.4	9.4	12.1	15.9	18.7	20.4	20.8	19.3	17.6	14.4	9.3	14.4
69	7.5	7.9	9.6	12.1	15.5	18.2	20.0	20.4	18.9	17.0	13.9	9.6	14.2
70	6.3	6.6	8.3	11.0	14.9	17.5	19.3	19.5	17.7	15.7	12.7	8.4	13.2
71	5.8	6.5	8.5	11.4	15.1	17.8	19.6	19.7	17.9	16.0	12.8	8.1	13.3
72	6.4	6.9	8.4	11.1	14.9	17.7	19.6	20.1	18.4	16.3	12.7	8.2	13.4
73	7.6	8.4	10.6	13.5	17.1	19.9	21.7	21.9	19.9	17.6	14.0	9.6	15.2
74	5.5	6.1	8.0	10.7	14.6	17.7	19.5	19.7	17.7	15.5	12.1	7.7	12.9
75	9.4	10.0	12.1	14.8	18.6	20.9	22.7	23.1	21.3	19.2	15.5	10.8	16.5
76	8.1	8.8	11.0	14.1	17.5	19.9	21.1	21.4	19.9	18.3	14.6	10.0	15.4
77	6.0	7.2	9.4	12.8	17.1	19.5	21.1	21.4	19.4	17.1	13.1	8.2	14.4
78	3.6	5.2	8.0	11.9	16.2	19.1	20.5	20.2	17.9	14.6	9.9	5.2	12.7
79	5.3	6.4	8.5	11.1	14.6	17.8	19.3	20.1	17.1	15.3	11.2	6.6	12.8
80	8.8	9.6	12.6	16.3	20.1	23.0	24.2	24.6	22.6	18.5	14.6	10.2	17.1
81	6.2	7.3	9.8	13.5	17.5	20.0	21.4	21.6	19.7	17.5	13.3	8.2	14.7
82	10.1	10.0	12.5	15.9	20.2	23.0	24.3	25.0	23.0	19.7	15.7	12.0	17.6
83	6.1	7.1	10.1	14.5	18.9	21.4	22.4	22.8	20.9	18.5	12.9	7.9	15.3
84	6.9	7.8	11.4	16.1	20.8	23.2	24.1	24.2	22.0	18.8	13.6	8.9	16.5
85	13.9	14.4	16.6	19.6	23.4	25.7	26.4	27.0	25.6	23.3	19.8	16.0	21.0
86	4.8	6.3	9.9	14.3	19.3	22.4	23.1	23.0	20.8	17.5	12.3	6.7	15.0
87	6.0	7.1	11.2	15.4	21.2	23.2	23.4	22.8	21.21	18.6	13.0	8.0	15.9
88	20.2	19.9	20.9	22.6	25.2	26.1	27.3	28.0	27.1	26.0	24.1	21.7	24.1
89	10.1	11.2	14.5	19.1	23.5	25.8	26.4	26.4	24.0	21.6	16.5	11.8	19.2
<i>The Sudan</i>													
90	9.5	10.5	14.6	19.4	23.3	25.0	24.9	24.9	24.4	21.5	15.7	11.3	18.8
91	19.7	19.0	19.9	21.6	23.7	25.9	28.2	28.9	26.8	25.3	23.8	21.3	23.7
92	20.0	19.7	20.9	22.0	23.1	25.1	28.0	28.3	26.2	25.3	23.6	21.2	23.6
93	14.4	15.4	19.1	22.3	26.1	28.2	27.3	26.9	27.3	25.0	20.2	16.1	22.4
94	15.6	17.0	20.5	23.6	27.1	27.3	25.9	25.3	26.0	25.5	21.0	17.1	22.7
95	16.5	17.2	20.1	23.0	25.8	25.7	23.9	23.4	24.0	24.3	21.4	17.9	21.9
96	14.3	15.9	19.1	21.6	24.5	24.9	23.3	22.5	22.2	22.0	18.4	15.3	20.3
97	17.2	18.3	21.6	23.8	25.2	23.4	21.6	21.2	21.4	22.1	21.0	18.1	21.2

102	13.5	15.4	19.1	21.9	24.6	24.5	23.1	22.4	21.8	22.4	18.3	14.1	20.1
105	17.0	18.0	20.0	24.0	24.0	22.0	22.0	21.0	21.0	20.0	18.0	16.0	20.0
107	19.0	20.0	22.0	24.0	23.0	22.0	22.0	21.0	22.0	22.0	20.0	18.0	21.0
108	11.6	13.8	18.7	21.0	22.2	20.6	20.6	20.5	20.3	19.6	15.4	12.2	18.0
110	18.0	19.0	21.0	22.0	22.0	21.0	21.0	21.0	21.0	21.0	19.0	18.0	20.0
111	20.0	21.0	23.0	23.0	22.0	21.0	20.0	20.0	20.0	20.0	20.0	20.0	21.0
<i>Djibouti</i>													
113	21.5	22.5	23.8	25.3	27.0	29.3	31.1	30.6	28.9	25.6	23.1	21.6	25.9
<i>Somalia</i>													
114	20.6	21.6	23.3	23.8	24.4	23.8	22.7	22.7	21.6	21.6	21.6	20.0	22.2
115	20.6	20.6	21.6	24.4	26.1	30.6	31.7	30.0	28.3	22.2	20.0	21.1	25.0
116	6.0	7.0	8.0	10.0	12.0	13.0	13.0	13.0	12.0	8.0	7.0	6.0	9.0
117	21.3	21.6	23.3	25.2	27.7	31.0	31.8	31.1	29.3	24.0	22.2	21.6	25.8
118	11.2	12.0	14.6	16.1	17.2	17.0	16.7	16.7	16.9	14.7	12.6	11.6	14.8
119	17.7	18.3	20.2	22.3	23.0	22.6	21.9	21.8	21.5	21.6	19.8	18.8	20.8
120	21.7	22.0	22.5	23.5	23.0	21.7	21.1	21.3	21.8	22.7	22.4	22.3	22.2
121	23.8	26.1	26.7	26.1	26.1	25.0	24.4	23.8	24.4	24.4	24.4	23.3	25.0
122	23.0	23.0	25.0	26.0	25.0	24.0	23.0	23.0	23.0	24.0	24.0	23.0	23.8
123	24.0	25.0	25.0	26.0	25.0	24.0	23.0	23.0	23.0	24.0	25.0	24.0	24.3
<i>Comoro Islands</i>													
C.I.	23.6	23.5	23.3	22.8	21.6	20.1	19.1	18.8	19.3	20.6	21.9	22.9	21.5
<i>Syria</i>													
124	2.3	3.5	6.2	10.2	14.7	19.6	23.2	22.7	19.3	14.4	8.8	4.1	12.4
125	1.3	2.0	4.9	9.1	14.0	18.7	21.8	21.2	16.1	10.6	5.5	2.6	10.7
126	1.7	2.9	5.3	9.3	13.6	18.0	20.9	20.8	17.6	12.5	6.6	3.4	11.1
128	8.4	9.1	11.0	14.0	17.0	20.7	23.7	24.3	21.9	18.2	13.8	10.1	16.0
129	2.5	3.7	7.0	12.0	17.1	21.9	25.1	24.5	19.4	13.7	7.2	3.2	13.1
131	2.1	3.8	6.8	11.4	15.8	19.3	21.3	21.2	19.0	14.0	7.5	3.5	12.1
132	2.3	3.2	6.6	11.4	16.3	20.5	23.2	22.8	18.0	13.4	7.3	3.4	12.4
133	0.5	1.5	3.6	7.5	10.1	13.9	16.6	16.2	12.8	8.3	3.8	1.2	8.0
<i>Lebanon</i>													
134	10.0	10.0	11.0	14.0	17.0	20.0	22.0	23.0	22.0	19.0	15.0	11.0	16.2
135	0.4	1.1	2.6	5.3	8.4	11.3	13.3	13.9	11.9	9.0	5.4	2.1	7.1
136	1.9	2.0	4.0	7.0	10.4	13.1	15.3	15.6	13.0	10.0	6.5	3.1	8.2
137	10.6	10.6	12.2	14.4	17.8	20.6	22.8	23.3	22.8	20.6	16.1	12.8	17.1
<i>Jordan</i>													
140	3.1	4.0	5.9	9.2	12.9	16.5	18.3	18.2	16.2	13.2	8.5	4.7	10.9
142	0.3	0.3	2.7	5.4	7.3	10.1	12.6	13.5	10.0	8.4	5.2	1.4	6.4
<i>Palestine</i>													
143	6.2	6.1	8.2	11.8	15.2	17.4	18.8	19.1	17.5	16.4	13.8	9.3	13.3
145	4.4	5.9	9.6	13.6	18.2	20.2	21.9	21.1	20.5	17.6	16.6	11.6	15.1
146	4.1	4.6	6.3	9.5	12.4	15.2	17.2	17.3	16.3	13.7	9.5	5.7	11.0
148	9.4	10.0	11.6	13.8	16.4	19.5	21.4	22.2	20.5	17.7	14.5	11.6	15.7
<i>Iraq</i>													
149	2.5	3.5	6.3	10.2	15.0	19.5	22.9	21.8	16.6	11.4	7.0	3.3	11.7
151	4.5	5.5	8.5	13.0	18.8	23.7	26.7	26.5	22.4	17.2	11.3	6.8	15.4
152	3.9	5.6	8.9	13.9	19.4	22.8	24.4	24.4	21.1	16.1	10.6	5.6	14.7
153	1.1	2.2	5.8	10.0	15.0	18.3	21.1	21.1	17.2	12.8	7.2	2.8	11.2

(Continued)

Table 5. (Continued)

Ser. No.	Mean daily minimum temperature, °C, for												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
154	5.5	6.9	10.7	15.6	21.0	24.4	26.4	25.9	22.5	17.4	11.8	7.0	16.3
156	4.1	5.8	9.6	14.5	20.0	23.1	24.3	23.6	20.3	15.8	10.4	6.4	14.8
158	5.9	7.7	11.5	16.6	22.4	25.3	26.1	25.2	22.0	17.1	12.0	7.5	16.6
159	7.0	8.7	12.6	18.0	23.7	26.9	27.7	26.3	22.6	18.3	13.2	8.0	17.8
<i>Kuwait</i>													
163	7.2	9.1	13.2	18.4	24.1	27.5	29.3	28.5	24.6	19.7	13.8	8.6	18.7
<i>Bahrain</i>													
166	13.9	15.0	17.2	21.1	25.6	27.8	29.4	29.4	27.2	23.9	20.6	15.6	22.2
<i>Qatar</i>													
167	10.8	11.5	14.4	18.0	22.4	24.8	26.3	26.0	23.4	20.2	16.2	12.9	18.9
168	9.9	10.3	13.2	17.4	21.7	23.5	24.9	24.8	22.6	19.3	15.5	11.9	17.9
169	10.5	12.0	15.2	19.7	23.7	25.5	27.0	27.0	24.5	20.6	16.5	12.6	19.6
<i>Saudi Arabia</i>													
170	-1.1	0.0	2.7	4.8	11.7	16.8	18.2	19.2	15.5	8.9	5.1	1.8	8.6
171	3.9	3.9	7.8	11.1	17.2	21.1	22.8	22.8	19.4	16.1	12.2	5.6	13.7
172	5.9	7.8	11.2	15.3	19.7	23.9	25.4	25.6	21.9	17.9	10.9	7.1	16.1
173	3.0	3.8	8.4	12.0	17.5	21.4	23.3	23.7	19.4	14.3	8.5	3.3	13.2
174	7.6	9.8	12.4	15.0	20.2	25.0	24.6	26.2	23.8	19.0	13.1	9.3	17.1
175	10.1	10.4	12.5	14.6	17.5	20.9	22.5	23.0	20.9	18.7	14.4	11.1	16.4
176	15.8	15.9	17.1	18.3	21.1	23.4	24.7	25.7	23.5	21.7	19.8	17.6	20.4
177	4.2	5.3	6.8	8.9	13.3	17.2	17.9	18.4	16.0	10.6	8.1	4.5	10.9
178	19.8	20.2	20.1	21.6	24.4	27.0	26.6	27.4	25.3	24.2	20.7	19.3	23.1
<i>United Arab Emirates</i>													
179	12.1	12.7	15.3	18.3	21.9	24.6	27.5	27.7	24.3	20.6	16.4	13.5	19.6
<i>Oman</i>													
180	18.9	19.4	22.2	25.5	30.0	30.1	30.5	28.9	28.3	26.6	22.8	20.0	25.3
181	17.4	18.2	20.9	24.9	29.2	30.5	29.1	27.1	26.4	24.3	20.4	18.3	23.9
182	23.9	23.9	25.0	26.1	28.3	29.4	30.0	30.0	28.9	27.2	25.5	24.4	26.9
183	17.8	18.9	20.6	22.8	25.0	26.1	23.9	23.3	23.3	20.6	20.0	19.4	21.8
<i>Yemen</i>													
184	11.5	13.2	15.3	15.2	16.1	17.0	17.7	17.2	14.6	13.0	11.6	11.4	14.5
185	18.0	21.5	25.0	26.6	29.5	31.4	32.5	32.6	29.8	25.2	21.6	18.9	26.1
186	3.0	6.0	6.6	9.5	9.5	10.9	12.2	12.0	9.0	4.3	3.5	2.4	7.4
187	23.3	23.3	25.0	26.1	27.8	28.9	29.4	29.4	28.9	27.8	25.6	23.9	26.7
188	25.0	25.3	27.9	29.9	31.9	33.2	33.9	32.4	32.8	30.0	26.8	25.7	29.6
189	20.3	21.7	23.1	25.6	26.7	28.3	28.4	28.2	27.2	25.0	22.6	20.0	24.8
190	19.4	20.0	21.1	23.3	25.0	26.7	25.0	24.4	25.6	22.2	20.6	20.0	22.8
193	18.6	20.3	22.8	24.4	25.4	28.0	27.8	27.6	25.0	23.4	21.4	19.3	23.7
194	16.1	17.8	18.6	20.3	20.3	19.4	21.3	20.3	19.3	16.5	15.1	14.1	18.3
198	22.2	22.8	24.4	25.0	27.2	28.9	28.3	27.8	28.3	24.4	22.8	22.8	25.6
199	23.9	23.9	25.0	26.1	28.3	29.4	30.0	30.0	28.9	27.2	25.6	24.4	27.2

Table 6. Mean relative humidity of air at selected stations

Ser. No.	Relative humidity, percent, for												Year
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1	39	34	33	29	27	28	39	45	40	36	38	41	36
2	36	31	29	28	27	29	32	44	42	38	40	37	34
3	41	41	42	48	55	62	73	74	69	56	45	42	54
4	29	28	28	30	34	46	64	70	75	45	34	33	43
5	22	20	19	17	23	40	57	69	60	42	35	24	36
6	18	16	14	14	22	39	58	68	59	30	20	22	32
7	76	77	76	73	69	69	67	68	71	75	76	77	73
8	73	71	74	73	72	73	70	71	75	76	74	73	73
9	74	66	70	70	68	67	57	60	62	68	70	71	67
10	81	78	77	75	75	74	74	76	77	77	78	78	77
11	74	72	71	68	65	67	68	70	70	73	71	72	70
12	78	77	77	77	76	75	76	80	80	77	76	77	77
13	71	71	72	69	68	61	43	47	59	70	74	76	65
14	77	73	70	65	60	58	53	53	57	61	65	66	63
15	58	48	43	39	36	31	25	30	37	48	57	60	43
16	72	69	70	75	72	78	80	78	76	73	72	73	74
17	71	66	65	62	66	66	67	65	68	66	68	68	67
20	73	72	66	64	61	52	45	46	56	65	71	75	62
21	49	39	33	27	26	21	17	20	26	38	47	52	33
22	57	50	44	39	34	31	27	31	41	48	55	59	43
23	80	78	75	73	71	70	70	69	72	75	78	80	74
24	73	66	61	61	57	51	48	50	60	68	71	73	62
25	65	57	53	48	44	38	34	34	46	57	63	67	51
26	54	44	37	33	29	23	17	21	29	40	49	56	36
27	56	46	39	33	28	24	22	24	32	42	52	59	38
28	42	37	31	28	28	25	23	25	29	33	40	44	32
29	23	25	17	18	12	9	11	20	18	28	33	39	21
30	28	31	26	27	29	24	21	25	26	29	32	31	27
31	83	80	78	78	75	70	68	69	75	78	83	83	77
32	82	79	77	77	73	70	67	69	76	79	81	82	76
33	81	78	77	77	72	69	67	69	74	77	81	80	75
35	66	68	72	67	58	61	53	57	59	60	60	65	62
36	73	70	71	74	75	73	72	75	77	75	72	73	73
37	67	66	66	68	65	63	61	65	70	71	69	69	67
38	68	62	56	54	51	44	41	48	54	65	68	72	57
39	68	61	56	52	47	47	42	47	51	55	59	69	54
40	65	61	64	67	70	70	69	67	70	69	67	69	67
42	61	54	56	55	52	49	51	50	57	63	60	63	56
43	64	66	61	60	60	64	63	66	67	62	60	60	63
44	77	73	72	64	57	54	63	65	69	69	69	74	67
46	68	67	69	70	72	71	74	72	72	69	70	71	71
48	76	76	73	72	72	74	74	73	75	74	75	76	74
49	78	77	73	65	59	55	59	58	56	56	65	73	64
50	62	53	53	52	46	46	46	49	56	59	57	62	53
51	67	61	59	53	53	52	58	60	61	62	63	66	60
52	60	61	57	55	55	57	56	58	59	55	53	56	57

(Continued)

Table 6. (Continued)

Ser. No.	Relative humidity, percent, for												Year
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
53	68	70	65	69	71	76	78	77	75	69	67	65	71
54	75	75	70	64	57	53	56	56	58	59	63	72	63
55	58	50	47	39	31	28	28	33	35	45	48	51	40
56	69	58	51	46	41	38	39	42	45	53	56	61	50
57	60	54	48	40	30	27	26	30	35	42	52	58	42
58	54	51	40	38	35	29	36	40	43	42	50	55	43
59	47	41	33	28	27	24	26	26	31	35	43	48	34
60	65	60	64	63	69	72	74	76	70	68	66	67	68
61	64	63	61	58	62	59	65	70	68	65	66	64	64
62	81	78	75	65	60	60	67	73	76	78	80	82	73
63	70	66	64	65	69	72	73	71	67	65	66	68	68
64	71	69	68	66	73	73	75	73	71	70	68	69	71
65	76	75	73	73	73	75	77	76	73	72	73	76	74
66	65	63	62	63	67	70	73	69	65	64	64	65	66
67	72	70	68	67	66	69	71	72	70	68	69	71	69
68	82	78	75	68	60	61	68	73	78	80	82	82	74
69	81	78	76	67	62	63	67	71	75	77	79	80	73
70	81	78	76	68	61	63	70	74	77	79	81	80	74
71	83	79	75	67	60	62	68	73	78	80	82	83	74
72	80	74	69	63	56	58	65	70	73	75	79	82	70
73	55	48	45	38	34	38	45	49	50	49	53	56	47
74	79	72	67	60	53	56	62	68	72	73	78	81	68
75	68	66	63	60	59	61	62	65	67	68	69	68	64
76	61	56	52	45	41	44	51	54	58	59	62	62	54
77	68	63	58	50	42	46	51	57	62	64	69	72	58
78	52	45	37	32	28	29	33	36	40	44	51	54	40
79	67	60	55	45	40	45	48	53	60	63	68	70	56
80	53	51	53	55	56	57	59	63	66	61	58	55	57
81	64	58	52	43	39	42	46	51	58	61	65	68	54
82	56	54	53	54	51	51	54	53	58	58	59	59	55
83	69	62	54	41	36	37	42	46	55	62	67	69	53
84	63	56	44	31	27	28	31	32	44	53	59	63	44
85	53	51	51	52	51	52	54	52	54	55	56	54	53
86	51	47	41	35	32	30	31	33	37	42	47	53	40
87	58	54	46	41	38	37	38	38	44	48	55	60	46
88	68	70	74	70	77	78	77	76	78	79	73	68	74
89	45	40	32	27	27	25	26	29	33	35	40	45	34
90	48	40	31	24	22	21	23	26	30	34	39	42	32
91	68	67	65	58	51	42	42	44	50	56	68	69	58
92	69	66	64	59	50	37	34	36	42	58	63	67	54
93	29	24	16	15	22	34	47	52	46	31	30	29	31
94	28	20	16	14	14	29	45	55	42	29	26	30	30
95	62	56	48	40	40	49	66	72	65	48	52	60	55
96	32	25	20	18	27	41	58	67	63	47	35	35	39
97	37	32	27	22	33	45	60	66	60	46	34	38	41
99	21	16	15	13	18	28	45	54	40	25	21	21	27
100	45	37	29	26	38	54	64	72	74	70	52	44	50
101	21	18	16	19	29	41	68	81	68	39	26	24	57



102	23	17	14	14	26	42	61	68	59	37	24	25	34
104	64	59	55	56	56	54	53	55	53	50	57	65	56
105	41	34	27	31	48	66	79	83	80	70	49	42	54
107	23	20	22	35	55	66	73	76	73	66	41	27	48
108	32	33	39	50	65	71	75	75	71	61	44	37	54
109	43	43	45	63	75	79	84	85	84	78	71	58	67
110	35	29	36	45	64	73	78	80	76	71	55	46	57
111	43	41	50	63	85	77	82	83	77	71	63	52	66
112	39	45	53	67	73	75	79	79	74	72	62	53	64
113	74	72	74	76	70	53	39	44	55	67	71	73	64
115	66	68	64	64	62	48	40	48	56	70	74	71	61
116	38	45	51	63	59	59	54	57	63	48	36	40	51
117	78	79	79	81	73	49	44	45	51	72	74	76	67
118	63	58	58	56	57	54	53	53	53	52	58	66	57
119	61	67	67	69	70	65	67	69	66	69	72	69	68
120	82	97	84	80	82	74	79	77	82	85	82	88	81
121	40	34	38	53	54	52	51	52	48	49	47	44	47
122	85	85	84	83	83	85	85	83	83	84	85	85	84
C.I.	79	77	76	74	69	66	65	65	70	73	69	72	71
124	62	60	59	58	52	40	35	33	34	50	57	63	50
125	70	62	64	58	51	38	30	34	39	42	55	67	51
126	66	63	60	58	55	49	49	50	51	55	61	66	57
128	64	62	64	67	72	74	74	71	68	64	58	63	67
129	80	73	65	61	45	36	29	38	39	48	51	60	52
130	70	69	62	56	51	49	47	48	49	54	62	70	57
131	71	56	51	49	39	29	36	34	39	41	56	72	48
133	62	59	55	51	51	50	50	51	51	53	58	62	54
134	69	72	70	74	76	75	75	73	69	69	66	72	72
135	75	70	66	57	59	56	52	49	55	62	68	72	62
137	71	71	71	70	67	64	62	61	61	64	64	70	66
138	70	67	55	42	36	34	34	36	38	45	58	68	49
140	68	65	51	44	34	34	36	38	42	42	53	65	48
142	70	67	61	50	41	38	42	52	64	62	55	68	56
143	74	75	66	55	47	50	65	62	73	62	54	69	64
145	77	81	74	62	49	50	51	57	52	56	54	74	61
146	72	66	59	49	40	40	44	47	49	48	58	67	53
148	85	84	83	82	84	87	86	87	86	74	78	81	83
149	83	76	70	60	43	30	26	28	34	48	67	92	49
150	78	73	65	55	43	30	23	25	27	36	58	80	50
151	73	65	59	48	32	20	19	18	21	28	49	69	36
152	68	60	55	49	33	24	22	23	27	36	55	68	43
153	65	59	49	42	35	28	28	26	29	34	52	64	43
154	69	60	56	48	34	24	25	24	24	34	54	72	40
156	70	58	52	43	32	28	28	29	32	38	56	71	42
158	66	58	50	40	36	33	30	26	25	32	52	71	41
159	81	74	65	58	53	49	49	48	46	55	69	80	61
160	85	81	77	73	77	70	66	65	68	70	77	81	74
161	66	52	47	42	34	26	26	27	29	38	52	65	42
163	69	65	67	61	61	56	43	48	52	62	63	71	60
165	84	80	76	72	74	70	67	67	69	72	76	80	74

(Continued)

Table 6. (Continued)

Ser. No.	Relative humidity, percent, for												Year
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
166	78	77	75	71	67	67	68	70	70	73	75	81	73
167	70	70	64	47	44	40	48	49	61	62	68	75	58
168	67	64	58	45	47	43	56	54	59	61	68	75	58
169	72	70	65	59	56	55	60	63	64	65	68	71	64
171	56	46	39	38	27	16	15	15	15	23	44	50	32
172	77	75	73	70	65	64	67	68	69	71	72	76	71
173	54	47	40	40	32	22	21	21	22	30	47	53	36
174	42	38	34	32	29	17	20	29	28	24	24	34	31
176	56	52	52	54	53	56	53	55	63	61	57	55	56
179	71	72	68	65	62	65	64	65	69	70	69	72	68
180	72	73	71	66	59	72	77	81	76	72	71	71	72
181	67	68	61	53	45	48	56	64	61	59	68	70	60
182	66	67	66	63	65	70	76	77	77	69	69	67	69
183	59	59	63	67	81	90	90	80	66	66	60	58	71
184	62	61	59	60	63	48	58	59	57	51	53	63	58
185	46	40	41	46	36	33	28	34	30	33	35	40	37
186	44	49	50	59	40	38	42	49	40	38	39	43	44
187	74	71	70	68	63	61	58	61	65	62	69	73	66
188	71	70	65	62	60	57	56	59	60	59	62	70	63
189	81	81	82	82	79	76	75	76	72	76	78	82	78
190	71	69	75	76	79	77	75	76	81	78	72	70	75
191	51	52	56	57	49	42	48	55	47	44	49	53	50
192	45	46	45	49	43	48	57	56	50	38	34	36	45
193	69	69	64	62	59	57	56	57	62	64	67	69	63
194	71	71	70	73	71	69	77	77	70	71	72	70	72
195	73	74	75	70	72	68	66	65	68	63	58	71	69
196	75	73	73	74	75	76	75	77	75	71	70	74	74
197	75	76	77	76	77	74	74	75	77	76	74	74	75
198	71	72	74	75	75	64	63	64	64	67	68	69	69
199	71	72	73	74	72	71	69	68	74	72	71	73	72

Table 7. Average number of daily sunshine hours at selected stations

Ser.	Average duration of daily sunshine, in hours, for												
No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1	8.3	9.2	9.5	10.3	10.5	10.3	9.3	9.4	8.8	8.5	8.4	8.1	9.2
2	8.8	9.3	10.0	10.8	10.1	8.8	9.7	9.6	9.0	9.0	8.8	8.1	9.3
3	7.8	8.7	9.4	10.6	10.0	9.5	8.8	8.5	8.3	8.3	8.6	8.0	8.9
4	8.7	9.2	10.0	10.8	10.5	10.0	9.8	9.0	8.8	8.6	8.9	8.1	9.4
6	8.9	9.4	9.8	9.9	9.3	8.9	8.7	8.5	8.7	8.8	9.1	8.3	9.0
7	5.0	5.9	6.9	8.8	9.9	10.8	11.8	11.2	9.5	7.6	5.6	4.6	8.2
8	5.3	5.6	6.1	6.7	7.9	8.7	8.8	8.2	6.3	6.1	5.5	5.1	6.7
9	5.8	6.9	7.5	9.0	10.1	10.8	12.0	11.1	9.6	9.2	6.5	5.9	8.6
10	5.4	6.5	7.1	8.8	9.6	10.0	10.8	10.3	8.9	7.5	6.1	5.5	8.1
11	5.3	6.5	7.1	8.2	9.7	10.4	11.7	11.1	9.6	7.9	6.5	5.9	8.6
12	5.3	6.4	7.4	9.0	9.4	9.8	10.0	9.7	8.9	7.2	5.8	5.4	7.9
13	5.1	6.1	6.7	8.0	9.0	10.0	11.3	10.2	8.6	6.9	5.4	4.8	7.7
14	6.9	7.5	8.1	9.0	9.4	10.7	11.5	10.6	9.4	7.8	7.2	6.6	8.7
15	7.2	8.3	9.4	10.3	10.5	9.8	9.5	9.1	8.9	8.4	7.9	7.4	9.0
16	7.6	8.2	9.2	9.9	9.7	9.6	8.6	8.5	8.5	8.0	7.6	7.4	8.6
17	4.5	5.6	6.7	7.6	9.7	10.0	11.4	10.5	8.9	6.4	5.1	4.7	7.6
18	10.6	10.7	9.9	10.4	10.3	9.9	8.6	8.7	10.0	10.3	10.8	10.6	10.1
19	4.7	6.0	7.1	7.9	9.9	10.2	11.1	10.7	9.1	6.9	5.2	4.7	7.9
20	5.1	5.9	7.0	7.7	8.9	10.4	11.5	10.6	8.9	7.2	5.4	5.0	7.8
21	6.3	7.5	7.5	9.0	9.5	10.9	11.4	10.3	8.9	7.2	7.0	6.2	8.5
22	7.2	7.9	8.4	9.4	10.3	11.1	11.7	10.6	9.0	8.6	7.1	6.8	9.0
23	5.2	5.7	7.6	8.2	9.6	9.9	11.3	10.5	8.9	7.4	5.4	5.1	7.9
24	5.2	7.3	8.0	8.0	10.0	10.2	12.3	10.6	9.4	7.2	6.1	5.3	8.3
25	6.8	8.2	9.0	9.9	10.7	11.4	11.6	10.8	9.9	8.6	7.3	6.6	9.2
26	7.9	8.8	9.9	10.7	11.2	11.6	11.7	11.0	10.0	9.1	8.0	7.6	9.8
27	8.4	9.0	9.5	10.2	10.9	11.0	11.7	11.2	9.8	9.0	8.5	8.1	9.8
28	8.9	9.4	10.6	11.1	11.2	11.6	12.2	11.6	10.8	9.9	9.1	8.2	10.4
30	8.4	9.1	10.0	9.7	10.0	9.2	10.0	9.9	8.9	8.9	8.9	8.4	9.3
31	4.6	5.8	7.0	7.9	9.8	11.0	12.4	11.5	8.9	6.7	5.1	4.3	7.9
33	5.2	5.9	6.5	8.0	9.6	10.6	12.2	11.3	8.6	6.6	5.8	4.9	8.0
34	4.3	6.5	7.7	7.8	8.8	9.0	11.0	9.4	7.8	7.1	4.8	5.5	7.7
35	6.9	7.3	8.0	9.3	10.4	11.5	12.4	11.2	9.4	8.1	7.1	6.4	9.0
37	6.8	6.8	8.2	9.0	10.3	10.7	12.8	11.4	9.3	9.3	7.2	6.9	9.1
38	6.8	7.9	8.0	8.6	10.2	10.2	11.8	11.6	9.5	7.9	7.3	6.9	8.9
39	7.3	7.4	7.9	7.8	9.8	10.0	11.6	10.7	8.9	7.9	7.3	6.7	8.6
40	7.6	8.2	8.2	8.7	9.2	10.1	11.9	11.6	9.5	7.8	7.4	6.7	8.9
43	5.5	6.7	7.3	8.5	9.9	9.9	11.5	10.9	8.6	7.3	6.2	5.3	8.1
46	4.9	6.7	6.6	7.7	9.1	9.9	10.2	9.6	7.9	7.2	6.3	4.7	7.7
48	5.9	7.7	7.7	8.5	10.2	10.1	12.2	11.4	9.1	7.7	7.1	5.8	8.6
49	6.5	7.8	7.9	8.8	10.5	11.2	12.6	11.8	9.7	8.0	7.4	5.5	9.0
53	6.4	8.1	7.6	7.5	9.0	10.9	11.5	11.2	8.2	6.5	6.8	5.4	8.2
55	8.0	8.5	8.3	9.1	10.1	10.3	12.0	11.4	9.1	8.5	8.2	7.5	9.3
59	8.9	9.1	9.5	9.5	11.2	11.4	12.2	12.1	10.3	9.9	9.7	8.4	10.2
60	7.0	7.4	9.0	9.9	9.9	12.3	12.7	12.2	10.9	9.7	7.3	6.8	9.6
61	7.0	7.5	9.0	9.9	9.9	12.3	12.7	12.2	10.9	9.7	7.3	6.8	9.6
64	6.5	7.3	7.8	10.0	10.7	11.9	12.2	11.9	10.4	8.8	8.3	6.6	9.4
65	6.9	7.3	8.6	9.8	10.9	12.0	12.2	11.8	11.0	10.0	8.7	6.6	9.6

(Continued)

Table 7. (Continued)

Ser. No.	Average duration of daily sunshine, in hours, for												Year
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
66	7.0	7.8	9.0	10.6	10.9	11.9	12.0	11.9	11.1	9.9	8.2	6.7	9.8
70	7.0	7.5	9.2	10.1	11.0	12.2	12.1	11.6	10.7	9.4	8.0	6.6	9.6
73	7.4	8.1	9.0	10.2	10.7	12.1	12.0	11.5	10.6	9.5	8.2	6.8	9.7
74	7.3	8.1	8.9	10.2	11.0	12.4	12.1	11.6	10.6	9.3	8.2	7.2	9.7
76	7.6	8.5	9.4	10.6	11.4	12.8	12.6	12.1	11.1	9.8	8.6	7.6	10.2
78	7.8	9.4	9.4	9.5	11.5	12.7	12.3	12.0	8.2	9.6	10.3	8.7	10.1
81	8.1	9.0	9.2	10.1	10.9	12.2	12.3	11.7	10.5	10.0	8.7	7.6	10.0
86	9.5	9.9	10.2	10.5	11.5	12.2	12.4	12.1	11.2	10.6	10.0	9.4	10.8
87	8.7	9.1	10.4	11.3	12.5	13.0	13.4	12.9	11.6	10.3	9.2	8.3	10.9
89	10.1	10.3	10.3	10.4	11.2	11.8	11.3	11.1	10.6	10.5	10.3	9.9	10.6
90	10.2	10.4	10.3	10.0	11.3	11.9	11.0	11.1	10.0	10.7	10.4	9.8	10.6
91	6.9	8.2	9.1	10.4	10.9	10.3	9.9	9.6	10.0	9.9	8.3	7.6	9.3
92	4.0	5.1	6.7	8.8	9.2	6.5	4.9	7.1	8.3	8.7	6.8	5.3	6.8
93	10.1	10.6	10.5	12.0	11.1	10.4	9.9	9.5	9.8	10.2	10.3	10.1	10.4
94	10.6	10.7	9.9	10.4	10.3	9.9	8.6	8.7	10.0	10.3	10.8	10.6	10.1
95	10.1	10.4	10.2	10.8	10.5	10.2	8.4	8.4	9.7	10.3	10.1	10.0	9.9
96	10.6	10.6	10.5	10.8	10.2	9.4	7.7	7.8	8.8	10.0	10.6	10.5	9.8
97	9.8	10.0	9.6	9.9	9.5	9.0	7.5	7.6	8.6	9.1	9.9	9.9	9.2
99	10.3	10.7	10	10.1	9.9	9.2	7.7	7.4	8.6	9.9	10.9	10.5	9.6
101	10.5	10.7	9.9	9.6	9.7	8.6	7.1	6	8.6	10.1	10.8	10.5	9.3
102	10.3	10.6	9.9	10.3	9.8	8.5	7.3	6.8	8.3	9.3	10.6	10.5	9.3
104	10.2	10.2	9.6	10.3	9.6	7.9	7.3	6.8	8.6	9.3	10.3	10.6	9.2
105	9.9	9.9	9.5	9.7	8.3	6.8	5.5	5.9	6.9	8.0	9.8	9.8	8.3
107	9.7	9.3	9.0	8.3	7.7	5.5	5.3	5.9	6.0	7.3	8.6	10.1	7.7
110	9.7	9.3	8.4	7.6	8.2	7.9	5.7	6.2	7.0	7.4	8.9	9.8	8.0
111	9.3	8.2	7.1	6.5	7.8	7.5	5.9	6.9	7.5	7.6	7.9	8.1	7.6
113	8.2	8.8	9.0	9.3	10.0	7.9	7.6	8.9	9.4	10.0	9.7	8.9	9.0
122	9.2	8.9	9.1	8.7	8.8	7.3	7.3	8.2	8.8	8.6	8.7	8.4	8.4
C.I.	6.0	6.3	7.3	6.4	7.5	7.7	7.6	7.5	7.4	7.6	7.7	6.8	7.2
124	4.8	5.5	6.6	7.4	9.3	11.3	11.5	11.3	10.4	8.2	6.4	4.8	8.1
125	4.4	6.0	6.8	7.9	10.0	12.4	12.3	12.0	10.6	8.3	6.8	4.9	8.5
126	3.9	5.0	6.4	8.1	10.3	12.5	11.8	11.3	10.1	7.9	6.2	4.1	8.2
128	4.4	5.3	6.4	10.0	9.6	10.7	10.5	10.2	9.6	8.0	6.4	4.9	8.0
129	5.2	6.4	7.2	8.1	10.0	11.3	12.0	11.5	10.3	8.3	6.9	5.2	8.6
130	3.5	5.0	5.5	7.8	9.4	10.7	8.5	12.0	8.5	8.5	6.0	4.4	7.5
131	5.3	6.6	7.4	8.6	10.3	12.1	12.3	11.7	9.9	8.5	7.1	5.3	8.8
133	5.3	6.5	7.3	8.3	10.4	11.9	11.8	11.4	10.2	8.6	6.9	5.3	8.7
135	4.8	5.9	7.0	8.6	10.6	12.6	12.6	12.2	11.1	8.5	6.6	4.4	8.7
137	4.8	5.3	6.3	7.5	9.9	12.1	11.9	11.3	9.2	8.2	6.6	4.7	8.2
140	6.3	7.4	9.6	10.2	11.4	13.7	13.8	12.9	12.0	9.9	8.0	6.2	10.1
145	6.1	6.6	7.9	9.6	11.7	13.1	13.5	12.8	11.2	9.5	8.3	6.7	9.8
146	5.8	6.4	7.5	9.7	11.2	13.7	13.2	12.9	11.3	9.3	7.0	6.0	9.5
148	6.6	6.8	7.8	8.8	10.7	11.3	11.4	10.9	10.2	8.9	7.9	6.6	9.1
149	5.1	6.0	7.2	8.1	10.0	12.2	12.3	12.1	10.8	8.6	6.9	5.2	8.7
152	6.2	7.2	7.9	8.6	9.7	11.6	11.2	11.4	10.5	8.8	7.1	6.3	8.9
153	6.5	7.6	8.5	8.8	10.4	12.2	12.3	12.0	10.4	9.1	8.2	5.5	9.3
159	7.2	7.9	8.5	8.5	10.9	11.3	10.9	10.7	10.2	9.4	7.6	7.3	9.1
161	8.0	9.0	9.0	8.0	10.0	10.0	10.0	11.0	10.0	10.0	8.0	7.0	9.2
163	8.0	8.9	9.0	8.0	10.0	10.0	10.0	11.0	10.0	10.0	8.0	7.0	9.2

166	7.2	7.2	6.8	8.2	10.6	11.0	10.5	10.6	10.1	9.6	8.8	7.5	8.9
167	6.6	7.0	6.2	7.8	8.3	9.4	8.1	8.6	8.8	8.5	7.6	6.3	7.8
168	6.3	6.2	5.1	6.2	6.8	7.1	6.6	7.3	7.5	7.6	6.8	5.6	6.6
169	5.5	5.8	5.1	5.4	6.4	7.0	6.4	7.6	7.6	7.8	7.1	5.8	6.5
171	8.0	8.5	8.8	9.3	10.0	11.8	12.0	11.6	9.3	9.4	8.3	7.6	9.5
172	7.0	7.2	5.5	7.0	6.6	6.5	6.7	7.3	7.7	7.7	7.8	6.0	6.9
173	7.5	8.3	7.9	8.2	8.7	10.7	10.4	10.3	9.6	8.9	7.9	7.1	8.8
176	8.0	8.5	8.8	9.3	10.0	11.8	12.0	11.6	9.3	9.4	8.3	7.6	9.5
178	7.5	8.3	7.9	8.2	8.7	10.7	10.4	10.3	9.6	8.9	7.9	7.1	8.8
179	7.9	8.0	8.3	9.8	11.3	11.6	10.7	10.5	10.2	9.7	9.2	7.9	9.6
180	9.5	9.8	9.0	11.1	11.6	11.9	9.2	10.4	10.7	10.5	9.6	8.6	10.2
181	8.7	8.6	8.2	10.1	10.9	10.6	9.2	9.1	9.8	10.2	9.8	8.8	9.5
183	8.9	8.2	9.7	9.8	10.4	6.9	2.4	1.1	6.1	9.9	9.9	9.4	7.7
184	9.5	9.8	9.0	11.1	11.6	11.9	9.2	10.4	10.7	10.5	9.6	8.6	10.2
185	10.1	9.3	8.7	8.5	9.9	9.3	8.6	8.1	9.4	10.5	10.5	10.0	9.4
186	10.4	9.5	8.7	8.0	9.8	9.5	7.7	7.8	9.4	10.7	10.6	9.9	9.3
188	7.7	6.5	6.5	8.2	8.2	6.9	6.4	5.4	5.6	8.7	8.6	6.4	7.1
189	8.6	8.5	8.3	9.0	9.4	7.4	6.7	7.2	7.6	9.5	9.8	8.9	8.4
190	10.1	9.3	8.7	8.5	9.9	9.3	8.6	8.1	9.4	10.5	10.5	10.0	9.4
191	10.4	9.5	8.7	8.0	9.8	9.5	7.7	7.8	9.4	10.7	10.6	9.9	9.3
193	7.2	7.0	6.5	8.1	7.9	6.7	4.7	5.8	6.8	8.4	8.9	7.6	7.1
194	8.6	8.5	8.3	9.0	9.4	7.4	6.7	7.2	7.6	9.5	9.8	8.9	8.4
195	6.9	5.6	6.1	6.3	8.5	7.7	5.1	6.5	6.7	8.7	8.6	7.9	7.1
196	6.8	8.9	8.7	9.2	8.7	6.7	6.0	7.2	7.4	9.9	10.2	9.3	8.3
197	8.2	8.3	8.1	7.2	10.2	8.8	7.0	6.8	7.2	9.6	9.2	7.3	8.2
198	7.5	6.9	7.0	8.0	9.0	10.0	9.5	9.0	9.0	9.5	9.5	8.0	8.6
199	9.2	9.1	8.7	8.4	7.7	8.3	6.3	6.2	7.2	9.1	8.4	9.3	8.2

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Table 8. Sky cloudiness (oktas of sky covered) at selected stations

Ser. No.	Cloudiness, in oktas, for												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1	3.1	2.2	2.1	2.0	2.9	3.0	3.1	3.0	3.2	3.9	4.0	4.1	3.2
3	3.0	3.0	2.0	2.0	2.0	4.0	4.0	5.0	4.0	4.0	3.0	3.0	3.3
6	3.0	3.1	2.0	3.1	3.9	3.0	4.1	5.1	4.0	3.2	3.1	3.0	3.4
7	3.5	3.4	3.8	3.4	3.0	2.6	1.4	1.5	2.5	2.7	3.4	3.6	2.9
8	4.0	4.0	4.1	3.9	3.5	3.3	3.0	2.7	4.1	3.9	4.1	4.0	3.7
9	3.4	3.4	3.5	3.6	3.0	2.7	1.5	1.9	2.5	2.9	3.1	3.2	2.9
10	3.5	3.6	3.7	3.3	3.2	3.1	2.1	2.3	2.7	2.8	3.6	3.5	3.1
12	3.4	3.5	3.5	3.3	3.6	3.4	2.9	2.9	3.1	3.1	3.3	3.3	3.1
14	2.8	2.9	3.1	3.0	2.9	2.0	1.4	1.5	2.1	2.7	2.7	2.6	2.5
16	3.2	3.2	3.4	3.4	3.8	3.7	3.2	3.9	3.5	3.6	3.2	3.0	3.4
17	6.0	4.1	4.0	4.0	3.1	2.9	2.0	2.0	3.0	4.0	4.1	5.0	3.7
20	3.9	3.6	3.3	3.2	2.9	2.2	1.5	1.6	2.2	2.8	3.7	3.8	2.9
22	2.0	3.1	3.1	3.0	2.1	2.0	1.2	1.1	1.9	2.0	3.0	2.0	2.2
23	4.1	3.9	3.0	3.1	3.1	2.9	2.1	1.9	2.1	3.0	4.0	4.0	2.9
26	1.7	1.6	1.4	1.5	1.4	1.3	1.2	1.4	1.4	1.6	1.9	1.6	1.5
27	1.4	1.2	1.1	1.3	1.3	1.2	0.7	0.9	1.3	1.3	1.6	1.4	1.2
28	1.4	1.2	1.1	1.5	1.8	1.8	1.0	1.1	1.4	1.5	1.0	1.4	1.4
30	2.1	2.0	2.0	2.1	2.9	3.0	2.2	2.9	3.0	2.1	2.0	2.0	2.4
31	4.3	3.6	3.3	3.1	2.4	1.9	1.0	1.1	2.2	3.2	3.9	4.4	2.9
33	3.8	3.5	3.6	3.1	2.5	2.1	1.1	1.2	2.4	3.2	3.4	3.9	2.8
35	2.4	2.5	2.6	2.2	2.0	1.6	1.0	1.3	1.8	2.2	2.4	2.7	2.1
38	2.6	2.1	2.6	2.7	2.1	2.3	1.3	1.0	1.8	2.3	2.3	2.3	2.1
40	2.0	1.9	2.4	2.6	2.6	2.3	1.2	1.0	1.8	2.4	2.3	2.5	2.1
43	4.0	3.2	3.1	3.0	3.0	1.3	0.6	0.4	1.2	2.9	3.0	4.1	2.4
46	5.0	4.1	4.5	3.2	3.0	1.6	1.5	1.4	2.4	3.9	4.5	5.0	3.4
47	4.0	3.3	3.1	2.5	2.4	2.3	0.8	0.8	1.6	2.4	3.2	3.2	2.4
48	5.1	5.0	4.9	4.1	3.9	2.0	1.9	2.1	2.9	4.8	5.0	5.1	3.9
49	4.1	4.9	4.0	3.2	3.0	1.9	1.1	1.9	2.1	3.0	4.1	4.9	3.2
53	3.5	3.5	3.1	3.0	2.8	1.6	2.4	2.5	2.6	3.0	3.5	3.6	2.9
55	2.0	1.2	2.1	1.9	2.0	1.1	0.6	0.5	1.1	1.9	2.0	2.1	1.5
59	1.0	1.1	1.0	0.9	0.6	0.5	0.5	0.6	0.9	0.9	1.0	1.1	0.8
60	3.4	3.5	2.6	2.7	2.2	1.4	1.5	1.9	1.7	2.2	2.4	2.7	2.4
61	4.0	3.0	3.0	3.0	2.0	1.0	0.5	0.5	1.0	3.0	3.0	4.0	2.3
62	3.3	2.7	2.9	2.5	2.1	1.1	1.4	1.7	1.7	2.1	3	3.4	2.3
63	4.0	3.5	3.4	2.7	2.3	1.6	1.7	2.1	2.2	2.3	3.4	3.7	2.7
64	4.0	3.3	3.2	1.7	2.5	0.9	0.7	1.6	1.7	2.4	3.1	3.4	2.4
65	3.3	3.2	2.5	2.3	1.6	0.9	0.8	1.5	1.6	1.7	2.4	3.2	2.1
66	4.0	4.0	4.0	3.0	3.0	2.0	2.0	2.0	2.0	3.0	4.0	4.0	3.1
67	2.4	2.3	2.5	1.7	1.6	0.9	0.8	0.7	0.9	1.6	2.4	2.5	1.7
68	2.7	2.4	2.2	1.6	1.5	1.0	1.5	1.3	0.9	1.4	2.4	2.7	1.8
69	3.4	2.9	2.6	2.2	1.9	0.9	1.3	1.4	1.1	1.6	2.7	3.2	2.1
70	3.2	3.1	2.5	2.3	1.7	0.9	0.8	0.7	1.5	1.6	2.3	3.2	2.0
71	2.5	2.4	1.7	1.6	0.9	0.8	0.7	0.7	0.8	0.8	1.5	2.4	1.4
72	2.8	2.3	2.1	1.8	1.5	0.9	1.6	2.4	1.7	1.8	2.3	2.6	2.0
73	3.3	3.2	2.3	1.7	1.6	0.9	0.8	0.8	0.7	1.6	2.4	3.2	2.0
74	3.4	3.1	2.8	2.2	2.2	0.8	1.0	1.2	1.6	2.0	3.0	3.4	2.2
75	2.4	2.4	2.4	1.6	1.7	0.9	0.8	0.8	0.8	0.9	2.4	2.5	1.6
76	3.3	3.1	2.4	2.2	1.7	0.9	0.8	0.7	0.8	1.5	2.5	3.2	1.9

77	2.5	2.4	2.3	1.7	1.6	0.1	0.1	0.9	0.8	1.6	2.5	3.2	1.6
78	1.7	1.5	0.9	0.8	0.7	0.6	0.1	0.1	0.0	0.8	1.5	1.6	0.9
79	1.2	1.1	0.7	0.9	0.4	0.2	0.5	0.3	0.4	0.6	0.6	1.2	0.7
80	1.7	1.6	1.5	0.9	0.7	0.3	0.2	0.2	0.1	0.8	0.9	1.6	0.9
81	1.9	1.8	1.6	1.2	1.4	0.2	0.2	0.2	0.3	1.1	1.7	2.3	1.2
82	1.6	1.4	1.3	0.8	0.9	0.1	0.0	0.1	0.2	0.7	1.1	1.9	0.8
83	1.3	1.0	0.8	0.7	0.8	0.2	0.1	0.0	0.1	0.4	0.8	1.3	0.6
84	1.9	1.5	1.6	1.4	1.5	0.3	0.2	0.2	0.2	0.9	1.4	2.0	1.1
85	1.4	1.1	0.9	0.7	0.7	0.1	0.0	0.1	0.0	0.6	0.8	1.1	0.6
86	1.4	1.0	0.9	0.8	0.9	0.2	0.1	0.0	0.0	0.3	0.6	1.1	0.6
87	1.2	0.9	0.7	0.6	0.7	0.2	0.0	0.0	0.0	0.3	0.6	1.0	0.5
88	1.6	1.7	1.7	1.7	1.6	0.9	0.8	0.8	0.8	1.7	1.6	1.5	1.4
89	1.2	1.0	0.9	0.9	0.8	0.3	0.2	0.3	0.2	0.4	0.9	1.1	0.7
90	1.0	1.0	1.0	1.0	1.0	0.5	1.0	1.0	0.5	0.5	1.0	1.0	0.9
91	3.2	2.4	2.4	1.7	1.6	1.6	1.6	1.5	1.7	1.6	2.4	3.2	2.2
93	2.0	2.0	2.0	2.0	2.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.5
94	0.8	1.0	1.4	1.2	1.8	2.4	2.1	2.9	2.3	0.9	0.7	0.8	1.5
95	1.0	0.9	1.4	1.3	1.8	2.5	3.0	3.0	2.2	1.4	0.9	1.0	1.6
96	0.7	0.9	1.2	1.2	1.9	2.4	3.5	3.4	2.6	1.3	0.6	0.7	1.7
97	1.1	1.1	1.7	1.7	2.0	2.6	3.6	3.6	2.8	1.8	1.1	1.0	2.0
99	0.9	1.0	1.6	1.6	1.8	2.5	3.4	3.6	2.8	1.4	0.7	0.8	1.8
102	0.8	0.9	1.5	1.5	2.0	2.8	3.6	3.9	3.0	1.7	0.9	1.0	2.0
104	2.0	3.0	2.0	3.0	4.0	3.0	4.0	4.0	3.0	2.0	2.0	2.0	3.0
105	1.2	1.2	1.9	1.9	2.8	3.8	4.7	4.6	3.8	2.7	1.4	1.2	2.5
107	1.4	1.4	2.4	2.5	3.4	4.6	5.0	4.7	4.3	3.1	1.6	1.2	3.0
110	1.6	2.0	3.0	3.0	3.2	3.6	4.4	4.2	3.6	3.1	1.9	1.5	2.9
111	1.9	2.3	3.5	3.6	3.0	3.5	4.2	3.8	3.4	2.7	2.4	1.9	3.0
113	2.5	2.4	2.4	1.7	0.9	0.8	0.8	1.5	0.9	0.8	0.8	1.6	1.4
114	6.4	4.8	4.0	3.2	1.6	2.4	4.0	3.2	1.6	2.4	4.0	4.8	3.3
115	2.4	2.0	1.6	1.2	1.6	1.2	2.0	1.6	1.2	1.6	2.0	2.4	1.7
116	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.6
117	3.3	3.2	2.4	1.6	1.6	0.8	1.7	1.6	0.8	0.9	1.5	1.7	1.7
118	2.0	3.0	2.0	3.0	4.0	3.0	4.0	4.0	3.0	2.0	2.0	2.0	2.8
119	2.0	2.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	3.0	3.0	3.5
121	1.0	1.0	2.0	4.0	3.0	3.0	4.0	4.0	3.0	4.0	3.0	2.0	2.8
122	3.2	3.2	3.2	3.3	3.3	4.1	3.4	3.2	2.4	2.3	3.2	3.3	3.2
123	3.2	3.2	2.8	3.2	4.0	4.0	4.0	4.0	3.6	3.6	4.0	3.6	3.6
124	4.2	3.6	3.4	3.0	2.2	1.0	0.7	0.7	0.7	1.8	2.4	3.8	2.3
125	4.4	3.4	3.3	3.1	2.2	1.1	1.0	0.8	1.0	2.0	2.6	3.1	2.3
126	4.7	3.9	3.0	2.3	1.4	0.6	0.3	0.2	0.6	1.5	2.5	4.5	2.1
128	4.4	4.0	3.7	1.8	2.4	2.0	2.0	1.9	1.7	2.2	3.0	3.9	2.8
129	3.3	2.6	2.5	2.5	1.8	0.8	0.6	0.5	0.6	1.2	1.7	2.9	1.8
131	3.4	2.3	2.3	2.0	1.6	0.4	0.2	0.3	0.7	1.2	1.9	3.0	1.6
133	3.5	2.8	2.2	1.8	1.0	0.6	0.2	0.2	0.5	1.3	1.7	2.5	1.5
135	4.2	3.6	3.3	2.6	1.8	0.9	0.8	0.6	0.7	1.9	2.6	4.4	2.3
137	4.6	4.2	3.9	3.0	2.2	1.5	1.4	1.5	1.8	2.4	2.9	4.4	2.8
140	2.8	2.7	2.2	1.8	1.2	0.5	0.4	0.3	0.5	1.0	1.9	2.8	1.6
145	3.2	3.1	2.6	2.0	1.1	0.5	0.2	0.2	0.7	1.3	1.6	2.6	1.6
146	3.1	2.8	2.7	2.2	2.2	1.2	0.5	0.5	1.1	1.2	2.0	2.8	1.9
148	3.0	3.0	2.7	2.5	1.6	1.4	1.3	1.3	1.3	1.7	2.0	2.8	2.1
149	3.9	3.5	3.1	3.0	2.2	1.2	1.0	0.7	0.9	1.8	2.5	3.7	2.3

(Continued)

Table 8. (Continued)

Ser. No.	Cloudiness, in oktas, for												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
152	3.1	2.6	2.6	2.6	2.3	1.4	1.7	1.1	1.1	1.7	2.5	2.9	2.1
153	2.9	2.4	1.7	2.5	1.9	1.1	0.9	0.7	1.2	1.5	1.6	3.6	1.8
159	3.2	2.4	2.4	2.4	2.4	0.4	0.8	0.8	0.4	0.8	2.4	2.4	1.6
161	1.8	1.4	1.9	3.0	2.1	2.2	2.1	1.2	1.4	0.9	1.9	2.5	1.9
163	3.2	3.2	2.4	2.4	1.6	0.4	0.4	0.4	0.4	1.6	2.4	3.2	1.8
166	3.2	3.2	3.2	2.4	1.6	0.4	0.8	0.8	0.4	0.8	2.4	3.2	1.9
167	3.0	2.9	3.8	3.1	3.0	2.5	3.2	2.7	2.2	2.0	2.4	3.2	2.8
171	1.9	1.8	2.1	2.1	2.0	1.1	0.9	0.8	1.9	1.4	1.8	2.1	1.7
173	2.4	2.0	2.7	2.8	2.7	1.6	1.8	1.6	1.7	1.8	2.2	2.6	2.2
176	2.4	1.6	1.6	1.6	1.6	0.8	1.6	1.6	0.8	0.8	0.8	1.6	1.4
177	2.4	1.6	1.6	1.6	1.6	0.8	1.6	1.6	0.8	0.8	0.8	1.6	1.4
179	2.1	2.2	2.4	1.8	1.2	1.1	1.6	1.5	1.3	1.2	1.2	2.0	1.6
180	2.4	2.4	1.6	1.6	0.8	1.6	3.2	2.4	0.8	0.8	1.6	2.4	1.8
181	1.6	1.8	2.5	1.5	1.6	1.6	2.4	2.3	1.5	0.9	0.8	1.4	1.7
183	1.6	2.2	1.5	1.7	1.5	3.8	6.5	7.3	4.0	1.2	0.9	1.2	2.8
186	0.6	1.4	2.2	2.8	1.8	2.1	3.2	3.0	1.8	0.7	0.5	0.9	1.8
188	2.5	3.5	3.6	2.7	2.8	3.7	4.0	4.5	4.3	2.0	1.9	3.5	3.3
190	0.8	1.5	2.2	2.0	1.7	2.2	2.6	2.8	1.8	0.8	0.6	0.8	1.6
193	2.9	3.1	3.6	2.7	3.0	3.8	5.0	4.3	3.5	2.3	1.7	2.6	3.0
196	1.9	2.1	2.4	2.1	2.0	3.4	3.8	3.4	3.0	1.5	1.1	1.7	2.4
198	4.8	5.6	4.8	4.0	3.2	2.4	3.2	3.2	3.2	2.4	2.4	4.8	3.7



Table 9. Shortwave radiation flux at the top of the earth's atmosphere,  $\text{cal cm}^{-2} \text{d}^{-1}$ , as a function of the month of the year and the latitude of the location

Month	Geographical latitude, degrees																		
	Northern hemisphere									Southern hemisphere									
	90	80	70	60	50	40	30	20	10	0	10	20	30	40	50	60	70	80	90
January	0	0	0	90	225	380	520	660	780	885	965	1020	1050	1055	1035	1000	1000	1035	1055
February	0	0	70	215	360	505	630	750	840	915	960	975	965	925	865	785	695	645	660
March	40	125	275	425	555	675	775	850	900	925	915	885	830	740	640	510	375	225	135
April	470	480	565	670	750	845	895	920	925	900	840	765	665	545	415	280	130	15	0
May	900	890	855	890	930	965	975	960	915	850	755	650	525	390	250	110	10	0	0
June	1085	1075	1025	1000	1010	1020	1000	965	900	820	710	590	460	315	180	55	0	0	0
July	1010	995	945	945	970	985	990	960	905	830	730	615	480	345	205	75	0	0	0
August	670	660	685	770	830	895	925	935	915	870	795	705	595	465	325	190	55	0	0
September	170	255	385	510	640	740	820	875	905	905	875	820	750	650	525	390	250	100	15
October	0	25	145	285	435	565	685	785	865	910	935	930	900	840	760	660	550	450	440
November	0	0	15	120	265	415	560	685	800	890	955	1000	1020	995	975	920	885	905	920
December	0	0	0	60	190	335	490	630	760	875	960	1025	1065	1080	1075	1060	1090	1140	1160

Table 10. Global radiation at selected stations

Ser. No.	Global/Solar radiation, cal cm <sup>-2</sup> d <sup>-1</sup>												Year	e/m*
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
17	185	237	392	426	470	553	545	456	405	263	185	145	360	m
30	437	508	589	639	656	636	654	606	517	480	427	394	545	m
33	194	253	361	476	579	630	630	566	452	313	226	176	405	m
60	287	360	461	539	592	643	639	612	524	396	310	260	469	e
61	292	365	458	549	603	658	669	647	535	400	318	268	480	e
62	301	368	470	569	613	662	655	632	541	422	329	278	495	e
64	292	358	453	551	595	648	649	625	526	401	312	265	473	e
65	303	374	475	571	619	666	658	632	549	427	330	270	490	e
66	287	352	449	545	593	648	634	610	517	403	309	257	467	e
67	302	363	461	544	600	654	646	618	540	408	326	271	478	e
69	306	376	473	566	616	665	658	638	548	428	337	280	491	e
70	314	380	479	568	617	662	653	634	554	432	342	289	494	e
73	318	376	475	564	604	655	645	630	552	430	430	285	497	e
74	290	375	498	576	635	667	663	610	533	420	319	266	488	m
	321	381	483	568	612	661	562	635	556	434	348	290	488	e
75	323	390	486	575	671	668	671	646	561	440	352	295	506	e
77	335	400	500	583	624	673	669	648	577	451	365	304	511	e
78	338	404	515	588	626	675	673	658	577	448	362	306	514	e
79	350	418	525	604	640	672	670	655	582	467	380	321	522	e
80	366	432	538	618	649	680	675	660	584	476	390	326	533	e
81	359	422	526	605	633	678	670	659	587	474	383	322	527	e
82	364	436	529	604	632	678	571	658	594	477	391	330	522	e
83	473	441	541	614	640	678	675	662	596	486	399	346	546	e
85	388	446	543	611	641	676	669	657	596	486	402	356	539	
86	395	561	557	627	648	674	668	658	601	501	417	362	556	e
87	396	434	574	649	704	717	707	676	606	524	440	387	568	m
	394	459	554	615	644	675	666	656	599	499	417	363	545	e
89	380	495	584	648	698	714	700	659	587	498	440	387	566	m
	406	471	547	619	639	664	653	640	592	498	426	375	544	
90	483	557	612	648	622	589	571	563	562	522	488	455	556	m
91	354	449	539	612	625	577	564	552	547	486	383	340	502	m
94	483	557	612	648	622	587	571	563	561	522	488	455	556	m
96	483	433	576	602	584	459	474	484	562	533	489	466	512	e
99	480	550	590	600	610	560	540	520	570	530	490	472	543	m
102	497	526	536	492	497	456	387	399	370	442	483	480	464	m
105	526	564	602	622	600	570	527	534	552	533	518	501	554	m
107	421	521	527	536	510	448	448	486	484	487	487	476	490	m
110	430	542	478	472	454	450	453	458	535	480	545	475	481	e
111	458	464	462	454	479	459	415	466	509	480	457	445	462	m
122	606	615	614	581	558	492	503	567	613	615	588	570	580	m
148	290	349	450	351	608	645	624	607	536	413	326	270	456	m
167	341	413	454	517	573	599	557	544	507	456	389	330	473	m
168	259	295	323	397	426	457	424	399	371	317	265	220	346	m
169	316	371	403	483	502	523	507	485	466	414	360	309	428	m
173	323	394	451	486	525	580	570	544	513	461	385	320	463	m
180	331	389	459	537	594	586	534	516	495	446	385	335	466	m
181	297	329	383	444	475	449	411	420	400	372	317	271	380	m

183	383	402	457	475	482	433	261	241	353	430	380	348	387	m
184	336	365	439	489	528	497	429	460	495	454	375	318	433	S
185	464	508	522	574	604	598	548	540	584	561	510	454	514	e
186	340	379	411	382	456	424	402	393	444	431	342	334	395	m
188	368	381	434	513	530	527	465	470	476	481	449	379	456	e
189	415	413	454	507	492	466	413	436	426	464	442	402	444	e
192	462	487	525	518	565	526	457	344	508	532	493	448	497	e

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*Explanation*

\* *e/m: e=estimated and m=measured*

Mean daily wind speed at selected stations

Ser.	Average wind speed, km h <sup>-1</sup> , for												
Ser.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
1	11	10	11	10	12	14	14	16	16	13	11	11	12
3	10	10	13	12	12	16	16	13	12	13	12	13	13
5	11	10	9	7	9	7	5	7	4	6	10	10	8
6	11	10	9	7	10	7	6	7	4	6	10	10	8
7	22	22	23	23	24	23	21	21	20	22	22	23	22
9	12	13	14	12	12	13	13	13	12	10	11	15	13
10	9	12	13	14	13	13	13	12	12	12	11	12	12
12	11	13	14	12	13	13	11	11	10	11	13	13	12
13	11	14	18	14	11	11	11	11	14	14	14	14	14
14	9	11	13	13	11	10	11	11	10	9	8	8	10
16	10	12	12	13	13	12	9	10	10	10	8	8	10
17	11	11	10	11	11	10	11	10	7	10	11	11	10
20	8	8	10	11	11	12	11	10	10	9	9	8	9
21	9	8	9	11	10	10	9	8	8	8	9	9	9
22	15	16	17	20	19	17	14	14	14	14	14	13	15
23	11	12	13	14	14	14	13	14	12	10	10	10	12
26	9	12	14	17	17	16	14	14	14	11	10	9	13
27	10	12	13	15	15	14	13	12	12	11	9	10	12
33	9	9	7	8	9	9	9	8	7	7	7	8	8
37	12	10	11	11	10	10	9	8	8	8	9	10	10
38	9	9	9	11	11	9	9	9	9	8	7	7	9
39	9	10	13	16	15	18	15	15	13	10	9	9	13
40	16	17	19	17	18	15	12	12	10	12	13	15	15
43	22	25	22	25	25	22	25	22	25	22	22	22	22
46	21	22	21	18	15	16	18	21	16	14	18	21	18
48	11	14	11	11	17	11	11	11	7	11	11	11	11
49	5	6	6	6	6	5	5	4	4	5	5	6	5
53	16	15	14	14	12	12	12	11	11	12	13	14	13
55	15	13	12	17	16	16	15	13	15	13	12	17	15
59	7	9	9	11	11	11	13	11	11	9	7	7	9
61	20	20	20	20	17	20	25	23	19	16	17	20	20
64	19	19	19	19	16	17	16	15	14	14	15	18	17
65	16	14	18	15	14	15	15	12	11	12	14	12	14
66	16	16	16	15	14	15	16	15	13	11	12	13	14
70	16	18	18	18	18	17	16	13	11	11	11	13	15
72	11	9	9	7	6	6	6	6	6	6	9	9	8
73	14	14	14	14	14	11	11	11	11	11	11	11	12
74	8	9	10	10	11	11	10	10	9	8	7	7	9
76	13	14	17	19	20	29	18	18	19	18	16	13	17
77	8	9	11	13	13	14	12	10	12	13	12	9	11
78	11	13	13	14	12	10	9	9	8	8	8	9	10
79	11	12	13	15	14	14	16	17	14	15	10	12	14
81	6	7	9	10	11	13	10	8	8	7	7	6	8
83	13	14	16	18	16	17	16	14	15	14	12	12	15
85	19	18	18	18	17	14	14	18	14	18	14	14	17
86	6	6	7	7	7	7	8	8	8	7	5	4	7
87	4	4	9	9	11	11	10	8	10	8	7	6	8
89	8	8	9	9	8	9	7	7	8	8	7	7	8

90	14	15	16	16	16	15	14	13	14	14	13	11	14
91	19	19	17	17	15	13	15	13	13	13	15	17	15
92	14	11	11	11	11	13	19	18	11	14	13	13	14
93	11	13	11	10	10	8	10	10	8	8	10	11	10
94	16	16	15	14	16	14	16	15	11	13	14	16	15
95	7	6	7	7	6	9	10	9	7	6	6	7	7
96	10	12	12	11	12	18	18	15	11	7	10	11	12
97	11	11	11	9	9	11	11	10	9	6	9	9	10
99	8	8	10	9	9	9	9	7	6	7	7	7	8
102	14	14	12	11	11	14	14	11	9	11	12	13	12
105	9	9	10	10	12	12	10	8	8	7	7	9	9
107	14	14	10	10	10	8	8	5	5	5	8	12	9
108	7	7	6	6	6	5	5	5	5	4	5	6	6
110	6	6	7	7	7	6	6	6	5	5	5	6	6
111	4	4	5	5	4	4	4	4	4	4	3	3	4
121	4	3	4	4	4	4	4	3	3	4	4	4	4
122	18	14	14	11	14	15	14	15	11	11	11	15	14
C.I.	11	10	7	8	8	12	13	13	10	8	9	9	10
124	14	14	14	13	13	14	12	11	10	10	11	13	13
126	12	12	13	14	15	20	23	20	14	10	8	10	14
128	19	18	16	15	13	13	14	13	10	11	14	18	15
129	9	11	13	13	14	19	20	17	12	9	7	9	13
131	9	11	14	16	17	21	28	22	16	12	8	9	15
133	12	14	14	12	16	17	19	17	12	10	10	11	14
137	11	11	9	11	11	11	11	9	9	8	8	9	10
140	12	13	13	13	13	14	15	13	10	8	9	10	12
146	25	28	27	27	26	31	32	30	25	19	18	20	26
152	5	6	7	6	7	8	9	8	5	5	5	5	7
163	13	15	16	16	17	21	20	17	13	13	13	14	16
166	18	21	22	19	21	23	19	18	17	15	16	18	19
167	4	4	5	6	5	8	5	8	3	4	3	5	5
168	9	11	12	12	12	16	12	15	8	8	7	10	11
169	11	13	14	13	12	12	11	13	9	10	9	14	12
173	5	6	6	6	6	6	6	5	4	4	4	4	5
176	5	4	4	4	4	4	4	4	4	3	3	4	4
179	11	11	11	11	11	11	11	11	9	9	9	9	11
180	9	10	9	9	9	10	10	9	8	8	8	8	9
181	15	15	18	18	24	24	28	23	25	17	12	14	19
183	12	10	9	9	9	12	10	8	9	6	8	10	9
184	3	4	4	3	3	3	3	3	3	3	3	3	3
185	6	7	9	8	9	10	10	12	10	8	7	8	9
186	3	4	4	4	5	7	6	7	5	5	4	4	5
188	7	8	7	7	7	7	8	8	7	6	6	7	7
189	10	11	11	10	9	8	9	8	8	8	10	9	9
192	7	8	8	7	8	6	9	7	8	8	7	7	7
193	5	5	6	6	6	6	7	8	5	4	4	4	5
194	4	4	4	3	2	1	2	1	1	2	4	4	3
195	5	6	7	7	6	7	8	8	6	5	5	5	6
196	23	19	22	19	15	8	7	8	10	22	37	33	30
197	7	6	7	6	5	5	6	7	6	6	5	6	6

Table 12. Mean monthly and annual rainfall

Ser. No.	Rainfall depth,mm, for												Year
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1	1	1	1	1	1	8	8	33	35	8	10	1	108
2	2	3	1	0	4	10	21	56	37	10	4	1	149
3	1	1	1	1	1	1	18	81	38	10	5	1	156
4	1	2	1	1	3	5	32	64	46	15	3	2	173
5	1	1	1	1	4	24	77	127	80	15	2	1	333
6	1	1	1	4	9	27	62	105	55	12	1	1	279
7	114	106	120	90	42	15	1	1	23	99	147	137	895
8	37	38	30	46	40	8	1	1	6	42	30	66	345
9	43	31	52	45	31	15	4	1	13	15	29	58	337
10	66	64	66	43	28	8	1	1	1	49	84	86	496
11	92	86	87	72	36	14	2	2	17	49	72	95	624
12	64	51	54	38	21	2	0	1	7	40	56	85	419
13	112	127	125	117	82	38	8	11	40	137	152	163	1112
14	24	27	39	26	16	9	2	5	11	20	35	21	235
15	12	9	9	9	6	4	2	6	15	17	21	11	121
16	71	25	23	8	5	0	0	0	0	5	33	46	216
17	106	71	60	35	37	14	2	5	39	69	93	114	645
18	93	70	55	82	38	22	3	12	51	112	129	91	758
19	116	76	57	65	36	14	2	4	27	84	93	117	691
20	153	87	71	107	45	23	1	4	24	92	102	101	810
21	9	2	7	8	1	0	1	2	3	10	6	12	61
22	15	10	19	10	15	7	2	4	17	15	21	17	152
23	70	54	35	33	19	7	1	3	16	43	46	67	394
24	33	26	38	30	38	29	10	10	33	29	30	29	335
25	16	12	14	16	22	10	7	9	24	13	9	15	167
26	10	10	4	8	7	1	1	5	10	6	8	9	79
27	10	3	6	1	1	0	0	1	2	3	4	12	43
28	1	7	1	1	0	0	0	0	0	1	0	2	12
29	2	2	1	0	0	3	2	6	5	1	0	1	23
30	4	1	1	2	6	4	3	10	7	2	2	2	44
31	92	111	73	60	30	11	4	7	40	87	109	61	685
32	12	8	15	8	5	1	1	1	5	8	15	10	89
33	70	47	43	42	23	10	1	11	37	52	57	68	461
34	46	60	56	48	34	21	4	18	40	40	53	39	459
35	28	25	36	25	23	13	5	8	38	31	30	25	287
36	25	53	37	40	16	4	1	11	43	55	41	62	388
37	25	17	25	12	10	5	2	2	22	28	30	15	193
38	17	14	21	18	11	5	2	7	12	21	20	15	163
39	11	13	13	8	7	1	0	1	8	9	14	12	97
40	23	18	20	10	8	2	1	3	13	30	31	15	174
41	32	28	27	15	8	1	0	3	18	41	38	242	207
42	9	16	27	8	13	3	0	1	6	9	7	6	105
43	62	38	19	14	3	1	1	1	10	32	41	65	286
44	132	82	65	24	9	2	1	2	11	60	68	113	569
45	71	54	50	31	11	3	0	1	17	33	31	48	350
46	46	34	28	5	10	0	1	1	9	11	57	55	256
47	47	31	22	8	8	2	1	1	5	16	25	61	227

48	66	35	20	5	3	2	0	1	12	25	26	51	246
49	47	35	28	5	10	0	0	1	9	11	58	56	260
50	19	18	27	18	10	2	0	0	5	14	15	15	143
51	22	12	10	4	4	0	0	0	2	11	11	17	93
52	7	6	10	9	4	2	0	0	7	10	4	9	68
53	48	28	12	1	3	1	0	0	8	18	30	37	186
54	40	28	3	2	2	1	0	1	2	7	22	27	135
55	5	3	5	2	2	1	0	1	1	2	5	1	28
56	3	3	2	3	4	0	0	0	3	5	2	3	28
57	1	1	1	1	1	0	0	0	0	1	2	2	10
58	3	1	0	0	0	0	0	0	1	2	1	2	11
59	2	0	0	0	0	0	0	0	0	0	0	0	3
60	41	19	13	5	3	0	0	0	1	21	18	42	163
61	20	13	9	4	3	0	0	0	2	14	19	19	103
62	26	19	13	5	1	0	0	0	0	7	17	24	112
63	60	30	14	5	2	0	0	0	1	10	28	53	203
64	36	19	11	3	4	1	0	0	2	17	20	34	147
65	15	14	11	4	2	0	0	1	1	5	8	17	78
66	50	25	10	3	2	0	0	0	1	6	33	56	186
67	24	16	14	7	7	0	0	0	0	5	14	23	110
68	11	9	7	3	3	0	0	0	0	3	8	10	54
69	25	21	9	2	2	0	0	0	0	5	9	23	96
70	11	8	7	3	3	0	0	0	0	3	7	11	53
71	9	10	6	2	2	0	0	0	0	2	4	10	45
72	3	4	3	0	1	0	0	0	0	2	1	4	18
73	5	3	2	1	1	0	0	0	0	0	3	5	20
74	7	7	8	1	1	0	0	0	0	2	4	6	36
75	4	3	4	1	1	0	0	0	0	2	2	3	20
76	4	4	3	1	2	0	0	0	0	1	3	6	24
77	8	5	4	1	1	0	0	0	0	1	2	7	29
78	5	2	4	1	1	0	0	0	0	0	1	2	16
79	1	1	4	1	0	0	0	0	0	0	0	2	9
80	3	3	2	1	0	0	0	0	0	1	2	1	13
81	1	1	1	0	0	0	0	0	0	0	0	1	4
82	0	0	1	0	7	0	0	0	0	0	0	2	10
83	0	0	0	0	0	0	0	0	0	0	0	0	1
84	1	0	0	0	0	0	0	0	0	0	1	1	3
85	1	0	0	0	0	0	0	0	0	0	1	1	4
86	0	0	0	0	0	0	0	0	0	0	0	0	1
87	0	0	0	0	3	0	0	0	0	0	0	0	4
88	1	1	1	1	0	0	0	0	0	0	5	2	11
89	0	0	0	0	0	0	0	0	0	0	0	0	1
90	0	0	0	0	0	0	1	0	0	0	0	0	1
91	6	1	1	2	2	0	5	2	0	11	52	25	107
92	17	4	1	2	2	1	5	4	1	7	22	16	82
93	0	0	0	1	3	2	20	32	6	2	0	0	66
94	0	0	0	1	4	7	48	70	19	4	0	0	153
95	0	0	1	3	12	28	89	109	52	9	1	0	304
96	0	0	0	2	13	30	109	124	53	14	1	0	346
97	0	0	1	5	26	93	177	192	97	27	5	0	623
98	0	0	0	2	11	22	84	112	44	9	0	0	284

(Continued)

Table 12. (Continued)

Ser. No.	Rainfall depth,mm, for												Year
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
99	0	0	0	2	8	14	71	112	36	6	0	0	249
100	0	0	0	3	21	57	125	157	69	22	1	0	456
101	0	0	1	4	18	43	156	201	65	9	0	0	497
102	0	0	0	2	14	26	105	128	65	19	0	0	359
103	0	0	0	4	28	75	150	184	87	24	1	0	553
104	0	0	0	3	19	41	105	126	72	17	1	0	384
105	0	0	1	13	50	122	169	201	140	33	4	0	733
106	0	0	1	5	32	79	132	138	92	46	3	0	528
107	0	0	6	24	92	116	158	170	135	76	7	0	784
108	0	2	17	55	138	174	222	259	195	93	8	1	1164
109	1	3	20	77	130	119	160	194	144	72	18	3	941
110	1	5	21	67	130	172	191	212	172	126	14	0	1011
111	4	11	42	102	149	118	134	143	111	103	39	10	966
112	8	21	48	95	128	116	169	142	113	112	53	18	1023
113	10	14	26	13	5	1	2	8	9	11	23	13	135
114													
115	0	0	1	3	3	0	0	0	0	2	7	3	19
116	18	13	33	38	81	63	10	41	114	8	13	2	434
117	8	2	5	12	8	1	1	2	1	2	5	5	52
118	3	8	25	61	61	58	42	81	58	10	8	1	416
119	0	3	1	24	60	2	0	2	1	41	14	1	149
120	13	0	8	20	33	0	0	0	3	38	25	25	165
121	2	4	28	113	40	1	3	0	1	47	56	15	310
122	1	0	9	58	56	82	58	40	23	27	36	9	399
123	0	1	9	70	104	98	57	27	45	25	31	1	468
124	79	68	67	65	35	18	6	2	5	20	42	62	469
125	54	43	43	44	18	11	7	1	4	18	28	39	310
126	61	51	43	35	23	6	2	1	0	23	35	58	338
127	36	31	36	24	16	7	4	2	6	17	21	33	233
128	184	102	97	49	21	5	1	3	9	70	90	168	799
129	30	23	27	20	9	4	0	1	3	8	13	22	160
130	74	53	49	33	13	7	3	2	5	23	38	65	365
131	21	18	20	19	7	2	0	0	1	9	15	20	132
132	22	17	23	21	9	4	2	1	2	7	11	21	140
133	39	30	26	12	8	4	3	3	1	11	26	39	202
134	190	110	104	44	16	1	0	0	12	23	101	144	745
135	159	123	76	34	16	0	0	0	1	16	66	113	603
136	155	134	70	41	15	2	0	1	1	18	69	120	625
137	191	157	94	56	18	3	2	2	5	51	132	185	893
138	58	45	89	23	1	0	0	0	0	16	34	94	360
139	121	64	119	32	2	0	0	0	0	45	82	153	618
140	69	74	30	17	6	1	0	0	2	7	35	47	288
141	59	48	62	38	9	4	0	0	3	12	39	106	380
142	72	62	41	29	5	1	0	0	0	4	41	57	312
143	155	135	90	34	5	0	0	0	2	17	60	158	656
144	165	137	103	37	8	0	0	0	5	20	72	171	718
145	59	44	20	4	1	0	0	1	2	3	5	65	204
146	132	132	64	28	3	2	0	0	2	13	71	86	533
147	141	64	88	71	5	1	0	0	0	17	73	145	605



148	104	76	30	13	3	1	0	1	3	18	64	81	390
149	68	70	68	55	22	0	0	0	0	7	35	65	390
150	106	118	141	101	55	1	0	0	0	15	55	126	718
151	68	65	66	57	21	0	0	0	0	8	33	62	380
152	32	26	24	28	8	0	0	0	0	4	12	24	158
153	17	17	14	18	10	1	1	1	1	6	10	19	115
154	32	23	19	27	7	0	0	0	0	5	18	22	153
155	24	20	21	12	3	0	0	0	0	1	5	21	107
156	26	18	14	16	6	0	0	0	0	6	12	19	117
157	40	36	20	11	7	0	0	0	0	4	11	51	180
158	26	20	13	17	9	1	0	0	0	4	10	17	117
159	33	25	11	15	5	0	0	0	0	3	17	26	135
160	18	9	15	13	2	1	0	0	0	2	15	45	120
161	15	7	8	11	3	0	0	0	0	0	25	41	111
162	18	7	8	12	2	0	0	0	0	0	26	39	112
163	23	23	28	5	2	0	0	0	0	2	15	28	126
164	25	21	30	6	0	0	0	0	0	2	4	11	28
165	22	14	12	9	0	0	0	0	1	3	7	34	102
166	17	13	12	8	2	0	0	0	0	0	4	14	70
167	0	1	42	0	0	0	0	0	0	0	0	10	53
168	0	0	52	0	0	0	0	0	0	0	0	8	60
169	0	2	7	0	0	0	0	0	0	0	0	17	26
170	34	6	9	1	7	0	0	0	0	2	21	0	80
171	22	6	23	16	9	0	0	0	0	2	26	8	112
172	15	15	9	15	2	0	0	0	0	1	4	9	70
173	15	6	22	30	10	0	0	1	2	0	8	10	104
174	9	1	5	7	4	0	1	0	0	1	6	4	38
175	3	2	0	0	0	0	0	0	0	9	24	8	46
176	5	2	2	2	2	0	2	2	2	2	25	30	76
177	12	13	12	31	27	10	5	7	5	7	48	18	195
178	0	4	0	6	0	0	5	2	4	4	11	0	36
179	23	23	10	5	0	0	0	0	0	0	10	30	101
180	28	18	10	10	2	3	2	2	0	3	10	18	106
181	11	27	16	14	1	4	0	0	0	2	1	7	83
182	2	2	5	0	2	2	2	2	2	2	2	10	33
183	1	0	2	2	2	5	29	25	3	13	2	8	92
184	12	21	36	110	39	26	45	101	38	0	11	29	468
185	0	7	15	41	1	1	2	2	2	0	0	0	71
186	6	13	19	40	18	6	25	37	5	9	4	3	185
187	5	5	3	3	3	2	13	18	3	3	10	23	91
188	1	5	2	13	14	1	7	36	37	17	1	4	138
189	18	15	12	33	3	0	5	12	4	3	0	2	107
190	2	17	11	25	2	1	1	1	2	5	6	4	77
191	11	33	86	89	97	42	105	183	45	14	8	7	720
192	13	14	34	75	95	46	74	103	60	26	14	2	556
193	4	14	12	18	44	5	39	65	96	45	4	2	348
194	16	32	99	148	243	252	322	333	245	85	42	17	1834
195	13	3	19	36	53	25	28	27	83	33	6	3	329
196	0	4	9	1	0	0	0	0	0	2	0	5	21
197	5	8	8	3	4	2	2	7	15	8	1	3	66
198	6	7	5	5	5	0	2	3	6	3	2	6	50
199	5	3	5	3	2	2	3	5	13	3	3	3	50

Table 13. Annual rainfall series for selected stations

Year	Annual rainfall, mm, at station No.												
	6	23	66	74	97	110	113	126	136	140	Beit Jala*	166	198
1886													15
87													55
88													17
89													85
90													212
1891													82
92													13
93													53
94													84
95													41
96													34
97													34
98													18
99													36
1900													42
													70
1901							193				404		
2							73				521		5
3							92				677		132
4					493		153				530		7
5					543		153				947		128
6					588		119				990		29
7					519		58				525		18
8					455		105				745		22
9					641		46				508		15
10					429		241				650		85
1911					466		250				771		43
12					390		110				584		49
13					335		94				532		17
14					478		109				476		57
15					503		26				490		8
16					657		232				610		28
17					639		36				508		27
18					546		10				502		16
19					384		116				567		18
20					734		123				802		2
1921	202				570		42		649		593		1
22	262				812		125		639		591		30
23	241				744		NA		607		385		45
24	262				736		140		697		512		41
1925	252				462		241		367		260		46
26	167				485		245		866		426		54
27	237				610		203		572		510		103
28	167				503		87		678		380		7
29	213				848		89		853		553	53	98
30	304				514		205		467		448	49	13

1931	221				450		25		668		319	116	55
32	467				778		218		320		369	86	20
33	235				599		119		424		322	43	18
34	325				678		182		638		418	80	26
35	222				870		109		727		519	75	97
36	315				509		67		571		392	155	8
37	183				647		282		481	341	718	49	N.A.
38	135		228	9	394	1318	53		784	843	754	57	N.A.
39	391		75	22	704	1156	183		583	286	692	112	103
40	305		199	15	563	1081	191		839	214	550	169	18
1941	299		155	16	611	1165	137		602	402	670	41	12
42	270	357	93	17	427	944	45		669	380	800	64	26
43	299	598	194	38	570	892	102		629	222	776	53	33
44	288	170	218	36	495	1389	62		888	480	509	62	28
45	288	227	198	30	554	957	194		519	287	801	52	36
46	290	388	144	30	861	1189	168	400	507	137	523	2	23
47	246	263	113	37	497	1352	86	300	538	295	281	102	20
48	232	471	284	25	518	1068	114	421	795	428	586	93	58
1949	184	432	294	24	615	1159	289	226	758	302	505	86	12
50	345	528	150	12	713	1487	41	377	558	136	600	21	42
1951	359	411	130	55	469	985	160	389	581	363	843	59	23
52	332	371	139	54	575	1094	25	274	562	306	644	23	91
53	485	370	164	9	571	1181	67	342	877	290	433	78	61
54	506	563	241	30	557	1117	237	599	658	154	758	105	56
55	386	355	185	16	588	1328	56	205	581	331	664	168	26
56	258	473	250	28	698	1031	121	327	695	358	789	30	25
57	476	482	307	34	474	1210	300	417	667	220	936	110	31
58	355	499	116	3	590	1366	155	272	419	206	779	76	45
59	305	289	203	24	589	1211	52	185	467	104	634	161	95
60	289	321	178	11	439	1197	161	213	373	249	332	10	51
1961	301	268	127	34	599	1100	114	305		247	669	116	9
62	304	422	169	8	574	1387	205	280		141	399	15	27
63	315	483	124	7	743	1275	88	404		341	295	36	43
64	190	464	290	10	555	1365	213	304		272	779	114	19
65	335	335	165	19	600	1004	22	367		218	814	25	18
66	266	254	269	19	616	1429	29	256		462	359	35	97
67	278	520	175	22	661	1033	557	482		254	750	29	32
68	259	317	142	13	549	1100	131	472		323	654	76	32
69	210	633	230	17	451	1269	39	360		176	630	166	10
70	202	243	194	5	518	954	94	182		294	469	9	18
1971	238	610	240	26	550	733	67	393		313	437	46	177
72	268	442	241	62	618	892	290	295		195	757	85	122
73	220	442	138	4	598	1045	66	278		448	472	12	45
74	182	446	405	26	712	1042	153	408		240	973	146	85
75	332	457	147	13	608	1223	17	307		195	493	42	52
76	215	425	164	3	462	1004	75	426		190	416	233	26
77	100	318	184	11	609	1023	248	355		247	500	84	24
78	342	264	171	20	603	1161	151	301		134	603	20	32
79	227	431	160	27	775	1096	59	323		503	436	18	5
80	188	361	82	18	645	971	9	334		301	875	94	12
1981		192	161	4	659	847	276	399		194	658	29	144

(Continued)

Table 13. (Continued)

Year	Annual rainfall, mm, at station No.												
	6	23	66	74	97	110	113	126	136	140	Beit Jala*	166	198
82		322	193	12	710	905	306	320		422	605	197	165
83		173	189	11	482	825	290	294		200	865	80	9
1984		409	118	29	322	945	176	241		279	750	51	10
85		259	203	19	745	1209	94	318		109	650	49	12
86		395	219	19	604	821	116	314		264		55	128
87		324	189	33	473	1259	71	448		359		25	27
88		264	212	40	584		31	499		244		129	45
89		274	332	38	761		464	135		156		67	
90		458	98	21	372		186	178		198		45	
1991		352	405	50	419			319		540		88	
92		340	242	15	574			264		257		132	
93		311						249		163			
94		232						383		279			
95		405						254					
1996		347											
97		286											
98		227											
99		421											
2000		260											
2001		482											
2		260											

*Emplanation*

\* Beit jala is a village in the central part of the West Bank, Palestine at a distance of about 12km southwest of jerusalem.

Table 14. Evaporation measurements at selected stations

Ser. No.	Average rate of evaporation, mm d <sup>-1</sup> , for													Device
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
6	6.6	8.6	11.8	15.4	18.2	19.4	19.8	17.2	17.3	12.7	8.4	7	13.5	P*
17	1.8	2.2	2.5	2.9	2.7	2.8	3.0	3.2	2.9	2.6	2.2	2.0	2.6	CSP**
22	3.0	3.7	5.4	7.0	9.1	11.3	12.4	11.6	8.9	5.9	3.8	2.8	7.1	CSP
23	0.8	1.2	1.8	2.8	3.6	5.3	7.0	6.0	4.4	2.3	1.2	0.9	3.1	CSP
33	2.6	2.7	3.0	4.2	5.7	7.5	8.0	6.5	5.3	5.0	3.9	2.9	4.8	P
	2.5	2.8	3.1	3.6	5.1	6.3	7.1	6.7	5.1	3.6	2.8	2.6	4.3	CSP
37	4.0	4.4	4.2	4.3	5.0	5.0	5.4	6.5	5.9	4.4	4.7	4.2	4.8	P
37	3.5	3.7	4.1	4.3	5.2	6.1	6.3	6.2	5.1	4.1	3.6	3.5	4.6	CSP
38	3.2	4.2	5.5	6.3	8.5	10.2	11.7	10.5	7.8	5.4	3.8	2.9	6.7	CSP
39	2.4	3.8	6.0	8.2	10.3	13.1	14.1	12.6	8.8	6.2	3.4	2.1	7.6	CSP
40	4.1	4.7	4.8	4.4	4.9	5.5	5.8	5.0	5.0	4.4	4.0	3.9	4.7	CSP
59	7.3	9.5	13.1	17.2	20.2	21.5	22.0	19.1	19.2	14.1	9.3	7.8	15.0	P
60	4.8	4.8	5.4	6.5	6.9	6.3	7.0	6.6	7.8	6.8	6.6	5.4	6.3	P
61	6.6	7.3	7.9	8.9	7.9	9.4	9.7	8.2	7.9	7.2	6.9	7.1	7.9	P
62	2.7	3.2	3.9	4.5	5.1	5.1	4.8	4.6	4.5	4.1	3.5	2.7	4.1	P
63	3.9	4.0	4.1	4.2	4.1	4.1	4.1	4.5	4.9	4.7	4.3	3.9	4.2	P
64	6.4	7.4	7.6	7.5	6.9	6.8	6.9	7.5	8.3	8.1	6.8	6.4	7.2	P
65	5.9	6.2	7.7	7.4	8.5	8.8	9.2	9.1	10.0	9.3	7.8	5.5	8.0	P
66	4.8	5.2	5.0	5.3	5.0	4.7	4.7	5.0	5.5	5.2	4.9	4.9	5.0	P
67	3.4	4.0	4.7	4.8	5.1	5.2	5.1	5.0	5.1	4.8	3.9	3.4	4.6	P
68	2.7	3.3	4.1	5.6	6.9	7.4	6.8	6.0	5.1	4.5	3.4	2.7	4.9	P
69	2.8	3.4	4.4	5.6	6.6	6.6	5.8	5.4	4.8	4.2	3.1	2.8	4.6	P
70	2.1	2.8	3.8	5.6	7.2	7.8	6.7	5.7	4.5	3.6	2.7	2.0	4.5	P
71	1.9	2.5	3.2	4.5	5.6	5.9	5.2	4.4	3.5	3.1	2.3	1.8	3.7	P
72	2.9	3.8	4.2	6.0	7.3	7.9	7.6	6.2	4.6	4.0	3.1	2.6	5.0	P
73	2.5	3.3	4.3	5.6	6.9	7.2	6.5	5.6	4.5	4.0	3.0	2.4	4.6	P
74	3.3	4.2	5.3	7.2	9.1	9.2	8.4	7.0	5.5	4.8	3.5	2.9	5.9	P
75	5.1	5.8	7.6	10.1	12.5	13.7	13.2	12.4	10.8	8.8	6.5	5.2	9.3	P
76	5.2	6.8	9.2	12.8	15.5	16.5	15.3	14.2	12.0	10.2	7.2	5.3	10.8	P
77	3.4	4.4	6.0	8.6	11.8	13.3	11.8	10.1	8.0	6.5	4.5	3.2	7.6	P
78	4.8	6.4	8.1	10.3	12.6	14.2	14.4	13.2	11.1	8.4	5.8	4.8	9.5	P
80	7.1	7.8	9.0	9.9	10.6	12.6	11.7	11.4	9.8	7.8	7.5	7.0	9.4	P
81	3.1	4.2	6.1	9.1	11.6	12.4	11.7	10.4	8.6	6.6	4.6	3.2	7.6	P
82	10.7	11.5	13.6	15.5	17.6	21.5	19.5	19.8	17.6	13.7	11.5	10.4	15.2	P
83	3.9	5.1	7.6	10.8	13.7	15.6	13.9	12.8	10.6	7.1	4.9	3.7	9.1	P
84	3.3	4.2	6.5	9.2	10.9	12.4	11.8	11.4	8.6	6.1	4.4	3.4	7.7	P
85	8.0	5.6	9.6	10.0	11.3	12.9	11.5	11.9	11.2	9.4	8.8	7.9	9.8	P
86	6.8	8.3	11.6	14.7	18.2	20.0	19.0	18.4	16.4	13.1	8.9	6.4	13.5	P
87	9.5	11.6	16.3	20.3	24.2	25.1	24.5	23.9	22.6	19.8	13.7	9.9	18.4	P
88	9.6	8.9	7.8	6.3	5.8	6.2	6.0	6.4	5.9	5.6	8.0	9.0	7.1	P
89	7.3	8.8	12.6	16.2	18.0	20.6	18.6	18.6	17.7	14.9	10.2	7.2	14.2	P
90	8.8	10.9	14.4	18.1	19.4	21.5	19.4	17.5	18.2	15.9	11.7	8.6	15.4	P
91	8.4	8.6	9.0	10.1	12.0	15.1	16.4	16.0	11.8	7.8	7.9	8.2	10.9	P
93	13.8	16.2	18.9	20.8	20.8	20.2	18.5	16.1	16.6	16.4	14.8	13.5	17.2	P
94	12.2	14.6	17.2	18.7	17.9	16.6	12.9	10.0	11.7	14.0	13.6	12.1	14.3	P
95	11.2	13.0	15.6	16.6	14.2	10.4	6.6	4.8	5.6	8.6	10.4	10.6	10.6	P

(Continued)

Table 14. (Continued)

Ser.	Average rate of evaporation, mm d <sup>-1</sup> , for													Device
No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	
96	14.3	16.5	20.4	21,5	20.4	18.7	11.3	6.6	7.1	11.4	14.6	13.6	14.7	P
97	12.4	14.8	17.0	17.2	14.6	10.4	7.0	5.4	6.0	8.4	13.0	12.1	11.5	P
99	11.6	14.2	16.2	18.8	18.6	10.3	10.2	7.2	11.0	13.2	12.8	11.0	12.9	P
102	16.0	18.4	21.6	21.8	18.2	15.0	10.1	7.3	8.6	14.5	17.2	15.8	15.4	P
103	18.1	20.0	19.1	14.4	9.0	5.9	3.7	2.9	3.2	4.4	10.2	13.3	10.6	P
105	11.6	13.4	15.6	15.6	12.4	8.0	4.7	3.4	4.0	6.1	9.6	10.9	9.6	P
107	16.5	18.2	15.7	10.9	7.0	4.4	2.9	2.5	2.9	3.7	8.3	13.6	9.0	P
109	10.3	11.8	10.9	8.8	5.3	3.9	2.9	2.4	3.1	3.6	4.6	7.8	6.3	P
110	11.9	12.6	12.0	9.4	6.4	4.7	3.7	3.5	3.9	4.7	7.7	10.2	7.6	P
111	12.3	12.0	9.7	7.4	4.9	4.3	3.3	3.4	4.4	5.4	7.1	9.2	7.0	P
166	1.6	3.2	4.0	5.5	6.4	8.4	7.8	7.3	6.0	4.6	3.1	2.3	5.0	N.A. <sup>x</sup>
167	2.1	3.0	5.2	8.4	9.8	12.3	10.8	11.4	7.0	5.6	3.8	2.8	6.9	CAP***
167	6.1	6.2	8.3	12.5	15.4	14.2	11.4	6.0	8.1	9.2	7.3	6.1	9.2	P
168	4.2	5.9	7.8	12.2	14.1	17.4	15.8	17.0	8.9	8.0	5.7	4.0	10.1	CAP
169	5.1	5.6	5.7	11.2	11.9	12.7	11.7	11.8	9.8	7.9	6.3	5.1	8.7	CAP
173	4.0	5.7	7.8	9.7	12.1	14.6	14.8	13.9	11.7	8.9	5.3	3.9	9.4	CAP
176	6.2	6.2	9.6	11.7	13.2	13.5	12.8	14.6	12.4	12.5	10.1	7.4	11.0	CAP
180	6.1	6.2	8.3	12.5	15.4	14.2	11.4	6.7	8.1	9.2	7.3	6.1	9.2	P
181	8.2	8.8	12.8	19.5	24.5	26.8	23.2	15.3	18.3	15.3	10.1	8.6	16.0	P
183	11.2	9.4	8.2	6.9	6.0	4.7	2.4	1.8	3.7	6.0	9.4	10.1	6.6	P

*Explanation*

*P*\* = *Piche*, *CSP*\*\* = *Colorado sunken pan* and *CAP*\*\*\* = *USWB Class A pan*. \* *Obtained from the Experimental Station at Khulys 22° 08' N, 39° 20' E and 112m high and N.A*<sup>x</sup> = *Not available*

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Table 1. Some particulars of the perennial rivers traversing the surface of the Arab Region

No.	Name of river or tributary	Catchment area, 10 <sup>3</sup> km <sup>2</sup>	Length of main stream, km	Riparian countries
1	Nile	2900	4800	Rwd, Bur, Ugd, Tnz*, Ken, Eth, Sud, Egy
1.1	<i>Upper Nile (Eq. Lakes)</i>	380	2380	Ugd, Ken, Tnz, Sud
1.1.1	Bahr el Jebel	N.A.	1166	Ugd, Sud
1.1.2	Bahr el Ghazal	526		Sud
1.1.3	White Nile	400	980	Sud
1.2	<i>Sobat</i>	225	600	Eth, Sud
1.3	<i>Blue Nile</i>	324.5	1650	Eth, Sud
1.4	<i>Atbara</i>	112.5	880	Eth, Sud
1.5	<i>Main Nile</i>	940	1880	Sud, Egy
2	River Tigris	258	1720	Tur, Irq, Syr
3	River Euphrates	444	2330	Tur, Syr, Irq
4	R. Shatt el Arab	702	190	Irq
5	R. Barada	1.5	79	Syr
6	R. El A'swag	1.2	90	Syr
7	R. Quweiq	4.2	126	Syr, Tur
8	R. El Kabier, N.	1.1	80	Syr
9	R. El Asi (Orontos)	16.9	571	Syr, Leb
10	El Afrin	2.8	149	Syr, Tur
11	R. El Kabier, S.	1.0	90	Syr, Leb
12	R. Jordan	N.A.	225	Jor, Syr, Leb
13	R. Zarqa	N.A.	120	Jor
14	R. Medjerda	23.7	380	Tun, Alg
15	R. Meliana	2.3	110	Tun
16	R. Zeroud	8.8	N.A.	Tun
17	R. Oum Rebja	3.3	600	Mor
18	R. Sebou	37	500	Mor
19	R. Cheliff	43.8	490	Alg
20	R. Tafna	7.2	170	Alg
21	R. W. Shebelle	260	1650	Eth, Som
22	R. Juba	200	1150	Eth, Som, Ken.
23	R. Senegal	218	1790	Gun, Mal, Sen, Mrt

Explanation\*:

Alg = Algeria, Bur = Burundi, Egy = Egypt, Eth = Ethiopia, Gun = Guinea, Jor = Jordan, Ken = Kenya, Leb = Lebanon, Mal = Mali, Mrt = Mauritania, Mor = Morocco, Rwd = Rwanda, Sen = Senegal, Som = Somalia, Sud = Sudan, Syr = Syria, Tnz = Tanzania, Tun = Tunisia, Tur = Turkey and Ugd = Uganda.

Table 2. Names of rivers, gauging stations, their coordinates and respective catchment areas

River	No.	Station Name	Latitude,	Longitude,	Altitude, m	Catchment area, km <sup>2</sup>
<i>Mauritania</i>						
Senegal	1	Bakel <sup>o</sup>	14° 32' N	12° 27' W	11	218,000
<i>Morocco</i>						
Querga	2	Ourtzagh	35° 00' N		140	4,404
	3	M'Jara	34 35	05° 25' W	85	6,190
Sebou	4	Azib Soltane	34 17	05 20	70	17,250
	5	Ain Timedrine	33 45	04 32	645	4,392
Moulouya	6	Dar el-Caid	34 14	03 19	325	24,422
Bouregreg	7	Lalla Chafia	33 42	06 32	180	3,230
Oum er-Rabia	8	Dech. al Oued	32 41	05 54	591	3,330
El Abid	9	Ait Ouchene	32 15	06 05	1070	2,350
<i>Algeria</i>						
Sabaou	10	Baghilia	36° 48' N	03° 52' E	20	2,501
Mazafran	11	F.Cheval	36 40	02 49	10	1,912
Boudouaou	12	Kaddara	36 39	03 25	60	0,829
Isser	13	Lakhdaria	36 37	03 35	90	4,149
	14	Bensekrane	35 04	01° 13' W	287	1,118
Melah	15	Boucheouf	36 27	07° 43' E	95	0,552
Bousalem	16	Sidi Yahia	36 25	04 36	220	4,309
Rhumel	17	O.Athmaniya	36 14	06 18	710	1,220
Cheliff	18	S. Belatar	36 01	01° 22' W	2	43,750
Rhiou	19	Ammi Moussa	35 52	01° 07' E	140	2,398
Mina	20	O. el-Abtal	35 30	00 41	205	6,635
Tafna	21	P. du Chat	35 09	01 27' W	60	7,245
<i>Tunisia</i>						
Joumine	22	Jebel Antra	36 57	09° 28' E	130	0,235
Mejerdah	23	Sloughia	36 35	09 31	67	20,895
	24	Ghardimaou	36 16	08 26	192	1,480
Mellegue	25	K 13	36 07	08 30	327	9,000
Merguellil	26	Haffouz	35 38	09 40	250	0,675
Zeroud	27	Sidi Saad	35 23	09 43	232	8,575
<i>Egypt</i>						
Main Nile	28	El-Akhsas	29 42	31 17	20	
	29	Assiut	27 11	31 06	51	
	30	N.Hammadi	26 03	32 15	69	
	31	Esna	25 19	32 34	80	
	32	Gaafra	24 19	32 54	85	
	33	Aswan Dam	23 58	32 54		
<i>Sudan</i>						
Nile	34	Dongola	19 11	30 29	212	
Atbara	35	K 3	17 42	33 58	334	69,000
Main Nile	36	Tamaniat				
Blue Nile	37	Khartoum	15 37	32 33	363	325,000
White Nile	38	Mogren	15 14	32 50		
	39	Malakal	09 35	31 37		1,800,000
B.el-Jebel	40	Mongalla	05 12	31 46		450,000

*Somalia*

Juba	41	Lugh Ganana	03	39	42	10	179,520
Shebelle	42	Belet Uen	04	47	45	12	211,800
	43	Bulo Berti	03	52	45	40	231,000
	44	Mahaddei Uen	03	00	45	32	255,300
	45	Balad	02	22	45	25	272,700
	46	Afgoi	02	10	45	05	278,000

*Syria*

Euphrates	47	Kadahiyah	36	32	38	15	307	114,000
Asi	48	Jisr Echigour	35	46	36	21	128	5,130
Barada	49	Hama	33	32	36	14	760	467

*Jordan*

Yarmouk	50	Maqarin	32	44	35	52		5,950
Zarqa	51	Jerash Bridge	32	12	35	49		3,100
Jordan	52	Southern Stat.*	33	02	35	38	60	1,495
	53	Obstacle Br.**	33	02	35	37	64	1,376

*Iraq*

Tigris	54	Mosul	36	19	43	09	215	54,900
	55	Fatha	35	03	43	33		107,000
	56	Baghdad	33	18	44	23	34	134,000
Uzaym (Adhaim)	57	Narrows	34	30	44	31		9,840
Euphrates	58	Husseiba	34	25			162	200,000
	59	Hit	33	39	42	49	56	264,100
	60	Hindiyah	32	43	44	16	28	274,100

*Explanation*

°: situated in Senegal, and \* and \*\* in Israel.

Table 3. Mean monthly and annual discharges at the gauging stations on rivers listed in Table 2 (from UNESCO Publications, 1993, 1995 and 1996)

Stat. No.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Period of record
	Mean discharge, m <sup>3</sup> s <sup>-1</sup> , for													
1	126	73.6	38.8	14.1	5.2	86.5	548	2185	3138	1537	526	230	709	1904-84
2	142	159	124	89	47.9	13.8	4.41	2.72	2.53	9.51	37.6	101	61.1	1952-88
3	209	235	174	125	71.5	18.9	10.6	2.5	2.8	13.4	59.6	155	89.8	1951-89
4	103	113	103	83.8	56.1	35.2	32.4	23.6	23.1	27.1	34.9	53.3	57.4	1959-89
5	20.8	26.9	33.5	36.2	28.5	16.1	9.62	7.33	7.31	10.6	10.7	12.7	18.4	1965-84
6	27.6	31.2	33.6	40.7	36.2	20.8	7.00	3.93	7.11	10.6	13.2	13.9	20.5	1957-88
7	2.44	3.51	6.90	4.12	5.71	0.43	0.10	0.11	0.32	0.39	1.92	1.62	2.30	1980-84
8	40.0	59.7	52.4	49.8	29.8	21.2	16.9	15.4	16.3	18.7	21.1	36.2	31.5	1953-89
9	1.90	3.22	6.29	6.87	6.48	2.91	1.52	1.21	1.90	2.01	3.20	1.72	3.27	1980-84
10	24.0	41.4	43.7	37.5	24.6	4.17	1.29	0.35	0.36	0.87	9.45	20.0	18.1	1976-79
11	6.15	23.9	19.1	8.82	4.07	1.25	0.68	0.31	0.50	1.92	2.60	4.33	6.19	1976-79
12	0.76	2.36	1.19	0.94	0.44	0.16	0.07	0.01	0.01	0.06	0.42	0.71	0.59	1976-79
13	6.62	25.9	20.5	11.8	5.02	1.70	1.23	0.32	0.71	2.24	5.13	6.31	7.29	1976-79
14	2.15	3.00	2.62	1.67	1.66	0.77	0.44	0.31	0.50	0.90	1.10	1.40	1.43	1976-79
15	2.60	6.17	4.83	5.43	3.13	0.84	0.42	0.33	0.24	0.88	10.3	2.96	3.18	1976-78
16	6.17	10.9	7.70	9.93	7.13	2.42	1.47	0.52	1.81	1.64	3.45	4.77	4.83	1976-78
17	0.69	0.27	0.20	0.25	0.82	0.34	0.29	0.21	0.19	0.17	0.29	0.46	0.35	1976-78
18	35.3	96.8	31.0	25.6	15.1	4.67	1.73	2.43	8.11	29.5	26.0	31.0	25.6	1976-78
19	5.90	12.1	9.25	3.70	1.65	0.85	0.06	0.14	0.42	3.00	1.97	3.47	3.55	1976-79
20	2.83	3.83	2.00	3.27	2.83	2.31	1.94	2.12	2.51	5.40	3.12	1.61	2.81	1976-78
21	7.37	9.95	8.55	4.92	5.50	2.33	1.43	1.01	1.67	10.2	6.50	6.70	5.51	1976-79
22	2.72	6.57	2.60	2.65	0.72	0.30	0.18	0.12	0.30	0.50	5.30	1.92	1.99	1976-79
23	12.6	26.4	16.6	27.4	17.8	13.8	14.5	13.1	16.3	15.7	32.9	16.5	18.6	1976-79
24	2.85	5.90	4.35	8.65	3.30	0.68	0.26	0.18	0.55	1.71	8.42	4.36	3.43	1976-79
25	1.01	1.45	3.67	9.50	5.50	10.7	4.56	3.57	7.60	2.21	9.71	1.16	5.05	1976-79
26	3.13	2.54	0.47	0.40	0.22	0.32	0.72	0.84	0.36	0.69	0.08	0.22	0.83	1966-82
27	22.7	29.0	2.15	3.17	1.10	1.72	2.51	1.67	1.79	2.97	1.35	2.58	6.05	1949-78
28	1239	1035	1126	1110	1170	1542	1742	1559	1191	1103	1075	1124	1251	1973-84
29	1199	980	1029	1015	1114	1561	1687	1466	1076	990	974	1003	1174	1973-84

30	1314	1279	1379	1331	1481	2011	2124	1799	1396	1275	1264	1258	1493	1973-84
31	1335	1474	1557	1532	1716	2283	2361	2077	1547	1393	1392	1383	1671	1973-84
32	1401	1601	1681	1663	1853	2505	2578	2263	1711	1565	1572	1509	1825	1973-84
33	1387	1608	1675	1666	1891	2493	2574	2246	1675	1542	1547	1491	1816	1973-84
34	1335	1044	847	864	812	837	1967	6982	7930	4979	2611	1694	2666	1900-95
35	6.35	2.46	0.37	1.16	2.99	34.0	573	1914	1275	287	56.0	17.2	350	1903-94
36	1157	943	888	986	930	1103	2389	6030	6012	3732	1955	1422	2303	1911-95
37	270	184	157	165	188	418	1863	5689	5257	2662	946	469	1529	1900-95
38	922	780	752	858	756	691	511	536	863	1129	1075	1026	825	1911-95
39	862	715	624	587	629	788	951	1085	1201	1281	1287	1183	939	1905-95
40	935	893	863	904	1031	1031	1073	1241	1258	1215	1135	1025	1050	1912-82
41	48.7	69.8	45.8	99.1	216	180	162	283	291	477	366	167	200	1951-67
42	17.7	12.5	22.1	42.6	118	44.1	35.7	94.2	144	131	90.2	49.7	67.5	1954-73
43	16.7	9.51	21.3	38.7	99.2	43.1	33.2	92.7	134	127	94.9	47.9	63.2	1954-73
44	19.7	11.6	21.8	36.6	83.9	44.2	28.6	77.1	107	110	86.2	47.6	56.2	1954-70
45	18.2	8.92	17.1	28.9	63.4	36.3	26.6	58.0	85.0	78.5	69.1	43.7	44.5	1954-69
46	14.2	6.82	14.5	29.2	67.8	39.9	27.9	63.6	53.4	84.9	71.2	42.9	42.9	1954-72
47	908	971	1032	1300	1654	1460	846	792	558	643	692	815	973	1976-79
48	67.4	63.4	53.0	35.0	25.1	13.8	7.67	7.85	12.2	23.9	22.9	32.5	30.4	1976-79
49	6.00	9.10	12.9	18.6	15.7	8.82	5.12	3.87	3.40	3.25	3.32	2.25	7.86	1976-79
50	15.3	16.5	16.7	12.6	5.57	4.91	8.14	5.03	5.28	5.29	5.73	8.54	9.13	1965-75
51	4.30	3.33	0.62	3.10	10.6	0.82	0.65	0.68	0.79	0.69	0.92	1.21	2.31	1965-75
52	35.4	38.0	34.5	31.1	19.4	13.1	8.88	10.4	11.8	11.0	12.6	19.8	29.5	1965-72
53	21.3	28.1	31.6	25.1	16.5	10.2	6.07	6.56	9.59	10.6	11.2	13.8	15.9	1976-84
54	558	756	1167	1698	1565	717	308	179	147	180	272	419	664	1931-75
55	1178	1555	2278	3222	2963	1541	752	485	395	404	566	796	1345	1931-75
56	931	1335	1936	2619	2552	1467	703	415	321	326	452	661	1143	1931-75
57	50.4	43.6	68.8	52.2	20.2	4.22	2.64	3.12	1.04	2.56	13.1	31.4	24.4	1941-84
58	765	770	1118	1840	2010	1090	488	380	382	465	518	675	875	1958-84
58	700	705	815	920	1070	990	605	595	560	610	645	755	748	1974-84
59	699	787	1151	2152	2387	1223	530	310	270	343	464	598	910	1931-75
60	588	466	763	1382	1841	1088	481	373	338	288	278	473	696	1965-72

*Table 4. Annual flow series (equal to or larger than 25 years) of large rivers traversing the Arab Region at selected stations*

[illegible]



[illegible]

Table 4. (Continued)

Country River Station	Senegal, Mauritania Senegal Bakel	White Nile Malakal	Annual flow, 10 <sup>9</sup> m <sup>3</sup> y <sup>-1</sup> , for the rivers given below at the respective gauging stations										Tunisia Zurud Sidi Saad	Somalia Juba Lugh Ganana	
			The Sudan		Egypt		Iraq		Morocco						
			Blue Nile Khartoum	Main Nile Dongola	Main Nile Aswan	Mosul	Fatha Baghdad	Euphrates Hit	Sebou A.Soltane	Sebou M'Jara	Ouergha D el Oued	Omme er-Rebia Caïd			Moulouya Dar el- Caïd
Year															
1951	26.2	23.7	44.3	74.9	74.2	14.6	24.5	22.1	21.1	3.04	5.55			8.49	
52	23.1	23.8	46.3	73.4	75.2	24.8	47.1	43.7	31.4	1.66	1.69		0.026	5.55	
53	19.8	24.6	48.8	82.3	83.0	24.5	48.9	44.0	34.6	1.36	1.39		0.039	4.61	
54	33.2	26.9	63.2	102.4	101.8	34.5	64.5	57.3	39.1	2.06	1.59	1.09	0.064	7.01	
55	33.1	27.3	57.9	90.9	91.5	13.9	24.6	22.1	23.4	2.79	4.58	1.00	0.073	3.57	
56	30.2	29.7	59.4	98.0	98.0	22.4	45.4	37.7	27.7	3.29	4.58	1.68	0.144	6.34	
57	32.2	28.0	43.7	77.3	79.6	23.0	47.2	38.0	27.6	1.48	1.64	0.81	0.089	5.37	
58	32.4	25.3	56.4	92.5	94.4	18.2	33.2	29.1	24.0	3.22	2.93	0.93	0.175	8.39	
59	25.5	25.8	54.1	93.2	97.4	13.2	27.5	23.4	20.5	2.46	2.40	0.77	0.133	6.82	
60	19.6	26.1	50.7	78.4	81.2	15.5	30.7	26.3	30.4	5.16	5.65	1.42	0.061	6.31	
1961	29.7	27.9	61.4	99.9	101.6	12.0	26.1	23.3	16.1	1.17	2.01	0.84	0.032	9.85	
62	24.1	34.2	48.9	88.4	100.2	18.8	35.5	29.6	24.3	2.05	3.57	1.22	0.066	5.84	
63	21.1	40.2	44.8	86.9	89.8	38.3	65.0	40.9	42.1	5.25	8.74	2.18	0.075	5.37	
64	30.3	48.5	62.3	110.6	116.2	24.2	48.4	39.1	25.5	2.46	2.87	1.59	0.108	5.08	
65	33.0	47.9	37.7	85.3	92.2	19.5	37.3	32.0	27.0	2.27	2.70	1.06	0.230	4.48	
66	26.5	38.8	35.4	71.4	74.3	24.2	40.3	32.5	36.4	0.97	1.94	0.70	0.033	4.83	
67	33.9	35.9	48.9	92.4	69.2	31.6	44.1	34.7	44.9	0.63	0.93	0.46	0.050	8.30	
68	13.7	35.3	38.5	73.8	53.3	39.2	54.4	37.6	53.0	2.05	2.84	1.04	0.128	N.A.	
69	25.2	34.8	40.9	74.5	53.3	45.9	89.1	50.0	64.0	4.08	5.84	1.54	0.068	N.A.	
70	18.4	35.2	40.1	78.1	54.5	17.7	34.6	26.7	28.0	3.47	5.30	0.98	2.699	7.92	
1971	19.9	36.2	40.7	82.4	55.9	18.8	31.5	25.3	30.4	2.97	4.23	1.86	0.051	6.09	
72	8.1	32.4	23.2	56.8	55.3	23.4	46.6	37.8	30.4	2.15	2.70	1.26	0.069	6.22	
73	11.8	29.9	38.7	68.9	56.3	12.0	32.4	27.3	15.4	1.45	1.21	0.91	0.193	N.A.	



Table 4(a). Mean maximum and minimum monthly discharges of perennial rivers in the Arab Region

Station No.	Monthly mean		Period of record	Station No.	Monthly mean		Period of record
	$Q_{\max}^{\circ}$	$Q_{\min}^{\circ\circ}$			$Q_{\max}^{\circ}$	$Q_{\min}^{\circ\circ}$	
1	6740	0.134	1904–84	31	2460	1064	1973–84
2	523	0.300	1952–88	32	2691	1008	1973–84
3	1553	0.060	1952–88	33*	12345	393	1870–964
4	663	5.3	1960–88	34	12229	416	1912–84
5	83	2.0	1965–83	35	4928	0.000	1918–82
6	155	0.000	1960–88	36	9799	367	1912–73
7	21	0.020	1980–83	37	8834	61	1912–82
8	170	6.1	1954–88	38	x	x	x
9	14.3	0.670	1980–83	39	2396	331	1912–82
10	160	0.110	1976–79	40	2740	331	1912–82
11	72	0.140	1976–79	41 <sup>x</sup>	808	0.000	1951–78
12	6.1	0.010	1976–79	42 <sup>x</sup>	235	0.000	1951–78
13	68	0.020	1976–79	43 <sup>x</sup>	208	0.000	1954–73
14	4.7	0.140	1976–79	44 <sup>x</sup>	140	0.370	1954–70
15	11.5	0.200	1976–78	45 <sup>x</sup>	102	0.000	1954–69
16	24	0.250	1976–78	46 <sup>x</sup>	98	0.000	1954–72
17	1.9	0.110	1976–78	47	2308	440	1976–79
18	60	0.980	1976–78	48	114	5.7	1976–79
19	26.5	0.01	1976–79	49	26	1.0	1976–79
20	6.5	0.110	1976–78	50	53	3.4	1965–75
21	28	0.270	1976–79	51	29	0.240	1965–75
22	13	0.110	1976–79	52	94	4.0	1965–72
23	63	4.3	1976–79	53	50	0.740	1976–84
24	12.5	0.000	1976–79	54	3510	88	1931–75
25	22	0.310	1976–79	55	6580	208	1931–75
26	33	0.000	1966–82	56	5240	171	1931–75
27	536	0.138	1949–78	57	172'	2.6'	1941–84
28	1877	735	1973–84	58	x	x	x
29	1829	750	1973–84	59	5790	72	1932–75
30	2338	985	1973–84	60	2711	55	1965–72

*Explanation*

$Q_{\max}^{\circ}$  = maximum discharge,  $m^3 s^{-1}$ ,  $Q_{\min}^{\circ\circ}$  = minimum discharge,  $m^3 s^{-1}$ , \* = river flow as from 1965 onward is regulated by the Aswan High Dam, <sup>x</sup> = with interruptions and ' = mean discharge for months of maximum and minimum flows averaged over the period of record.

*Sources of information*

Stations No. 1–25, 28–53 and 60 are obtained from UNESCO Reports (1993, 1995 and 1996), Stations No. 26 and 27 from Bouzaiane & Lafforgue (1986), and Stations No. 54–59 from Kamal ed-Din (1981).

Table 4(b). Extreme discharges of rivers during the reported years of record (from UNESCO Publications, 1993, 1995 and 1996)

Station No.	Extremes, $\text{m}^3 \text{s}^{-1}$		Period of record	Station No.	Mean, $\text{m}^3 \text{s}^{-1}$ , of		Period of record
	$Q_{\max}^{\circ}$	$Q_{\min}^{\infty}$			$Q_{\max}^{\circ}$	$Q_{\min}^{\infty}$	
1	9940	0	1904–84*	31	2685	1050	1976–84
2	x	x	x	32	3333	984	1976–84
3	6530	0.05	1951–89	33	x	x	x
4	3560	N.A.	1959–89	34	9583	578	1976–84
5	976	1.83	1965–84	35	x	x	x
6	2030	0.00	1956–88	36	x	x	x
7	151	0.02	1980–84	37	6870	114	1976–79
8	N.A.	N.A.	1953–89	38	x	x	x
9	N.A.	N.A.	1980–84	39	1460	601	1976–79
10	1480	0.09	1976–79	40	x	x	x
11	566	0.01	1976–79	41	x	x	x
12	109	0.00	1976–79	42	x	x	x
13	479	0.04	1976–79	43	x	x	x
14	18.5	0.09	1976–78	44	x	x	x
15	1011	0.18	1976–78	45	x	x	x
16	424	0.19	1976–78	46	x	x	x
17	23.5	0.10	1976–78	47	3685	260	1976–79
18	1137	0.31	1976–78	48	268	5	1976–79
19	434	0.00	1976–79	49	36	0.70	1976–79
20	162	0.09	1976–78	50	x	x	x
21	995	0.07	1976–79	51	213	0.17	1965–75
22	255	0.07	1976–79	52	214	3	1965–72
23	735	1.28	1976–79	53	140	0.02	1976–84
24	1010	0.00	1976–79	54	7340	123	1965–72
25	1354	0.25	1976–79	55	x	x	x
26	740	0.00	1976–79	56	x	x	x
27	1000	0.25	1976–77	57	393	0.50	1983–84
28	2130	822	1976–84	58	x	x	x
29	1968	637	1976–84	59	7366	168	1965–72
30	2546	1007	1976–84	60	3271	15	1965–72

Explanation

\* With interruptions,  $Q_{\max}^{\circ}$  = maximum discharge and  $Q_{\min}^{\infty}$  = minimum discharge.

Table 5. Catchment areas and average discharges of major wadis in Yemen (from ECWA, 1981, Girgirah et al., 1987, Ba'Momen, 1995 and Farquharson, 1996)

Zone	Name of wadi or group of wadis	Catchment area, km <sup>2</sup>	Average rainfall, mm y <sup>-1</sup>	Mean annual runoff, 10 <sup>6</sup> m <sup>3</sup>	
				gauged	adopted
Red Sea Basin	W. Mawr	7910	405	162	150
	W. Surdud	2300	495	69	81.8
	W. Siham	4900	410		72.6
	W. Rima	2250	465	99	50.4
	W. Zabid	4630	515	125	86.1
	W. Rasyan	1990	595	12	16.4
	W. Mawza	1480	480		20
	W. Jizan	1100	475	80	80
	W. Dhamad	1000	450	60	60
	Harad	1700	375		35
	Other wadis	3750	300		62
	Subtotal	33000			707.8
Gulf of Aden Basin	W. Tuban	5340	460	109	125
	W. Rabwa	460	320	6	3.1
	W. Bana	7400	310	170	154
	W. Hassan	3300	200		45
	W. Ahwar	6410	210	71	84
	W. Hajar	9900	100		54-200
	W. Maifa'h	4300	100		24-110
	W. Suhaybiya	1400	200		19
	Other wadis	10110	80		28
	Subtotal	46680			520
Rub al Khali Basin	W. Najran	4400	151		70
	Other wadis (east)	70000	35		135
	Other wadis (west)	16500	40		36
	Subtotal	90900			171
Arabian Sea Basin a- draining towards Ramlat Sabatayn	W. el Jawf	14000	178		170
	W. Adhanah	12000	163	88	100
	W. Harib	2500	100		14
	W. Bayhan	3800	150		15
	W. Markah	4000	110		24
	Other wadis	15500	60		53
	Subtotal	51800			376
b- Wadi Hadramout/Masila tributaries	W. Amd/Du'an	6533	100	20	20.3
	W. Al-Ayn	1500	80	10	9.7
	W. Sarr	2540	45	3	3.0
	W. Idim	5485	70	41	41.3
	Ben-Ali	720	65	4	4.2
	Juaymah	760	35	1	0.2

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b- Wadi Hadramout/ Masila tributaries	Thibi	718	40	2	1.9
	Haynan,	515	55		1.6
	Masila, other wadis	27296	55		82
	Subtotal	46067			164.2
c- Al Ghaydah Basin	W. al Jiza	15000	60		80
	Other wadis	9000	55		27
	Subtotal	24000			107
	Total	292447			2046

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Table 5(a). Monthly and total flow,  $10^6 \text{ m}^3$ , of Wadi Mawr at Shat el-Erg for the period 1975–92 (cited in WRAY Report), Ministry of oil and Mineral Resources of Yemen and TNO Institute of Applied Geoscience, The Netherlands, 1995)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1975	6.90	5.40	6.30	19.66	8.23	24.17	25.02	27.41	17.78	9.81	5.11	6.39	162.2
76	4.45	4.01	6.38	22.84	18.03	13.33	23.77	33.32	24.02	11.79	10.96	10.45	183.4
77	11.59	8.95	10.98	38.84	33.83	13.11	12.06	9.62	14.32	27.75	18.26	16.62	215.9
78	20.71	19.27	17.36	20.14	40.12	20.28	36.11	50.65	42.88	27.50	28.33	21.11	344.5
79	(-)	(-)	(-)	5.46	18.53	3.41	9.75	(-)	(-)	(-)	(-)	(-)	(-)
80	3.40	(-)	(-)	7.94	(-)	5.54	7.09	(-)	19.53	(-)	3.43	2.11	(-)
1981	(-)	(-)	(-)	(-)	(-)	(-)	18.65	(-)	8.08	4.09	3.25	(-)	(-)
82	(-)	(-)	6.05	35.40	26.11	8.45	12.10	31.14	(-)	(-)	(-)	(-)	(-)
83	3.43	6.90	5.12	14.95	12.06	14.95	6.44	7.21	7.30	3.55	2.29	1.35	85.6
84	1.49	1.62	(-)	(-)	(-)	(-)	7.54	10.13	5.40	2.09	1.63	1.30	(-)
85	3.28	1.13	16.17	40.65	16.32	8.39	14.08	18.38	10.68	4.65	2.07	2.37	138.2
86	1.71	2.00	11.85	45.98	23.50	8.16	18.13	30.40	23.62	7.45	5.94	6.81	185.6
87	1.99	3.06	11.67	23.82	13.64	4.88	5.21	24.06	6.16	2.09	1.42	1.48	99.5
88	1.81	2.42	2.55	6.93	2.42	7.33	15.92	19.07	13.31	4.22	2.78	2.30	81.0
89	1.78	1.57	13.71	40.88	10.00	23.78	8.16	33.06	13.16	3.24	0.98	1.42	151.7
90	1.18	7.85	11.63	28.27	4.73	10.50	11.80	12.18	5.93	2.10	1.11	0.84	98.1
1991	0.89	5.08	6.78	25.02	12.90	1.00	13.90	15.04	8.02	2.44	1.94	4.00	97.0
92	0.64	0.64	0.42	1.62	4.72	2.88	27.47	130.74	55.82	10.16	8.41	23.29	266.8

Explanation

(-) Data are not complete or missing



Table 5(b). Monthly and total flows,  $10^6 \text{ m}^3$ , of Wadi Zabid at Kohla for the period 1970–92 (cited in WRAY Report.) Ministry of Oil and Mineral Resources, Yemen and TNO Institute of Applied Geoscience, The Netherlands, 1995

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1970	2.87	1.31	3.12	6.83	5.85	6.31	24.27	20.52	15.95	16.53	3.62	2.79	110.0
1971	3.25	2.16	5.01	5.11	13.21	8.13	18.49	27.52	25.78	8.78	5.80	2.99	126.2
72	3.61	2.39	5.69	10.99	12.27	12.58	25.57	21.73	15.56	6.46	4.47	4.05	125.4
73	3.87	2.03	1.29	2.18	5.59	7.00	12.82	31.23	17.99	6.73	0.03	1.99	94.8
74	2.12	1.43	6.82	4.97	17.10	9.80	22.90	39.71	30.03	11.54	3.22	2.16	151.8
75	2.50	2.36	3.23	9.31	5.03	10.26	39.36	83.50	50.27	17.00	7.58	5.71	236.2
76	2.23	5.09	4.92	11.39	27.84	19.54	20.65	24.37	19.14	9.70	9.06	4.37	161.3
77	5.29	3.55	3.37	8.25	34.53	15.73	11.58	19.53	29.55	48.09	36.23	21.88	237.5
78	10.08	11.11	3.33	4.57	5.97	13.45	36.92	48.51	24.17	12.12	11.43	7.07	188.7
79	6.02	8.07	10.26	18.31	14.06	23.25	55.57	30.46	10.00	4.92	3.83	(-)	184.8
80	3.68	2.95	4.21	4.29	20.53	22.01	9.70	12.49	13.04	9.40	2.92	2.50	108.1
1981	1.12	0.92	26.90	15.02	23.65	13.87	25.48	19.58	14.76	6.93	3.39	2.42	154.0
82	3.92	2.24	4.00	5.59	3.63	3.83	10.87	11.21	21.12	10.30	11.94	4.55	93.2
83	3.76	4.11	4.04	46.77	12.28	5.24	9.79	8.41	13.62	5.17	2.88	2.28	118.4
84	3.82	2.94	2.50	0.81	59.93	6.66	9.66	14.54	8.45	4.97	3.20	3.26	120.7
85	2.06	1.85	1.04	7.87	7.95	7.05	7.88	8.96	8.61	3.54	1.50	1.05	59.4
86	1.10	1.26	2.75	6.47	9.33	5.98	7.23	13.18	12.70	12.63	2.69	1.20	76.5
87	1.32	1.13	7.76	9.14	12.91	8.28	13.42	26.64	20.07	7.22	1.32	0.69	109.9
88	1.20	0.93	0.43	14.34	4.75	5.14	12.53	38.10	12.15	5.56	1.64	1.26	99.9
89	1.45	2.38	1.08	10.46	5.05	11.45	12.53	22.98	11.81	3.98	1.16	0.83	85.2
90	1.23	1.45	0.63	3.90	6.42	2.86	20.47	29.22	16.99	3.20	0.49	0.30	45.8
1991	0.47	0.37	4.84	2.10	13.08	2.49	6.29	8.55	5.29	1.54	6.96	8.41	98.1
92	0.46	0.29	0.17	1.42	12.32	5.96	14.76	20.06	16.30	10.99	0.61	0.34	89.3

*Table 5(c).* Monthly and total flow,  $10^6 \text{ m}^3$ , of Wadi Rabwa at Saba Weir, Yemen, for the period 1973–89 (cited in WRAY Report), Ministry of Oil and Water Resources, Yemen, and TNO Institute of Applied Geoscience, The Netherlands, 1995

[illegible]

Table 5(d). Monthly and total flow,  $10^6 \text{ m}^3$ , of Wadi Bana, Yemen, for the period 1951–77 (cited in WRAY Report), Ministry of Oil and Mineral Resources of Yemen and TNO Institute of Applied Geoscience, The Netherlands, 1995)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1951	(-)	(-)	14.0	10.5	11.0	1.6	13.8	115.5	14.6	3.8	1.5	2.0	188.1
52	1.5	0.8	1.1	11.2	2.7	3.7	11.7	54.3	32.6	0.5	0.4	0.9	121.4
53	0.2	0.1	0.2	33.3	2.4	3.3	50.0	38.5	32.4	3.8	3.9	10.8	178.9
54	1.4	2.4	13.5	10.6	8.8	14.6	66.6	88.1	43.2	16.3	7.3	6.1	278.9
55	14.8	2.6	6.1	4.5	6.0	8.6	20.2	37.5	54.8	4.3	2.8	4.2	166.2
56	2.3	1.3	0.6	12.9	1.1	2.0	14.8	51.3	18.5	20.5	1.5	1.2	128.0
57	1.3	4.8	6.1	56.0	88.0	18.0	18.0	62.4	13.8	5.7	7.3	5.2	286.6
58	5.7	3.8	2.5	10.3	0.3	2.1	17.3	31.5	6.4	2.2	2.1	1.8	86.0
59	1.8	1.6	1.0	0.5	8.8	3.0	12.8	52.0	39.8	4.2	2.4	2.9	130.8
60	1.9	1.7	13.5	21.2	30.3	2.0	10.0	11.7	17.8	14.0	1.1	2.3	127.5
1961	1.1	1.5	1.0	5.4	1.1	4.8	12.1	39.7	18.2	2.1	2.4	1.3	90.7
62	0.4	0.4	3.1	5.8	2.8	11.6	8.0	67.8	46.7	2.1	1.4	1.2	151.3
63	2.2	1.0	0.6	77.0	49.3	8.8	37.4	57.0	17.1	6.7	5.6	2.1	264.8
64	2.0	1.5	0.5	37.3	4.3	4.5	50.6	62.3	33.6	12.5	2.5	3.9	215.5
65	2.9	0.6	0.2	25.8	0.6	0.1	20.9	46.1	15.5	3.4	7.4	1.4	124.9
66	2.2	7.6	1.2	4.6	(-)	3.1	11.7	29.5	32.3	2.7	1.9	0.2	
67	(-)	(-)	3.8	18.2	50.7	(-)	41.4	20.9	13.6	(-)	(-)	(-)	
68	0.3	6.1	1.8	24.7	11.0	7.0	48.4	40.7	27.5	4.9	6.0	0.5	178.9
69	3.1	4.8	12.8	6.7	8.7	(-)	4.2	57.7	31.6	0.7	1.6	4.5	
70	3.9	0.9	30.5	15.8	5.3	(-)	22.3	39.7	12.3	6.7	0.1	0.3	
1971	0.2	(-)	5.2	5.1	27.6	11.0	9.4	13.5	10.5	(-)	(-)	(-)	
72	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	
73	0.2	(-)	(-)	(-)	0.8	0.7	0.8	8.7	20.0	64.2	0.2	(-)	
74	(-)	2.0	2.6	0.2	5.9	6.2	10.3	(-)	(-)	(-)	(-)	3.2	
75	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	
76	(-)	13.0	1.0	19.7	13.3	5.6	8.8	5.4	3.3	2.0	6.8	0.9	
77	0.6	1.7	0.7	19.4	2.3	6.0	5.6	36.0	17.3	(-)	(-)	(-)	



Table 5(f). Mean monthly and total runoff;  $10^6 \text{ m}^3$ , of 19 Wadis over different periods (cited in WRAY Report), Ministry of Oil and Mineral Resources, Yemen and TNO Institute of Applied Geoscience, The Netherlands, 1995)

Wadi	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Mawr	4.35	4.99	9.07	23.65	16.34	10.63	15.18	30.16	17.25	8.20	6.12	6.78	162.3
La'ah	1.06	0.70	1.07	2.35	3.40	2.50	0.90	5.20	6.50	4.60	1.70	1.60	31.6
Surdud	2.76	2.48	2.73	6.53	8.19	4.00	5.01	11.64	7.51	4.50	4.01	2.65	69.3
Rima	2.62	1.66	6.43	9.78	15.71	6.04	17.53	18.38	8.13	4.33	3.75	2.63	98.9
Zabid	2.93	2.71	4.67	9.13	14.58	9.86	18.64	25.30	17.97	9.88	5.48	3.73	125.0
Rasyan	0.48	1.09	0.74	1.41	1.40	1.47	0.88	0.89	2.02	2.56	0.66	0.19	11.9
Tuban	0.89	0.52	0.25	4.58	8.83	8.87	12.37	27.67	31.00	9.53	3.24	1.69	109.4
Rabwa	0.03	0.40	0.72	0.50	0.60	0.09	0.32	0.96	1.77	0.65	0.01	0.00	5.76
Bana	2.37	2.87	5.15	18.19	14.30	5.83	21.08	44.49	23.89	8.32	3.15	2.71	169.9
Ahwar	0.23	3.03	35.84	10.26	10.37	1.06	3.11	3.26	10.55	1.22	0.29	0.00	70.9
Adhana	0.00	6.24	9.08	36.33	14.93	0.63	2.47	10.82	0.94	4.05	0.21	1.83	87.5
Amd/													20.3
Du'an													9.68
Al-Ayn													3.00
Sarr													4.15
Ben-Ali													0.75
Juaymah													41.30
Idim													1.90
Thibi													51.0
Masila													

#### Explanation

The mean annual flow volume is calculated as the mean of available, complete annual flow volumes.

Periods of record used in calculation: W. Mawr; 1975–92, W. La'ah; 1975–77, W. Surdud; 1965–67 and 1984–91, W. Rima; 1976–85, W. Zabid; 1970–92, W. Rasyan; 1981–84 and 1987–92, W. Tuban; 1973–80, W. Rabwa; 1973–89, W. Bana; 1951–77, W. Ahwar; 1972–89, W. Adhana; 1987–94, and W. Amd/Du'an and the remaining wadis; 1977 and 1987–81.

Table 6. Catchment areas and average discharges of major wadis in Oman (from ECWA, 1981, Country report of Oman, 1986 and Mohsen et al., 1995)

Zone	Name of wadi or group of wadis	Catchment area, km <sup>2</sup>	Average rainfall, mm y <sup>-1</sup>	Mean annual runoff, 10 <sup>6</sup> m <sup>3</sup> gauged	adopted
Musandam Peninsula					23.4
	Subtotal				23.4
Al-Batinah (east and middle)	Lansab				3.9
	Ar-Rasiel				3.2
	Samail	2400	193		36.4
	Taww	310	167		3.9
	Al-Ma'awel	730	187		13.7
	Bani-Kharus	1050	187		34.7
	Al-Far'	1290	195		33.9
	Bani-Ghafer	878	232		27.9
	Hajer	495	200		8.5
	Mabrah	1090	138		9.1
	Minor wadis				5.0
	Subtotal	8233			180.2
Al-Batinah (north)	Hulu	254	211		5.4
	Hatta	780	172		13.3
	Al-Fay	306	225		4.1
	Rajimi and Zabin	725	187		9.5
	Fizh	290	186		7.7
	Bani-Omar	490	155		15.9
	(north and south)				
	Souq				1.9
	Jizzi	1250	174		24.9
	Yanbu/Salahi				6.0
	Al-Hilti	910	193		10.0
	Saken/Shida	360	124		4.4
	Sarami	550	150		8.3
	Shafan/Kanut	824	190		8.1
	Al Hawasina	620	163		11.1
	Ahen	830	180		7.5
	Sohar	880	132		6.9
	Al-Gharbi	420	177		3.7
	Shinas	290	124		2.1
	Aday	1200	113		9.4
	(Aday)/Mayh				
	Harabis, Shab	1400	250		21.0
	Tiwi,				
	Minor wadis				3.4
	Subtotal	12379			184.6
Sharqiyah (Eastern) and coastal plains	Dayqah	2000	175		43.3
	Mijlas	450	166		10.9
	Ben-Khaled	400	250		4.1
	Al Batha	8300	175		72.5

	Fulayj	830	190	21.5
	Andam/Samad	3170	140	23.5
	Ibra	189	225	6.2
	Bani Battash	188	200	3.2
	Aghda	595	200	10.3
	Qanet			3.9
	Upper Saad			5.8
	Upper Ethly			3.4
	Ghulaji	758	87	3.5
	Fath			0.5
	Mangrid			3.3
	Al-Zaher			2.7
	Tima			2.9
	Salim			1.0
	Al-Qabil			28.3
	Subtotal	16880		250.8
Interior (Northern) Dhahirah	Jufra	720	168	5.2
	Al Ayn	1490	173	14.8
	Al Kabir	863	169	14.1
	Al-Aridh	661	225	3.3
	Yanqul	1460	250	6.6
	Lusayl	1726	247	17.5
	Sharm	478	250	2.7
	Sumayni	298	225	3.6
	Bijalah	207	225	1.4
	Al-Khubayb	206	225	3.9
	Buraymi/border wadis	2750	163	35.9
	Muraykhat	250	168	2.1
	Sifa	290	168	6.6
	Tumayma	1590	168	26.7
	Datah	200	168	1.4
	Dank	1250	168	12.5
	Mangal Helm			
	Minor wadis			73.3
	Subtotal	14439		231.6
Interior (north central and coastal	Jahla	350	190	6.7
	Al Abyadh	1040	192	20.0
	Al Ajai	260	154	4.0
	Ma'will	730	177	12.9
	Rubkhab	520	186	9.7
	Al Hawqayn	1160	185	21.5
	Subtotal	4060		74.8
Interior (Southern)	Al-Ula	630	138	5.7
	Sifam	610	152	16.4
	Bahla	1000	220	45.4
	Halfayn	420	214	14.1
	Muaydan	340	220	13.2
	Nizwa			25.3

(Continued)

Table 6. (Continued)

Zone	Name of wadi or group of wadis	Catchment area, km <sup>2</sup>	Average rainfall, mm y <sup>-1</sup>	Mean annual runoff, 10 <sup>6</sup> m <sup>3</sup> gauged      adopted
	Tenuf			9.1
	Al-Ghul			4.4
	Subtotal	3000		133.6
Remaining Omani wadis	Dhigda	105	175	
	Aqbiyah	622	165	
	Mistal	1010	215	
	Haylaln	702	193	
	Huthal	600	200	
	Doqal	540	200	
	Al-Khabiyat	662	180	
	Bld	175	150	
	Dawr	475	207	
	Ham	387	200	
	Fujayra/Dahnah	663	225	
	Dhabb Shansi	236	250	
	Limah	140	250	
	Khafifah	394	225	
	Bani-Habib	789	227	
	Al-Habyat	369	275	
	Maqniyat.Khawir	1028	250	
	Al-Shukayyah	205	250	
	Jawwal/Mudabbah	618	225	
	Al-Musaydirah	319	225	
	Ausaq	400	225	
	Nagab/Shan	587	250	
	Subtotal	11026		71.0
	Total	70017		1150.0



Table 7. Catchment areas and average discharges of the major wadis in Saudi Arabia

Zone	Name of wadi or group of wadis	Catchment area, km <sup>2</sup>	Average rainfall, mm y <sup>-1</sup>	Mean annual runoff, 10 <sup>6</sup> m <sup>3</sup>	
				gauged	adopted
Asir-Wadi Dawasir Province (II)	Turabah	3720	200–300	35	
	Ranyah	11950		30	
	Bishah	35780		150	
	Tathlieth	29782		60	
	Dawasir			(-)	
	Subtotal	82400			330
Asir-W. Najran Province (III)	Idemah	6475	200–300	5	
	Habawnah	4930		65	
	Tabalah	1270		25	
	Najran	4800	250	90	
	Subtotal	146000			135
Er-Riyadh Province (V)	Tuwayq Mountains				200
	Marrat formations				15
	Aruma formations				70
	Other formations				15
	Subtotal	105000			300
Red Sea Coastal Belt Province (VI)	Sabya	843	275	30	
	Khulab	869	500	60	
	Dhamad	1084	346	37.5	
	Jizan	1100	550	80	
	Liyyah	1293	266	37.5	
	Itwad	1553	163	55	
	Was'a, Qarah, A'qas, and Shahdan				100
	Atoud	(-)	(-)	(-)	30
	Shafaqah and Hali				110
	Tieh and Yiba				60
	Qanunah				50
	Eyar and Al-Lith				45
	Fatima				45
	Khulays	5220		65	55
	Baysh	5164	350	235	
	Rabigh		300–400		65
	Subtotal	194000			1060
North Tuwayq	Sudair, Meshgar / Namil, Northwest	152800	50–100		95
	Aremah, Ashirah and Marrat formations				
South Tuwayq Wadi Birka-	Al Maqran/Jadwal	48300			55
	Hawtah, Nesah,	162300			100

(Continued)

Table 7. (Continued)

Zone	Name of wadi or group of wadis	Catchment area, km <sup>2</sup>	Average rainfall, mm y <sup>-1</sup>	Mean annual runoff, 10 <sup>6</sup> m <sup>3</sup>	
				gauged	adopted
Nesah-Sahba	Hanifa, Sahba				
Ar Rema-Hafr	W. Ar Rema, Hafr	1023700			20
el Batin	el Batin, R. el-Khali, An Nafud, W. Sarhan				
At Taif	Wajj and Aqiq	43200			25
Al Jawf	As Sirhan	192300		N.A.	N.A.
	Subtotal	1622600			
Total		2150000			2120

Table 8. Catchment areas and average discharges of major wadis in the United Arab Emirates (ECWA Report, 1981, Traditional water Irrigation, 1982 and Country Report of of United Arab Emirates, 1986)

Zone	Name of wadi or group of wadis	Peak flow, $\text{m}^3 \text{s}^{-1}$	Probable duration, h	Probable flood volume, $10^6 \text{ m}^3$ $10^6 \text{ m}^3 \text{ y}^{-1}$	
E. Drainage East Coast	Qar (near J.Faiyah)	42.5	20	1.500	
	W.Ham (near Bithna)	29.5	2	0.105	
	W. Farah (U.S. old village)				0.037
	W. Farfar (U.S. Farfar)				0.510
E.Drainage (Southern Area)	W. Hatta				0.610
	W. Ghor				0.750
	W. Masfut (Warrah)				0.560
	(Masfut)				0.265
W. Drainage (Central Area)	W. Siji (near Siji)	50.5	4	0.360	
	W. Murrad				0.440
	W. Ghail				0.366
	W. Lamah (near Falaj al-Mulla)	87.4	20	3.140	
	(near T. Qaran)	54.7	12	1.180	
	W. Bih (near Burayrat)	190.5	54	17.440	
	(near Al-Fulayyah)	58.4	15	1.580	
	W. Semaini (near T. Bahuth)	76.5	20	2.760	

Table 9. Estimated annual storm runoff for wadi basins in Jordan (ECWA Report, 1981 and Biswas (editor), 1994)

Area/Wadi	Year	Annual rainfall volume, $10^6 \text{ m}^3$	Runoff coefficient %	Estimated surface runoff, $10^6 \text{ m}^3 \text{ y}^{-1}$
<i>Eastern Jordan Valley</i>				
W. Arab				6.5
W. Ziglab				2.2
W. Jurum				0.2
W. Yabis				1.6
W. Kufrinja				1.0
W. Rajib				1.3
W. Zarqa				46.5
W. Shueib				1.8
W. Kafrein				1.4
Subtotal	average	1025	6.1	62.5
	dry	811	3.8	30.8
	wet	1271	8.3	105.5
<i>Dead Sea Basin</i>				
W. Zerqa Ma'an				3.0
W. Wala				16.6
W. Mujib				20.7
W. Al-Kerak				3.2
W. Hasa				4.9
Subtotal	average	1345	3.6	48.4
	dry	914	1.8	16.5
	wet	1810	5.4	98.8
<i>Desert Basins</i>				
Subtotal	average	2068	1.4	29.2
	dry	1381	0.3	4.7
	wet	2755	2.8	78.3
Total	average			140.1
	dry			52.0
	wet			282.6

*Table 10.* Some data of seasonal (wadi) streams in Algeria and their respective catchment areas (from Rapport National de la Republique Algerienne Democratique et Populaire, 1983)

Name of principal catchment	Catchment area, km <sup>2</sup>	Annual rainfall depth, mm	Annual rainfall volume, 10 <sup>9</sup> m <sup>3</sup>	Surface runoff, 10 <sup>6</sup> m <sup>3</sup> y <sup>-1</sup>	Runoff coefficient, %
Chott Chirgui	49400	240	11856	240	2.02
Zahrez	9100	270	2457	60	2.47
Chott Hudna	25800	290	7513	250	3.33
Chott Merhir	59200	255	14956	380	2.54
Plains south of Mount Ksour	22700	250	5675	150	2.64
Guir	22600	150	3390	200	5.90
High Constantine Plateaus	9600	400	3840	200	5.21
Total	198000		49687	1480	2.98

*Table 11.* Some precipitation, runoff and runoff coefficient data of the Gorgol and Ghorfa Wadis, Mauritania, for the period 1977–79 (ORSTOM/WMO Report PROJET MAU 77/005, 1980)

Name of wadi and year of observation	Catchment area, km <sup>2</sup>	Annual rainfall depth, mm	Annual rainfall volume, 10 <sup>6</sup> m <sup>3</sup>	Surface runoff, 10 <sup>6</sup> m <sup>3</sup> y <sup>-1</sup>	Runoff coeffi- cient, %
<i>White Gorgol</i>					
1978	8370	237	1984	47.5	2.4
<i>Black Gorgol</i>					
1977	8950	200	1790	213	11.9
1978		261	2336	287	12.3
<i>Ghorfa</i>					
1979	5020	301	1511	260	17.2
Total	22340		7621	807.5	
Average			5558	557.5	10.0

Table 12. Hydrogeological characteristics of the groundwater basins in the Western and Central sub-regions (from Gischler, 1979 and ECWA, 1981)

Basin/Aquifer	Areal extent, $10^3 \text{ km}^2$	Countries sharing the resource	Thickness, m	$T^*$ , $\text{m}^2 \text{ d}^{-1}$	$S^{**}$ , $10^{-4}$	Well yield, $\text{l s}^{-1}$	Salinity, ppm	$R^\circ$ , $10^6 \text{ m}^3 \text{ y}^{-1}$	Storage $^\circ$ , $10^6 \text{ m}^3$
Grand Occidental Erg	330	Morocco	250–300	40				300	
Grand Oriental Erg	375	Algeria and Tunisia						600	
Tanzarouft	240							20	
Fazzan	175	Libya						60	
Marzuq (including Fazzan)	350	Libya, Chad, Algeria, and Niger		500*–2500	50*–0.1				
Nubian sandstone basin	1800	Chad, Libya, Egypt and Sudan	> 500	250–1200				4–140	
Kufra	675	Libya							
Upp.aqui				300–3500	1–150				
Sarir									
Upp. aqui			4000	500–6000					
Low. aqui									

Explanation

\* $T$  = transmissivity, \*\* $S$  = storativity,  $^\circ R$  = recharge and  $^\circ$  = down to 300m depth.

Upp. Aqui = Upper aquifer and Low. Aqui. = Lower aquifer.





Table 14. Hydrogeological and lithological data of groundwater aquifers in Mauritania (from country Report of Mauritania, 1986)

Basin No./name	Surface* area, km <sup>2</sup>	Exploitable resource, 10 <sup>6</sup> m <sup>3</sup>	Depth below surface, m	Depth of well, m	Well discharge, m <sup>3</sup> h <sup>-1</sup>	Lithology	Remarks
1- Sedimentary basin south east of Mauritania	90000	25-55	5-80	40-150	20-70	Sandstone	Artesian
2- Sandy aquifer of the Aoukar	130000	22-47	15-30	10-70 20-40	2-5 2-5	Sand	
3- Continental Intercalary Sand-stones of Dhahr el-Na'ama	13000	3-6	50-70	10-20 50-70	10-20 1-4	Sandstone Sandy clay	
4- Sandstone aquifers of the Infra-Cambrian (Al-Ajoun)	35000	2-5	5-35	60-100 25-40	5-50 2-6	Sandstone Fractured sandstone	
5- Primary dolomites aquifer at the foot of the Tagant and Assaba Plateau	400	60-120	10-15	20-40 12-20	60-150 2-6	Fractured and karstified dolomites	Artesian
6- Primary sandstone aquifer of the Tagant and Assaba Plateaus	15000	N. I.**	N. I.	100-120	5-20	Fractured sandstone	
7- Discontinuous aquifers (pelites and dolomites)	50000	50-100		50-70 15-30 70+ /20	1-10 1-4 4-6	Fractured pelites/ dolomites	
8- Alluvial aquifers at or near the ground surface	8500	300-800	5-10	15-30 10-25	10-25 0.5-10	Silt, gravely sands and clays	Recharge by seepage from Senegal River
9- Discontinuous aquifers of the Mauritanide arch	55000	N. I.	N. I.	50-70 70+ /20	N. I.	Fractured Schistes	

(Continued)

Table 14. (Continued)

Basin No./name	Surface* area, km <sup>2</sup>	Exploitable resource, 10 <sup>6</sup> m <sup>3</sup>	Depth below surface, m	Depth of well, m	Well discharge, m <sup>3</sup> h <sup>-1</sup>	Lithology	Remarks
10- Discontinuous aquifers of crystalline rock, north of Mauritania	250000	N. I.	N. I.	50–70	N. I.	Crystalline rock	
11- Primary sandstone aquifer of the Adrar	50000	N. I.	N. I.	50–100		Fractured sandstone	
12- Pre-Cambrian sandstone and calcareous aquifers of the Adrar	35000	N. I.	N. I.	40–?	5–15	Calcareous sandstone	
13- Aquifers of the primary formations of the Tendouf Basin	1200	N. I.	N. I.	N. I.	N. I.	N. I.	
14- Aquifers of the primary and secondary groups of the Taoudeni Basin	300000	N. I.	N. I.	N. I.	N. I.	N. I.	
15- Deep aquifers (Maastrichtian)	N. I.	N. I.	N. I.	N. I.	N. I.	N. I.	

*Explanation*

\* Total surface area of groundwater sources = 1000000 km<sup>2</sup> and \*\* N. I. = No information.

Table 15. Summary of the available hydrogeological properties of groundwater reservoirs in the different parts of Algeria

Formation/ groundwater aquifer	Type of aquifer	Surface area, km <sup>2</sup>	Aquifer thickness, m	Depth to water level, m	Type of aquifer flow	Annual abstraction, 10 <sup>6</sup> m <sup>3</sup>	Aquifer capacity, 10 <sup>6</sup> m <sup>3</sup>	Volume of aquifer water, 10 <sup>9</sup> m <sup>3</sup>	Salinity of water ppm
Tafna	alluvial				normal		44		
Ouahran coast	alluvial				normal		60		
Chelif	Plio.-Quaternary				normal		120		
	Sandstone-Oligo				normal		80		
	miocene								
Zahrez	sandstone-lime	9000	50-300	5-40	normal		50	500-3000	
	Quaternary								
Algerian coast	alluvial, sandstone	1450	50-200	artesian-30	partly artesian	250	345	500-1500	168
Constantine	Limestone, dolomite				normal		140		
upper plains	and alluvium								
Isser	alluvial				normal		65		
Sebaou	alluvium-Quaternary				normal		50		
Soummam	Miocene-alluvial				normal		100		
Chott Hodna	Miocene-Pliocene-	26000	50-300	artesian-30	partly artesian		157		
	Quaternary								
Kebir Rhumel	limestone, alluvial				normal		30		
	sand,								
Keybouse	alluvial				normal		34		
Constantine	alluvial				normal		88		
coastal strip									

(Continued)



Table 16. Results of pumping test data as obtained from some aquifers in Egypt

Basin	Reservoir thickness, m	Transmissivity, $10^3 \text{ m}^2 \text{ d}^{-1}$	Storativity	Daily recharge, $10^3 \text{ m}^3$
<i>Natrun/Qattara/Siwa</i>				
Natrun (Pleistocene and Miocene)				
Lower formation	5–20	0.1	$3.25 \cdot 10^{-3}$	156–181
Marmarica (Siwa depression)	N.A.	N.A.	N.A.	N.A.
Moghra (Qattara - Natrun)	N.A.	N.A.	N.A.	N.A.
<i>Nubian sandstone</i>				
Northern part (Siwa Oasis)	1000	5.6		420
Middle part	2000	15.4		1400
Southern part	N.A.	N.A.		1221
Bahariya and Farafra Oases	1880	0.85		
Dakhla Oasis	1850	0.95		
Kharga Oasis	1280	0.51		
Nasser Lake	200	N.A.		16
East Uweinat	410	2.1		
<i>Nile Delta and Valley basin</i>				
Nile Delta	100–900	5–30	$(1-10) \cdot 10^{-4}$	N.A.
Nile Valley	10–200	0.5–2	$(1-10) \cdot 10^{-4}$	N.A.

Table 17. Hydrogeology of the groundwater reservoirs and formations in the Arab Republic of Egypt (from the documents presented to UNESCO meetings)

Groundwater water-bearing formation	Formation material	Surface area, $10^3 \text{ km}^2$	Thickness of formation, m	Depth to water level, m	Outflow from reservoir, $10^6 \text{ m}^3 \text{ y}^{-1}$	Total recharge, $10^6 \text{ m}^3 \text{ y}^{-1}$	Total storage, $10^9 \text{ m}^3$
<i>Northwest coastal basin</i>							
Recent sand dunes	sandstone		1.0	2–4	0.360	6.2	
Recent sediments	sand and pebbles		1.5–10	2–15	0.250	27.9	
Old sand dunes	limestone		0.5–2.5	2–20	0.25	27.9	
<i>Natrun/Qattara/Siwa basin</i>							
Pleistocene and Pleiocene sediments	sand and pebbles		10–20	10–20	29.2	62.0	
Marmarica (Middle Miocene)	limestone		5–25	N.A.	100*	125.0	
Moghra (Lower Miocene)	sandstone		0–550	N.A.	36.3 <sup>+</sup>	36.3	
<i>Nubian sandstone basin</i>							
Nubian sandstone	sandstone	1000	200–2000	N.A.	323	317	6000
<i>Nile Delta and Valley basin</i>							
Nile Delta	sand and gravel	22.0	up to 500	2–4	1573	2600	300
Nile Valley	sand and gravel	12.0	15–250	2–8	1361	5500	200

*Explanation*

\* $50 \cdot 10^6 \text{ m}^3 \text{ y}^{-1}$  are lost in Siwa Oasis and  $^+ 36.3 \cdot 10^6 \text{ m}^3 \text{ y}^{-1}$  are lost in the Qattara Depression.

Table 18. Summary of the groundwater potentialities of the Eastern Region of The Sudan (Hussein, 1986)

Aquifer	Depth to water table, m	Permeability, m d <sup>-1</sup>	Transmissivity, m <sup>2</sup> d <sup>-1</sup>	Storativity,	Annual renewed volume, 10 <sup>6</sup> m <sup>3</sup>
Mesozoic sandstone/ Tertiary Basalt	50–200	0.010–0.10	35–165	2*10 <sup>-7</sup> –6.3*10 <sup>-2</sup>	40.0
Paleo-Quaternary alluvial deposits					
Khor Arbaat	10	0.87–250	20–4000	0.015	13.5
Khor Baraka-Delta	7–9		86–860	0.003–0.26	55.0
Tokar					
River Gash	3–30		1–5860	0.0019–0.2	72.3
Rivers Seteit and Atabra	7		71–5875	0.22	?

*Table 19.* Groundwater aquifers and springs flowing in Syria, and their average discharges (from ECWA Report, 1982 and Country Report of Syria, 1986)

Water-bearing formation/aquifer	Spring	Average discharge, l s <sup>-1</sup>
Jurassic	Banyas	1700
Dolomite and Limestone	Barada	3500
	Al-Bared	1300
	Naour	650
	Senn	8000
Middle Cretaceous Limestone and Dolomites	Fijeh	8000
	Fasraya	250
	Tannur	1200
	Al-Sakhinah	450
	Tell-Ayoun	5500
	East Ghab	9000
	North Tartus	1500
	Himma	800
Paleogene and Marine Miocene Limestone	Ras el-Ain	45000
	Arous	4000
	Rouj Plain	2500
	Healan	250
	Qarena	150
	Maneen	400
Gypsum, Anhydrite and Sandstone	Hol	800
	Khatouniya	250
	Tell Taban	600
Volcanic Rocks	Mzeirib	1500
	Zizon	7500
	Sakhinah	500
	Ashari, )	
	Ghazoly, )	
	Bandak, ... )	900
	Sheikh )	
	Maskyn )	400
	Sayadah	900
	Burjiyat	150
	Fajir	300
	Juleibina	100
Total discharge, m <sup>3</sup> s <sup>-1</sup>		108.05



Table 20. Average yield of water wells used for drinking purpose in the West Bank, Palestine (from the Country Report of Palestine, 1986)

Well. No.	Name of well and it's location	Well yield, m <sup>3</sup> h <sup>-1</sup>	Well No.	Name of well and it's location	Well yield, m <sup>3</sup> h <sup>-1</sup>
1	Jenin	60	17	El-Bazzan (1)	270–300
2	Araba (1)	130–170	18	Al-Far'a (2)	160–180
3	Jabatiya (1)	90–100	19	Al-Far'a (1) Tobas	45–60
4	Tulkarm (1)	80	20	Az-Zawya	80–90
5	Tulkarm (2)	80	21	Anabta (1)	30–40
6	Tulkarm (3)	90	22	Anabta (2)	70–80
7	Qeffin	80	23	Shebtin (4)*	70–90
8	Zeeta	100	24	Ain Samia (1)*	120
9	Daer el Ghusoun	760	25	Ain Samia (2)*	160–180
10	Hebla	90	26	Batn el-Ghul (1) <sup>o</sup>	75–80
11	Azzoun	45–60	27	Batn el-Ghul (2) <sup>o</sup>	330–380
12	Qalqilya (1)	100	28	Batn el-Ghul (3) <sup>o</sup>	220–380
13	Qalqilya (2)	140–150	29	Beit Fujjar	100–120
14	Beit Ieba	170–200	30	Beit el-samou'	50–60
15	Daer Sharaf (1)	35–40	31	Al-Fawwar (1) <sup>x</sup>	30–40
16	Daer Sharaf (2)	60–70	32	Al Fawwar (2) <sup>x</sup>	50–70
Total					4200

*Explanation*

\* = Ramalla area, <sup>o</sup> = Beitlahm area and <sup>x</sup> = Hebron (Al-Khalil) area.

Table 21(a). Groundwater resources in Jordan (cited in ECWA Report,1982)

Groundwater area	Baseflow discharge	Replenishment	Total recharge	Under flow	Exploitation	Available storage
Yarmouk Basin	34.0	3.2	37.2	2.0	15	600
East Jordan Valley	91.1	32.4	123.5	29.6	18	0
Jordan Valley	56.0	35.2	91.2	2.0	18	3550
Zarqa River Basin	35.8	54.6	90.4	1.0	55	1700
Dead Sea Basin	137.5	19.7	157.2	7.0	53	2900
West Araba Basin	14.7	21.0	35.7	1.0	8	1000
Red Sea Basin	0.6	8.5	9.1	1.0	8	450
Jafer Basin	2.4	65.4	67.8	61.0	42	4400
Azraq River Basin	15.1	71.3	86.4	58.0	20	1680
Wadi Sirhan	(-)	39.5	39.5	35.5	5	50
Wadi Hammad area	(-)	15.0	15.0	5.0	5	0
Total, $10^6 \text{ m}^3 \text{ y}^{-1}$	387.2	365.8	753.0	203.1	247	16330

All figures in the above table are in  $10^6 \text{ m}^3 \text{ y}^{-1}$ .

*Table 21(b).* Some data of major groundwater resources in Jordan (from Al-Weshah, 1992)

Groundwater area	Baseflow discharge	Exploitation	Salinity, ppm
Yarmouk	167	53	240–800
(Historic average)			
Side wadis to the Jordan	66	26	450–3000
Zarka River	46	94	400–3000
Dead Sea wadis	44	60	500–1000
Wadis Mujib, Hassa and Yitim	67		
Wadi Araba	28	8	800–2500
Red sea		8	700–1500
Jafer basin	4	78*	800–3500
Azraq River Basin	12	20	300–800
Wadi sirhan	(-)	5	>1000
Wadi-Hammad area	(-)	5	>1000
Total, $10^6 \text{ m}^3 \text{ y}^{-1}$	434	357	

*All figures in the above table are in  $10^6 \text{ m}^3 \text{ y}^{-1}$ .*

Table 22. Summary of descriptive assessment of the major groundwater aquifers in Iraq (from Jibrael, 1973)

Groundwater province	Area	Age of aquifer	Type	Yield (per source)	Water quality	Storage	Amount	Recharge source
A- Mountain	A.1. Limestone	Cretaceous and older as in A1	Fractured	High	Good	Low	Good	Rainfall and snow
	A.2. Clastic		Porous	Medium- low	Variable	Low	Good	Direct precipitation and surface drainage
	A3. Alluvium	Pliocene-Quaternary	Porous	High	Good	High	Good	Precipitation, lateral inflow, perennial drainage
B- Fold and Terrace	B1. Bakhtiari and older gravel	Pliocene/Pleistocene	Porous	High	Good	High	Good	Precipitation, lateral inflow from surface drainage and from other aquifers
	B2. Marls and fold	Miocene/Eocene	Porous, fractured	Variable	Good to poor	Low	Variable	Precipitation, perennial drainage, overlying limestone
C- Delta Plain		Quaternary	Porous	Variable	Poor	High	Good	Drainage, some precipitation
D- Jezira Plain	D1. Lower Fars	Miocene	Porous	Medium	Poor	Moderate	Poor	Mainly from precipitation as in D1
	D2. Upper Fars	Miocene	Porous	Medium-low	Fair	Moderate	Poor	
E- Desert (northern and southern)	E1. Dibdiba	Miocene-Pliocene	Porous	High	poor	High	Moderate	from the Eocene limestone aquifer
	E2. Limestone	Eocene-Paleocene	Fractured	Moderate to low	Moderate to poor	Variable	Limited	Direct precipitation, wadi floods
	E3. Sandstone	Cretaceous and older	Porous	Moderate to low	Moderate to good	Moderate	Limited	Precipitation and wadi floods

Table 23. Summary of water-holding characteristics of the groundwater formations in Kuwait (from Country Report of Kuwait, 1986)

Formation	Lithology	Water-holding characteristics	Exploitation area
<i>Kuwaiti Group</i>			
Recent	Beach sand, eolian sand, valley fills and sabkha sediments	High permeability, local freshwater	Coastal areas
Dibdibba	Sand and ground complex with sandstone, clay and silt (105 m) <sup>o</sup>	High permeability, local freshwater under wadi beds and depressions. Salinity increases with depth	Rawdatein, UmAl-Aish Abdaly and other private wells
Fars	Calcareous sandstone with clays and gypsum (105 m) <sup>o</sup>	Low permeability, low salinity at depths with local freshwater under wadi beds and depressions	Well field A*, Wafra and other private wells
Ghar	Quartzitic sandstone with gravel and some silt at bottom (275 m) <sup>o</sup>	Generally contains deep groundwater with low salinity	
<i>Hasa Group</i>			
Dammam	Chert and silicious chalky limestone. Dolomite with subordinates of anhydrite and clays (180–220 m) <sup>o</sup>	Medium permeability with low water salinity in southwest Kuwait and high salinity in northwestern Kuwait	Sulaibiya, Abdaliya, and well fields A*, B*, C* and other scattered wells
Rus	Limestone and anhydrite (75–120 m) <sup>o</sup>	Saline water	
Umm er-Radhuma	Limestone, dolomite with anhydrite	Saline water with H <sub>2</sub> S gas	

*Explanation*

<sup>o</sup> = thickness of water-bearing formation, \* = location of well fields are indicated on the map in Figure 9.21

Table 24. Summary of lithology and aquifer characteristics in Saudi Arabia (from ECWA Report, 1986)

Era	Age	Formation	Lithology*	Thickness, m	Aquifer characteristics
<i>Cenezoic</i>	Quaternary/ Tertiary	Surficial deposits and basalts	Gr, Sa, Si, and Ba.		Produce variable quantity and quality of water depending upon recharge. Basalt yields little water in western S. Arabia.
	Tertiary (Meocene/ Pliocene)	Kharj	Ls, lac.Ls, Gy	28	Generally called Neogene aquifer. Irregular occurrence of water. Artesian and non-artesian conditions. Prolific aquifer in the areas of Hofuf, Wadi Miyah and some others in Eastern Province.
		Hofuf	s. Ma, s. Ls	95	
		Dam	Ma, Sh, Ss	91	
		Hadruk	cal., si. Ss	84	
	(Eocene)	Dammam	Ls, Do	35	Produces fair amounts of water with artesian and non-artesian conditions.
		Rus	Ma, chl. Ls	56	
	(Paleocene)	Umm er-Raduma	Ls, Do	243	One of the most prolific aquifers of S. Arabia with transmissivity in the range 7,400–44,000 m <sup>2</sup> d <sup>-1</sup> .
<i>Mesozoic</i>	<i>Cretaceous</i>	Aruma	Ls	142	Produces little water of low quality.
		Wasia	Ss, Sh	42–500	Low productive near outcrop, high productive artesian and non-artesian conditions in Eastern province. Hydraulically connected with Riyadh near outcrops.
		Riyadh Buwaib	Ss, Sh cal. Ls	425–600 180	Moderately productive Sandstone aquifer, hydraulically interconnected with Wasia near outcrop.
		Yamama	Biogenic	45	
	<i>Jurassic</i>	Sulaiy	chl. Ls	170	Yields always mineralized water Yields little water, mostly mineralized. Irregular occurrence of water. Same as Arab formation
		Hith	An	90	
		Arab	cal, aph. Ls	124	
		Jubaila	aph. Ls	118	
	<i>Triassic</i>	Hanifa	aph. Ls	113	Produces moderate amount of water in the
		Tuwaiq	aph. Ls	203	
		Dhruma	aph. Ls, Ss	375	

					Sandstone aquifer. In the south it is hydraulically connected with Minjur formation.
		Marrat	Sh, aph. Ls	103	Yields fair amount of water with fair-poor quality
		Minjur	Ss, Sh	315	Productive sandstone aquifer with flowing and non-flowing artesian conditions.
		Jilh	aph. Ls, Ss, Sh	326	Hydraulically connected with Minjur formation, produces poor-quality water.
		Sudair	Sh	116	
<i>Paleozoic</i>	<i>Permian</i>	Khuff, Faw	Ls, Sh, Ss in the south	171	Moderately productive limestone aquifer, mostly mineralized water,
		Wajeed	Ss, Precambrian B.C.	950	Highly productive limestone aquifer, with flowing and non-flowing artesian conditions.
		Jawf	Ls, Sh, Ss	299	Productive generally in el-Jawf area.
	<i>Devonian</i>				
	<i>Devonian/ Siurian</i>	Tabuk	Ss, Sh	1072	Productive Sandstone aquifer with flowing and non-flowing artesian conditions
		Saq	Ss	300–600	One of the most productive sandstone aquifers of S. Arabia, with flowing and non-flowing artesian conditions.
	<i>Cambrian</i>				

*Abbreviations*

\* *Gr* = gravel, *Sa* = sand, *Si* = silt, *Ba* = basalt, *Ls* = limestone, *lac.* = lacustrine, *Gy* = gypsum, *s.* = sandy marl, *s. Ls* = sandy limestone, *Ma* = marl, *Sh* = shale, *Ss* = sandstone, *cal.* = calcarenite, *si.* = silty sandstone, *Do* = dolomite, *chl.Ls* = chalky limestone, *cal. Ls* = calcareous limestone, *An* = Anhydrite, *aph. Ls* = aphanetic limestone and *B.C.* = basement complex

Table 25. Annual falage flows in the period 1977–82 in the different drainage areas of the United Arab Emirates (from the Country Report of UAE, 1986)

Drainage area & Serial No.	Name of falaj	Location of falaj	Discharge, $10^6 \text{ m}^3 \text{ y}^{-1}$ , for the years, 1977	1978	1979	1980	1981	1982	Average
<i>Southern Drainage (Al-Ain area)</i>									
1	Ain Suknah	Ain Sukhna Park	1.42	1.25	1.25	0.60	0.63	1.52	1.11
2	Maziad	Sheikh Zayed	0.76	1.07	1.07	1.21	0.82	0.95	0.98
3	Jimi	Jimi Oasis	0.93	0.93	x	x	x	x	0.93*
4	Qattarah	Qattarah Oasis	0.46	0.30	x	x	x	x	0.38*
5	Hili	hili Oasis	0.76	0.69	0.66	0.71	0.82	0.67	0.72
6	Daudi	D.S. Falaj Al-Ain	0.68	0.96	0.93	0.93	0.84	0.32	0.77
7	Al-Ain	Near Hilton Ho.	2.05	2.02	1.97	2.27	2.22	1.02	1.93
8	Mutrad	N. Clock Tower	0.43	0.47	0.28	0.13	0.13	x	0.29*
9	Buraimi	Al-Ain	1.83	2.01	2.07	2.24	2.37	1.19	1.95
10	Sarrah	Buraimi	2.11	1.59	2.69	2.81	2.22	2.11	2.26
<i>East Coast</i>									
1	Farah	U.S. Old Village	x	0.03	0.05	0.03	x	x	0.04
2	Farfar	U.S. Farfar Village	x	0.25	0.22	0.13	x	1.45	0.51*
3	Mamdouk	Mamdouk Village	x	0.06	0.08	0.06	0.01	0.28	0.10
4	Museira	D.S. of Bathina wier	0.50	0.44	0.19	0.24	0.25	0.82	0.41
5	Habisa	Upper Bathina	0.47	0.25	0.13	0.09	0.01	0.02	0.16
6	B. Wier L/B	Bathina wier	0.68	0.09	0.01	0.25	0.47	0.90	0.40
7	B. wier R/B	Bathna weir	0.47	1.48	0.73	0.47	1.19	0.94	0.88



8	Awina	Saqamqam Village	0.03	0.03	0.03	0.02	0.02	0.06	0.03
9	Kalba	Kalba	x	x	x	x	x	x	x*
<i>Western Drainage (Central area)</i>									
1	Fili	Fili Village	x	x	x	x	0.25	x	0.25
2	Bagah						0.09	x	0.09
3	Asimah	D.S. Assima Village	x	0.06	0.08	0.09	0.13	0.22	0.12
4	Murrad	Wadi Murrad	x	x	x	x	0.03	0.85	0.44
5	Ghail	U.S. Ghail Village	x	0.25	0.16	0.06	0.06	1.40	0.39
6	Dhaid	Dhaid Police Stat.	0.46	0.44	0.41	0.43	0.54	0.32	0.43
7	Massafi	Old Massafi Village	0.22	0.28	0.25	0.25	0.35	0.35	0.28
8	Al-Mulla	Falaj Al-Mulla Village	0.44	0.32	x	0.47	0.47	0.47	0.43*
9	Manama	Old Manama Village	0.25	0.06	0.06	0.16	0.03	0.27	0.14
<i>Eastern Drainage (Central area)</i>									
1	Hadaf	Hatta	x	x	x	x	0.43	0.79	0.61
2	Sheedam	R/B of wadi Sheedam	x	x	x	x	0.23	x	0.23*
3	Nasla		x	x	x	x	0.60	x	0.6*
4	Rafaq	D.S. Wadi Ghor	0.93	0.38	0.48	0.38	0.75	1.58	0.75
5	Munai	Munai Village	0.35	0.14	0.13	0.19	x	0.01	0.16*
<i>Eastern Drainage</i>									
6	Howailat	Howailat Village	0.82	0.19	0.19	x	0.19	0.63	0.4*
7	Warrah	Wadi Masfut	0.43	0.17	0.49	0.63	0.35	1.26	0.56
8	Dofdhah	Masfut area	0.08	0.08	x	0.06	0.06	1.1	0.28*

(Continued)

Table 25. (Continued)

Drainage area & Serial No.	Name of falaj	Location of falaj	Discharge, $10^6 \text{ m}^3 \text{ y}^{-1}$ , for the years, 1977	1978	1979	1980	1981	1982	Average
9	Masfut	Wadi Masfut	0.28	0.2	0.14	0.16	0.22	0.6	0.27
10	Sagheer	Hatta	0.18	0.17	0.28	0.44	x	0.63	0.34*
11	Sahreha	Hatta	0.35	0.13	0.08	0.20	0.38	x	0.23*
12	Hatta	Hatta	0.40	0.19	0.25	0.45	0.45	0.35	0.44
13	D.S. Hatta	Hatta					1.26	4.29	2.78
	Dam								
<i>Western Drainage (Northern area)</i>									
1	Khatt Spring North	Khatt area	0.16	0.06	0.20	0.35	0.43	0.58	0.30
2	Khatt North 2nd	Khatt area	0.25	0.32	0.60	0.63	x	x	0.45
3	Spring Khatt	Khatt area	1.15	0.88	0.88	0.63	0.49	0.73	0.79
4	Spring Habab	Khatt area	0.50	0.50	0.76	0.69	0.77	0.54	0.63
5	Usayli	Khatt area	0	0.13	0.11	0	0.1	0.16	0.13

Explanation

\* = Falaj has dried off or stopped flowing

Table 26. Lithology and hydrogeological characteristics of rock units in North Yemen (formerly YAR) (ECWA Report, 1981)

Formation	Age	Thickness, m	Lithology	Hydrogeology
Tihama Plain Alluvials	Quaternary	0–600	Alluvium, conglomerate, silt, sand and gravel. Thickens towards the coast	Good to excellent unconfined aquifer, good quality water
Upper catchment alluvials	Quaternary	Variable, up to 500 m	Alluvium, coarse boulders conglomerate to clay	Good to excellent unconfined aquifer, good quality water
Quaternary volcanics	Quaternary	Variable	Basaltic lava interbedded with fluvial and lacustrine sediments	Fair to good, unconfined aquifer
Yemen volcanics	Tertiary-cretaceous	Variable, up to 1200 m	Lavas, agglomerates, tuffs interbedded with alluvium	Fair to good, unconfined aquifer
Tawilah Series	Cretaceous	about 400 m	Sandstone with conglomerates	Good, satisfactory water quality, unconfined aquifer
Amran Series	Jurassic	? 350	Limestones, rocks, shales	Aquiclude or poor aquifer
Kholan Series	Jurassic	100–500	Sandstone and conglomerates	Good semi-confined to confined but poor quality
Pre-Cambrian	Pre-Cambrian	?	Crystalline metamorphic and intrusive rocks	Aquifuge

Table 27. Hydrology and water quality of wastewater treatment plants (WWTP) in Jordan (after Al-Sheriadeh, 1997)

WWTP Name	Period of record	Parameters	Flow $\text{m}^3 \text{d}^{-1}$	BOD <sub>5</sub> , $\text{mg l}^{-1}$ Influent	Affluent	TSS, $\text{mg l}^{-1}$ Influent	Affluent
As'Samra	86-96	M*	105573	636.8	74.3	552.6	134.7
		s**	31260	130.8	37.9	160.2	27.8
Aqaba	87-96	M	4520	375.6	87.1	359.9	49.8
		s	1249	61.3	13.8	249.2	121.8
Ma'raq	88-96	M	1325	758.2	139.7	640.6	260.2
		s	449	231.9	55.1	210.8	38.7
Ramtha	88-96	M	1014	1097.5	152.9	954.6	162.2
		s	389	244.1	65.7	216.6	45.6
Ma'an	90-96	M	1209	830.7	228.8	724.6	213.2
		s	373	131.0	46.7	209.4	41.8
Madaba	90-96	M	1209	830.7	228.8	724.6	213.2
		s	373	131.0	46.7	209.4	41.8
Irbid	87-96	M	5373	1179.4	233.6	1371.3	405.1
		s	2476	28.7	9.8	40.8	18.0
Salt	86-96	M	3559	840.0	56.3	860.4	96.5
		s	287	20.3	7.8	37.6	24.2
Jerash	85-96	M	1183	932.3	200.7	883.3	186.3
		s	357.4	16.8	9.1	31.7	15.5
Abu-Nusseir	88-96	M	1417	640.8	63.6	632.6	70.8
		s	90	23.9	3.8	27.6	7.8
Baqa	88-96	M	4715	1154.1	106.6	1093.6	157.8
		s	1777.3	217.4	154.8	131.3	68.3
Karak	88-96	M	797	644.2	151.3	524.1	138.6
		s	322	55.0	14.3	74.2	15.8
Tafieleh	88-96	M	672	976.0	360.3	768.9	190.0
		s	300	44.9	5.2	44.5	12.2
Kufrenja	90-96	M	811	864.3	132.7	870.6	378.2
		s	337	23.7	3.2	33.6	17.7
Total			133377				

*Explanation*

$M^*$  = arithmetic mean and  $s^{**}$  = mboxstandarddeviation

Table 28. Capacities and capital costs for some of the seawater desalination plants in Saudi Arabia (from Bushnak, 1995)

Year	Type	Location	Capacity Mgd <sup>+</sup>	10 <sup>3</sup> m <sup>3</sup> d <sup>-1</sup>	Capital cost, \$US Gpd	m <sup>3</sup> d <sup>-1</sup>
1978	SWRO*	Jeddah	3.17	12.0	9.46	2497
1979	MSF**	Jeddah III	21.00	80.0	16.4	4330
1982	MSF	Jeddah IV	58.00	220.0	9.36	2471
1985	SWRO	Jeddah I-Rehab	15.00	56.8	2.87	758
1986	MSF	Assir	27.00	102.3	4.74	1251
1987	MSF	Al-Khobar	63.00	240.0	4.58	1209
1987	SWRO	Jubail III	30.00	113.6	3.76	993
1988	SWRO	Jubail IV	24.00	90.9	6.42	1695
1992	MSF	Medina-Yanbu II	32.00	128.0	6.00	1797
1992	SWRO	Medina-Yanbu II	30.00	136.0	7.57	2010
1992	SWRO	Al-Jubail III	24.00	80.0	5.77	1730
1993	MSF	Khobar III	63.00	240.0	4.72	1417
1993	MSF	Shuaibah	106.00	400.0	3.97	1190
Total			496.17	1899.6		

*Explanation*

SWRO\* = Seawater reverse osmosis, MSF\*\* = Multi-stage flash and Mgd<sup>+</sup> = million gallons per day (all gallons are imperial gallons, 1 imperial gallon = 3.785 litres or 0.003785 m<sup>3</sup>)

Table 29. Distribution and capacities of desalination plants in the United Arab Emirates (Al-Sajwani & Lawrence, 1995)

Area	Location	Type	Capacity, m <sup>3</sup> d <sup>-1</sup>	Area	Location	Type	Capacity, m <sup>3</sup> d <sup>-1</sup>
Villages and islands	Jebel Dhana	RO	9000	Sharja	Kalba	RO	15890
		VC	9000		Umm Al-Nar		90800
		MSF	7950		East	MSF	
	Mirfa	RO	4540	Subtotal			106690
		VC	4540	Dubai	Dubai East and West	MSF	532915
		MSF	4540				
	Sila	RO	1125	Subtotal			532915
		VC	4540	Abu-Dhabi	Abu-Dhabi P. S.	MSF	57650
		MSF	4540		Umm al-Nar	MSF	166160
					East		
	Rafeek Isl.	RO	1125	City	Umm Al-Nar West	MSF	217920
	Bukshisha Isl.	RO	1125		Taweela 'A'		132560
	Sirbani Yas Isl.	RO	2250		Taweela 'B'		345950
	Delma Isl.	VC	9000	Subtotal			920240
		MSF	2750				
	Abu Al-Abyad	RO	2250				
	Ajman	RO	18150				
	Fujairah	RO	13600				
	Umm Al-Qaywan	RO	11350				
	R. Al- Khaimah	RO	6800				
Subtotal			118175	Total			1678020

Table 30. Distribution and capacities of desalination plants in the Sultanate of Oman Al-Sajwani & Lawrence, 1995

Province	Location	Type	Capacity, $\text{m}^3 \text{d}^{-1}$
Muscat	Al-Ghubrah 1	MSF*	22700
	Al-Ghubrah 2	MSF	27300
	Al-Ghubrah	MSF	27300
	Al-Ghubrah 4	MSF	27300
	Al-Ghubrah 5	MSF	27300
Subtotal			131900
Ash-Sharqiyah	Sur	RO**	4550
	Ras al-Hadd	RO	100
	Ar-Ruwais	RO	172
	Asyilah	RO	95
	Masirah 1	MSF	545
	Masirah 2	TC	600
Subtotal			6062
Al-Wasta	Mahawt	MSF	50
	AS-saadanat	RO	50
	Ash-Shuayr	RO	50
	Madrakah	RO	50
	Haytam	RO	50
	Abu-mudhabi	RO	50
Subtotal			300
Musandam	Kumzar	VC <sup>+</sup>	272
	Shisar	VC	408
	Lima	ED <sup>++</sup>	230
Subtotal			910
Total			139172

*Explanation*

MSF\* = Multi stage flash, RO\*\* = Reverse osmosis, VC<sup>+</sup> = Vapour compression and ED<sup>++</sup> = Electro-dialysis.

Table 31. Some data of the storage reservoirs in Morocco (from the Country Report on Water Resources of Morocco and their Utilisations, 1986)

Name of dam	Wadi/location	Year of construction	Gross capacity, 10 <sup>6</sup> m <sup>3</sup>	Regulated flow, 10 <sup>6</sup> m <sup>3</sup>
<i>Oum er-Rebia and Tensift Basins (existing dams)</i>				
Sidi Said Maachu		1929	N.A.	N.A.
Kasbet Tadleh	W. Oum er-Rebia	1931	0.1	280
L'iemfut		1944	N.A.	N.A.
Ad'Dawra		1950	N.A.	N.A.
Bine el-Oudiane	W. Abid	1953	1500	880
Ayet warda		1954	N.A.	N.A.
Moulaye Youssuf	W. Tessaout	1970	200	260
Al-Masierah	W. Oum er-Rebia	1979	2724	1360
Lalla Takarcost	N'ffis	N.A.	78	85
Ayet Shwarit	W. Al-Akhdar	1988	270	350
Dashr el-Wadi	W. Oum er-Rebia	1990	740	485
Subtotal				
<i>Sebou Basin (existing dams)</i>				
Kansara	W. Beht	1935	272	210
Idriss I	W. Inaouene	1973	1270	990
Subtotal			1542	1200
<i>(projected dams)</i>				
M'ajara	W. Ouerrha		3800	1600
M'dez	W. Sebou		595	256
Ayet Aoub	W. Menzel		80	270
Machraa Al-hajar			33	N.A.
Al-Herasa	W. Menzel		45	177
Matmata (tunnel)	connecting Idriss reservoir to Ayet Auoub		N.A.	N.A.
Other dams			N.A.	483
Subtotal			4553	2543
<i>Bou Regreg Basin and Basins along the Atlantic Coast between Rabat and Casa Blanca</i>				
Grauw	W. Grauw	1969	N.A.	N.A.
S. Moh. Ben Abdalla*		1974	N.A.	N.A.
Wadi Mellah	W. Mellah			
<i>El-Lokkus Basin and North Atlantic Basins</i>				
Wadi Al-Makhazen and El-Lokkus	W. El-Lokkus	N.A.	480	N.A.
Ibn Battuta	W. Al-Thulatha	N.A.	N.A.	N.A.
<i>Moulouya Basin</i>				
Machra Hamadi and Mohammad V	W. Moulouya	1959	N.A.	N.A.
M. A. Karim		1967	N.A.	N.A.
Al-Khattabi	W. Nakur	N.A.	62	N.A.



*South Atlantic Basins\*\**

Al-Hassan	W. Ziz	N.A.	N.A.	N.A.
Al-Dakhel				
Al-Mansour	W. Dra	N.A.	N.A.	N.A.
Al- Dahabi				
Youssuf Ibn Teshfin	W. Massa	N.A.	N.A.	N.A.
Abdel Mu'men	Sous	N.A.	N.A.	N.A.
and Al-Dakhila				

*Explanation*

*\*Planned to be heightened, \*\*reservoirs are also used for replenishing the groundwater resources.*

Table 32. Some data of the dams in Algeria up to 1986 (from the Country Report on Water Resources of Algeria and their Utilisations, 1986)

Drainage Basin	Situation of dams			Regulated water, 10 <sup>6</sup> m <sup>3</sup> y <sup>-1</sup>
	Existing	Under construction	Construction about to begin	
Tafna	Beni Bahdel			63
	Mafrouch			15
		Sawani		15
		Sidi Abdel-Lai		55
Maqu'ta (Macta)	Bou Hanifa			46
	Farquouq			1.5
	Sarto			18
	Wizert			32
Cheliff			Al-Shurfa	45
	Bakhada			50
	Ben Ouda			228
	Marja			54
	Wadi Al-Fadha			87
	Bou Ghazoul			21
	Gharib			139
	Dardar			50
	Haraza			115
		Dahmouni		9
		Sidi Yaqub		87
		Farfar		120
Al-Jazaeryiah	Boroumi			120
	Quaddara			150
		Hamiz	Bou-Kerdan	13
	Ladert			4
El-Soummam	Lakhal			17
		Issa Zada		50
			Tithi Haaf	150
Al-Hodna Constantinian coasts	Quassub			30
	Shefia			95
	Zerdzas			20
	Keneitra			50
		Maksena		175
	Araquin			80
Seybuse	Eghil Umda			80
		Hammam		70
Kebir Rhumel		Maskhutien		
		Hammam		17
		Quaaouz		
M'jerda		Ain Dahlia		45
Cott el-Moghier	Fadwa Ghera			19
Quir	Harf el-Turba			100
Total				2535.5

Table 33. Storage dams already existing pre 1986 in Syria (Sources: Report of ECWA, 1981, and Country Report of Water Resources in Syria, 1986)

Name of dam	Location	Length, m	Maximum depth, m	Surface area, 10 <sup>3</sup> m <sup>2</sup>	Storage capacity, 10 <sup>6</sup> m <sup>3</sup>
<i>Grand dams</i>					
Euphrates	Al-Tabqa	8800	60	625000	11600
<i>Medium dams*</i>					
Al-Rastan	Hamah	446	69	19000	225.000
Mouhardeh	North of Mouharda	230	52	4500	50.000
Ballouran	Lattakia	330	34	1125	15.500
Taldo	South of Taldo	230	52	4500	15.500
Bab El-Hadid	Al-Hassakah	61	22	3200	23.000
?	Al-Hassakah	675	30	2050	22.000
Jabal el-Arab	Damascus	700	20	2600	19.500
<i>Small dams</i>					
Richeh	Damascus	190	5.7	1322	1.750
Al-Kalamoun	Damascus	610	15	420	1.630
Al-Dumair	Damascus	425	15.5	650	2.150
Khan Al-Manqoura	Damascus	212	9.0	103	0.270
Al-Qatifah	Damascus	160	18	79.4	0.502
Wadi Al-Quarn	Al-Zabadani	154	15	311	1.700
Al-Asslaha	Damascus	93	9.8	10	0.037
Gharbi Qara	Damascus	340	12	80	0.400
Gharbi Deir Atiyeh	Damascus	146	11.5	300	1.500
Rasas Al-Suwayda'	Damascus	56	8.0	9.0	0.030
Al-Hien	Damascus	435	5.0	250	0.580
Al-Sahwa	Damascus	815	15	150	1.000
Khazneh	Damascus	160	8.0	50	0.200
Tayamam'a	Damascus	N.A.	N.A.	4	0.013
Radm Gwilien	Damascus	493	15.5	542	4.600
?	Damascus	185	24.4	200	1.950
Al-Mashnaf	Damascus	340	18.2	200	1.206
Ghadir El-Souf	Dar'a	200	7.0	100	0.160
Al Mataiyah	Dar'a	135	10	137	0.310
Etman	Dar'a	175	9.0	80	0.160
Dar'a Al-Sharqui	Dar'a	208	34.9	1365	15.000
Abtah Al-Kabir	Dar'a	608	14	950	3.500
Abtah Al-Saghir	Dar'a	500	10	200	0.500
Umm Jloud	Aleppo	432	14.2	462	3.500
Al-Shahba	Aleppo	216	6.0	5000	12.000
Al-Habit	Idlib	101	16.5	105	0.480
Ruwayhiya	Qunaitera	164	5.1	174	0.215
Maskana	Homs	N.A.	N.A.	N.A.	0.960
Al-Za'faranah	Homs	240	9.0	90	0.231

(Continued)

Table 33. (Continued)

Name of dam	Location	Length, m	Maximum depth, m	Surface area, 10 <sup>3</sup> m <sup>2</sup>	Storage capacity, 10 <sup>6</sup> m <sup>3</sup>
Salim	Homs	190	12.3	56	0.200
Al-Baoudiyah	Homs	262	13.4	86	0.310
Al-Mokhaddayeh	Homs	306	9.0	185	0.600
Taklekh	Homs	270	10.0	90	0.290
Al-Sendyanah	Homs	190	12	90	0.360
Rikaliyah	Homs	100	12	29	0.123
Al-Talil	Homs	355	14.4	207	0.818
Khirbet Al-Hamam	Homs	214	15	185	1.150
Al-Quariatein	Homs	360	13	1400	5.000
Al-Shandaquiya	Homs	262	12	262	1.250
El-Dalabouz	Homs	500	17	230	1.330
Ram El- A'nz	Homs	548	4	N.A.	0.270
Al-Walaj	Homs	320	4	20	0.001
Al-Wadi Al-Kabier	Homs	312	10	200	0.515
Al-Marba'a	Homs	420	10	1158	3.200
Jbab Shaqra	Homs	184	14.4	249	0.975
Abou-Faiadh	Hama	138	10.9	354	1.100
Al-Kafat	Hama	380	13.8	320	1.500
Wadi Al-Azeeb	Hama	198	12	212	0.930
Al-Ilbawy	Hama	521	13.4	300	1.400
Al-Lattamneh	Hama	157	11	215	0.650
Al-Mubarakat	Hama	180	8	76	0.232
Sraihien	Homs	194	19	176	1.000
Beit Al-Kasir	Lattakia	254	18	166	0.737
Burmana	Lattakia	234	20	196	1.365
Saquiya Sadeq	Lattakia	160	10	550	0.136
Kosana	Lattakia	241	15	390	0.093
Al-Haffa	Lattakia	410	26.4	160	1.500
Al-Qunboursa	Lattakia	210	16.5	145	0.770
Al-Waar	Deir Ez-Zor	214	12.5	805	3.345
Abou Al-Kahf	Al-Reqqa	194	8.6	390	0.620
Al-Goudiyah	Al-Hassakah	733	17	1484	8.000
Karima	Al-Hassakah	255	11.2	800	1.900
Khirbet Al-Hajji	Al-Hassakah	92	8.0	290	0.440
Ma'shouq	Al-Hassakah	605	17	334	2.500
Total					12072

Explanation

\* Medium reservoirs as listed here are reservoirs with capacities  $15 \times 10^6 \text{ m}^3 - 225 \times 10^6 \text{ m}^3$

Table 34. Storage levels and capacities of reservoirs built in Iraq in the period 1951–83 (Source: National Report on Water Resources of Iraq submitted to UNESCO, 1983, Country Report of Iraq, 1986 and ECWA Report, 1982)

Name of dam	Normal retention level*	Dead storage level	Maximum Storage level	Design capacity, 10 <sup>9</sup> m <sup>3</sup> Normal storage	Live storage	Reserve storage	Remarks
<i>Dams on the River Tigris</i>							
Dukan	511	479	512.5	6.8	5.5	0.4	Existing, 1959
Tharthar	62	42	65	77.6	38.5	7.8	Existing, 1956, improved in 1972 and 1976
Fatha	177.5	148.2	179.9	23.3	19.3	2.7	Planned
Mosul	329	300	333.5	10.7	9.7	1.8	Under construction
Bokhma	550	470.8	554.8	8.3	7.8	0.6	Planned
<i>Dams on the River Diyala</i>							
Derbandi-Khan	485	434	493.5	3.0	2.5	1.1	Existing, 1961
Himrin	104	92	107.5	3.95	2.3	1.4	Existing 1980
<i>Dams on the River Euphrates</i>							
Haditha	147	118	151	8.2	7.5	2.2	Expected to be complete by 1986
Habbaniyah	31	42.5	N.A.	3.3	2.7	N.A.	Existing 1956, improved in 1969

*Explanation*

\*All levels are in m a.m.s.l.

Table 35. Dams in Jordan (Source: Malkawi &amp; Abdulla, 1997, and Al-Kharabsheh &amp; Ta'any, 2005)

Name of dam and year constructed	Location	Dam body	Dam height, m	Effective capacity, 10 <sup>6</sup> m <sup>3</sup>	Total capacity, 10 <sup>6</sup> m <sup>3</sup>
King Talal (1986)	Zarqa	Rockfill	108.0	75.0	80.0
Wadi El-Arab (1984)	Irbid	Rockfill	82.5	16.9	20.0
Kafrein (1976)	Balqa	Earthfill	46.0	2.5	8.5
Ziglab (1964)	Irbid	Earthfill	48.0	3.0	4.3
Wadi Shueib (1964)	Balqa	Earthfill	32.0	1.4	2.3
Karamah (2001)	Balqa	Earthfill	N.A.	7.8	55.0
Hasa Tannour (2002)	Tafila	Reinforced Concrete	69.0	7.8	16.8
Wala (2003)	Madaba	Concrete	45.0	9.3	9.3
Sama Es Sirhan (1966)	Mafraq	Rockfill	8.0	1.7	1.7
Ghadir El-Abyad (1966)	Mafraq	Concrete	13.0	0.7	0.7
Burqu' (Old)	Mafraq	Concrete	5.0	1.5	1.5
Al-Aqqib (Khaldiya) (1983)	Mafraq	Concrete	15.0	1.1	1.4
Deir Al-Kahf (Old)	Mafraq	Concrete	5.0	0.05	1.5
Al-Sha'lan (1970)	Mafraq	Concrete	3.0	1.0	1.1
Al-Buweida (1967)	Irbid	Concrete	9.5	0.7	0.7
Al-Qatranah (1964)	Karak	Rockfill	12.0	2.0	4.2
Al-Sultani (1962)	Karak	Rockfill	8.0	1.2	1.2
El-Lahfi (1963)	Zarqa	Earthfill	5.0	0.7	0.7
Abu-Suwwanah (1962)	Zarqa	Earthfill	4.0	0.3	0.25
Wadi Rajil (1992)	Zarqa	Earthfill	9.0	3.5	3.5
Suwaqa (1993)	Amman	Concrete	16.5	2.5	2.8
Ruweishid El-Shamali (1992)	Mafraq	Earthfill	6.0	10.7	10.7
Jilat (Old)	Amman	Earthfill	N.A.	0.09	0.1
Muwaqqar (1960)	Amman	Earthfill	N.A.	1.0	1.0
Al-Ithna (1995)	Mafraq	Earthfill	N.A.	0.7	0.7
Yajuz (2001)	Amman	Earthfill	N.A.	0.2	0.2
Subtotal				153.34	230.2
<i>Dams under construction</i>					
Al-Jordaneh	Mo'an	Earthfill	15.0		2.3
Al-Fidan	Tafileh	Earthfill	37.0		10.0
Al-Mojib Other dams	Karak	R. concrete	51.0		35.0
Subtotal					220.5
					267.8
<i>Dams under planning (design stage)</i>					
Al-Karak	Karak	Earthfill			5.5
Medyen	Mo'ta	Earthfill			1.4
Ibn-Hammad	Karak	Earthfill			8.0
Al-Adasiyah	Irbid	R. concrete			8.0
Subtotal					22.9
Total					520.9

Table 36. Main features of the recharge dams completed in the period 1985–1994 in Oman (Abdel-Rahman & Abdel-Magid, 1993, Muqbali & Schmid, 1995 and Muqbali & Kotwicki, 2000)

Name of dam	Storage volume, 10 <sup>6</sup> m <sup>3</sup>	Maximum dam height, m	Spillway type	Design flood m <sup>3</sup> s <sup>-1</sup>	Overflow length, m	Year of completion
<i>Al-Batinah coastal plain</i>						
Wadi el-Khod	12.5	11.0	Gabion	12500	3000	1985
Wadi Hiti Salahi	0.55	4.5	Gabion	2200	1120	1985
Wadi Jizzi	5.4	20.4				1989
<i>Main spillway</i>			Concrete	4700	184	
<i>Auxillary spillway</i>			Gabion	3100	278	
Wadi Ma'awil	10.0	8.3	Gabion	4000	4040	1991
Fulayj	3.7	7.0	Gabion	2200	1150	1992
Wadi Taww	5.1	9.0	Gabion	3100	2500	1992
Wadi Far'a	0.6	12.0	Rock armour	3000	430	1992
Wadi Ahin	6.8	8.0	Gabion	5600	4000	1994
Wadi Hawasinah	3.7	6.0	Concrete	6000	1135	1994
Subtotal	48.35					
<i>Sur</i>						
Wadi Fulayj	0.7	7.0	Concrete	3300	430	1991
Subtotal	0.7					
<i>Interior</i>						
Wadi Quryat	0.14	5.3	Gabion weir	1280	300	1986
Wadi Tanuf	0.6	17.0	Concrete	3000	118	1989
Wadi Ghul	0.4	7.6	Gabion (cascade weir)	2800	330	1989
Wadi Al-Kabir	0.5	8.9	Rock armour	4200	600	1990
Subtotal	1.64					
<i>Salalah</i>						
Wadi Sahalnawt	6.4	11.4				1993
<i>Main spillway</i>			Concrete	850	103	
<i>Auxillary spillway</i>			Concrete slabs	2390	982	
Subtotal	6.4					
Total	57.09					1985–94

Table 37. Names and characteristics of constructed dams, and dams under construction or to be constructed in Saudi Arabia (based on the 1981 survey of dams reported by ECWA, 1981)

Name of dam	Catchment area, km <sup>2</sup>	Location	Height, m	Length, m	Storage capacity, 10 <sup>6</sup> m <sup>3</sup>	Type of dam	Purpose
<i>Constructed dams</i>							
Hanifa	N.A.*	Riyadh	9.5	390	1.3	Concrete	A.R.
Laban	N.A.	Riyadh	12.0	500	2.0	Rockfill	A.R.
Nammar	N.A.	Riyadh	8.0	400	1.5	Rockfill	A.R.
Hair	N.A.	Riyadh	14.0	400	3.8	Concrete	A.R.
Safar	54	Riyadh	4.0	325	0.3	Earth	A.R.
Hirqua	19	Riyadh	6.0	190	0.08	Earth	A.R.
Ghbeirah	21	Riyadh	6.0	170	0.1	Earth	A.R.
Al-Ainyyah	N.A.	Riyadh	5.0	400	1.0	Msonary	A.R.
Lalyah	N.A.	Al-Diriyah	9.5	380	3.0	Concrete	A.R.
Jalajil	N.A.	Sdair	11.6	630	1.75	Earth	S/A.R.
Melham	20	Sdair	4.0	100	0.2	Concrete	S/A.R.
Hreimlah	350	Sdair	6.0	1250	1.5	Earth	D.
Majma'a	100	Sdair	8.0	360	1.2	Rockfill	F.C./A.R.
Thadiq	N.A.	Sdair	7.0	850	2.0	Earth	
Rawdah	N.A.	Sdair	14.0	554	3.0	Earth	
Ghat	N.A.	Sdair	11.0	250	1.0	Earth	
Mellah	N.A.	Baha	7.0	60	0.2	Concrete	
Jozan	1100	Jizan	41.6	316	71.0	Concrete	F.C./Ir.
Sa'ab	N.A.	Al-Taif	10.0	290	0.5	Earth	
Akramah	N.A.	Al-Taif	8.0	300	0.4	Rockfill	
Abha	58.5	Asir	33.0	350	2.4	Concrete	W.S.
Bathan	20	Madinah	12.5	266	0.8	Concrete	F.C./A.R.
Shaqra'a	N.A.	Sharqa'a	10.0	90	0.2	Rockfill	
Marid	N.A.	Asyah	7.0	500	1.3	Earth	
Ananiyah	N.A.	Qasim	8.0	180	N.A.	Earth	F.C.
<i>Dams under construction or to be constructed</i>							
Rura'a	N.A.	Madinah	15.0	450	2.0	Earth	
Al-Ghab	N.A.	Madinah	11.0	650	1.0	Earth	
Al-Akoul	N.A.	Madinah	11.0	450	7.0	Concrete	
Al-sharaye'	N.A.	Madinah	8.5	500	0.088	Earth	
Okda	N.A.	Hail	7.0	100	0.1	Earth	
Salf	N.A.	Hail	6.0	230	0.15	Earth	
Hajla	N.A.	Asir	12.0	110	1.0	Rockfill	
Sroom	N.A.	Asir	13.0	75	1.0	Concrete	
Surat Obeida	N.A.	Asir	22.0	170	1.5	Rockfill	
Sfrat	N.A.	Sdair	13.0	490	1.0	Rockfill	
Lia	N.A.	Al-Taif	45.0	190	10.0	Rockfill	
Turba	N.A.	Al-Taif	21.0	380	20.0	Concrete	
Rumma	N.A.	Al-Qasim	7.0	700	1.5	Concrete	
Ok.Rabegh	N.A.	Rabegh	6.0	800	N.A.	Earth	D.
Murat	N.A.	Murat	12.0	110	0.4	Earth	
Shuara'a	N.A.	Al-Dawami	11.0	95	1.0	Concrete	
Al-Hanabej	N.A.	Al-Dawami	7.0	700	3.5	Earth	
<i>Dams under construction or to be constructed</i>							
Kadoose	N.A.	Salboulkh	7.0	520	0.7	Earth	



Table 37. (Continued)

Name of dam	Catchment area, km <sup>2</sup>	Location	Height, m	Length, m	Storage capacity, 10 <sup>6</sup> m <sup>3</sup>	Type of dam	Purpose
Houta	N.A.	Houta	N.A.	N.A.	N.A.	N.A.	
B.Tameem	N.A.	B. Tameem	13.0	770	3.5	Earth	
Samnan	N.A.	Al-Zulfi	21.0	150	1.5	Rockfill	
Al-Ghayl	N.A.	Al-Aflaj	11.5	126	2.5	Concrete	
Thama	N.A.	BabilKarn	15.0	145	0.325	Concrete	
Najran	N.A.	Najran	60.0	250	85.0	Concrete	

*Explanation*

\* N.A. = not available, A.R. = aquifer recharge, F.C. = Flood control, S. = Storage, D. = Diversion  
Ir. = irrigation and W.S. = water supply.

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## **APPENDIX III: WATER QUALITY DATA**

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*Table 1(a).* Monthly and annual sediment load in the Senegal River at Bakel, Senegal

Year	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb	Mar.	Apr.	Total
1979/80	0.18	6.03	120	545	718	108	14.2	3.65	1.92	1.13	0.21	0.14	1485
1980/81	0.05	9.04	283	131	904	79.7	15.3	13.4	4.88	0.69	0.39	0.07	2635
1981/82	0.01	5.89	497	1009	711	95.1	16.1	4.59	1.40	0.66	0.09	0.05	2340
1982/83	0.02	0.02	179	606	493	125	11.8	3.20	4.26	1.66	0.31	0.03	1422
1983/84	0.05	145	527	482	343	130	20.0	6.70	2.63	0.96	0.18	0.08	1656
Average	0.05	33.3	321	790	634	108	15.5	6.27	3.02	1.02	0.24	0.07	1908

*Explanation*

Sediment load is given in  $10^3 t$ , and  $T_s$  in  $t km^{-2} y^{-1}$ .  $T_s = 6.8$  for 1979/80, 12.1 for 1980/81, 10.7 for 1981/82, 6.5 for 1981/82 and 7.6 for 1983/84, with an average of 8.7. The area of river basin at Bakel is 218,000  $km^2$ .

*Table 1(b).* Monthly and annual concentration of suspended sediment in the Senegal River at Bakel, Senegal

Year	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Avg.
1979/80	40.0	55.0	145	205	210	70.9	18.7	13.2	16.6	26.9	18.7	30.0	157
1980/81	34.3	161	333	302	174	62.5	30.8	60.1	46.6	18.4	32.5	19.9	208
1981/82	45.6	65.3	421	200	163	55.5	27.9	20.3	12.2	16.3	6.6	13.3	175
1982/83	13.7	20.8	267	194	144	86.5	21.0	18.2	46.5	48.0	29.8	9.3	149
1983/84	9.3	722	505	258	162	114	57.3	46.7	41.1	47.9	27.5	25.7	239
Average	28.6	205	334	232	171	77.9	33.1	31.7	32.6	31.5	23.0	19.6	186

*Explanation*

*All figures in Table are in mg l<sup>-1</sup>. Avg. = average*

Table 2(a). Major cations and anions in the Nile River channel and Damietta Branch in July 1991 (Ministry of Irrigation and Water Resources, Egypt, 1995)

Distance, km below Aswan	Cations, meq l <sup>-1</sup>				Anions, meq l <sup>-1</sup>			
	Ca <sup>++</sup>	Mg <sup>++</sup>	K <sup>+</sup>	Na <sup>+</sup>	CO <sub>3</sub>	HCO <sub>3</sub> <sup>-</sup>	Cl <sup>-</sup>	SO <sup>-4</sup>
0.0	1.0	0.8	0.2	0.8	0.1	1.7	0.2	0.1
83.4	1.3	0.7	0.1	1.1	Tr	1.9	0.2	0.2
206.9	1.4	0.7	0.1	1.0	Tr	1.9	0.2	0.3
331.1	1.2	0.9	0.2	1.1	Tr	1.9	0.2	0.4
472.0	1.4	0.8	0.2	1.8	Tr	2.1	0.3	0.2
618.7	1.2	1.0	0.1	1.4	0.4	2.0	0.2	0.4
748.0	1.2	1.1	0.1	1.1	0.2	2.0	0.3	0.5
887.9	0.9	1.4	0.2	1.2	Tr	2.2	0.3	0.4
1180.0	2.0	0.3	0.2	2.9	Tr	2.9	2.1	1.5

*Explanation*

Ca<sup>++</sup> = calcium, Mg<sup>++</sup> = magnesium, K<sup>+</sup> = potassium, Na<sup>+</sup> = sodium, CO<sub>3</sub> = carbonate, HCO<sub>3</sub><sup>-</sup> = bicarbonate, Cl<sup>-</sup> = chlorine and SO<sup>-4</sup> = sulfate.

*Table 2(b). Average solute concentrations of the Nile in Egypt (Martins & Probst 1991)*

Location	Transport, $10^6$ t		TDS, mg l <sup>-1</sup>	TSS mg l <sup>-1</sup>	TSS/ TDS,	Specific transport		Q, $10^6$ m <sup>3</sup> d <sup>-1</sup>
	TDS	TSS				chem.	mech.	
Assiut	11.8	2.0	318	54	0.18	3.9	0.7	100

*Explanation*

*TDS = total dissolved salts, TSS = total suspended solids and Q = average discharge.*



Table 2(c). Spatial change of some of the chemical characteristics of the Nile water in the main channel and Damietta Branch in July 1991 (from Ministry of Irrigation and Water Resources, Egypt, 1995)

Distance, km below Aswan	Q, 10 <sup>6</sup> m <sup>3</sup> d <sup>-1</sup>	Ec, umohs cm <sup>-1</sup>	TDS, mg l <sup>-1</sup>	TSS, mg l <sup>-1</sup>	TSS/ TDS, %	COD, mg l <sup>-1</sup>	Alkalinity, mg l <sup>-1</sup>	Hardness, mg l <sup>-1</sup>
0	220	240	142	11	7.7	4	106	92
21	218	225	156	6	3.8	4	108	100
53	208	241	159	39	24.5	8	108	100
83	210	251	161	40	24.8	9	112	100
115	211	257	158	5	3.2	9	126	87
143	213	260	160	3	1.9	7	119	87
168	215	260	160	9	5.6	9	118	103
207	205	261	164	16	9.8	5	118	103
237	203	262	165	10	6.1	7	127	107
268	200	262	166	39	23.5	9	127	126
299	200	277	172	29	16.9	7	119	104
331	195	279	176	5	2.8	10	118	105
361	191	281	175	13	7.4	10	117	106
397	178	283	181	11	6.1	9	119	107
439	176	292	184	12	6.5	13	120	120
472	174	293	182	4	2.2	13	125	108
512	173	296	180	7	3.9	15	134	108
547	173	300	180	10	5.6	14	121	108
587	137	300	180	10	5.6	14	132	111
619	135	301	186	16	8.6	26	125	110
646	134	303	190	12	6.3	14	129	110
686	134	305	180	27	15.0	9	128	110
716	133	309	192	25	13.0	15	126	110
748	132	318	182	16	8.8	10	126	112
792	132	321	188	14	7.4	19	133	112
807	131	323	190	13	6.8	8	133	109
852	130	335	200	15	7.5	12	137	119
888	130	332	200	23	11.5	10	130	114
932	129	345	200	16	8.0	6	138	113
946	40	345	202	20	9.9	16	132	116
1166	10	698	341	29	8.5	46	173	160
1180	7	720	364	15	4.1	13	178	175

*Explanation*

*Ec = electric conductivity, COD = chemical oxygen demand*

*All sampling sites are located on the main channel of the Nile, except the last two are on the damietta Branch.*

Table 3(a). Monthly sediment discharge and erosion rate in the Tigris River at two stations within the Baghdad area for the year 1983–84 (Al-Ansari & Ali, 1986)

Month	Q, $\text{m}^3 \text{ s}^{-1}$	North Baghdad Station		erosion rate* $\text{t km}^{-2}$	Saddam Bridge	
		sediment load t	%		sediment load t	%
October	482	105,238	1	0.8	81,189	1
November	631	1,378,620	17	10.0	1,509,837	23
December	840	1,250,622	16	9.0	905,203	14
January	425	48,820	1	0.4	68,029	1
February	640	466,984	6	3.0	501,051	8
March	598	743,190	9	6.0	550,431	9
April	862	2,900,125	36	22.0	1,807,980	28
May	891	614,106	8	5.0	547,111	8
June	733	297,061	4	2.0	324,567	5
July	407	70,202	1	0.5	83,312	1
August	320	36,453	1	0.3	67,575	1
September	293	31,962	1	0.2	50,037	1
Total	7,122	7,943,383	100	59	6,496,322	100
Monthly average	594	21,703		5.0	17,750	

\*Mechanical erosion( $T_s$ )

Table 3(b). Monthly dissolved solids discharge and erosion rate in the Tigris River at two stations within the Baghdad area for the year 1983–84 (Al-Ansari & Ali, 1986)

Month	Q, $\text{m}^3 \text{ s}^{-1}$	North Baghdad Station		erosion rate* $\text{t km}^{-2}$	Saddam Bridge	
		solute discharge t	%		solute discharge t	%
October	482	805,321	7	6.0	908,277	8
November	631	835,961	8	6.2	940,053	8
December	840	1,044,753	10	7.8	1,147,745	10
January	425	864,017	8	6.4	1,061,107	9
February	640	918,873	9	6.8	964,989	9
March	598	1,063,713	10	7.9	1,177,580	10
April	862	1,103,551	10	8.2	1,053,830	9
May	891	1,165,616	11	8.7	1,147,725	10
June	733	946,876	9	7.1	957,673	8
July	407	745,880	7	5.6	832,887	7
August	320	625,085	6	4.7	653,367	6
September	293	566,236	5	4.2	656,904	6
Total	7,122	10,685,882	100	79.7	11,502,137	100
Monthly average	594	29,196		6.6	31,427	

\* Chemical erosion ( $T_d$ )

Table 3(c). Mean monthly discharge and suspended sediment in the Adhaim River for the year 1983–84 at Narrows gauging station (Al-Jabbari & Mansour, 1986)

Month	Discharge, $\text{m}^3 \text{ s}^{-1}$		Suspended sediment load			Suspended sediment concentration, $\text{mg l}^{-1}$	
	$Q_{\text{avg}}$	$Q_{\text{max}}$ fl	total load, t	rate $\text{t km}^{-2}$	flood load t	average	(avg/max)fl
October	1.70		174	0.02		50	
November	2.40	19.4	15,641	1.58	1,5482°	742	3,551/15,670
December	4.20	6.2	1,739	0.17	1,370°°	124	652/2,340
January	4.30		403	0.04		37	
February	4.10		249	0.025		25	
March	17.0	44.2	1,063,971	108	1,063603*	558	1,719/11,832
April	19.6	393	1,954,981	199	1,928403**	5,549	17,372/52,000
May	3.66		1,008	0.102		153	
June	1.35		153	0.015		45	
July	0.70		51	0.005		27	
August	0.19		12.8	0.001		26	
September	0.26		13.2	0.001		21	

*Explanation*

° = Flood event 26.11-1.12.1983, °° = flood event 26.12-29.12.1983, \* = flood event 24.03–02.04.1984, and

\*\* = flood event 22.04-28.04-1984.

<sup>x</sup> = Average and maximum sediment concentrations for the duration of the flood event.

Table 3(d). Mean annual discharge, erosion rate and total transported dissolved load for the period 1959–82 at four stations in the upper reach of the Euphrates River, Iraq (Al-Jabbari & Al-Ansari, 1986)

Water year	Husseiba Station			Hit Station			Ramadi Station			Faluja Station		
	A°	B <sup>+</sup>	C*	A°	B <sup>+</sup>	C*	A°	B <sup>+</sup>	C*	A°	B <sup>+</sup>	C*
1958/59	631	55	1.10	600	34	0.91	x	32	0.88	x	54	1.50
1959/60	876	39	0.77	931	42	1.10	x	45	1.20	614	63	1.70
1960/61	485	49	0.98	483	30	0.78	x	26	0.71	765	47	1.30
1961/62	706	64	1.30	730	37	0.98	x	37	1.00	x	60	1.60
1962/63	x	49	0.99	1280	49	1.30	x	58	1.60	1040	7.9	2.10
1963/64	x	53	1.10	812	39	1.00	x	40	1.10	946	74	2.00
1964/65	817	66	1.30	835	40	1.00	x	41	1.10	908	72	2.00
1965/66	1140	70	1.40	1130	47	1.20	x	53	1.40	1130	84	2.30
1966/67	1280	82	1.70	1340	51	1.30	x	61	1.60	1160	86	2.30
1967/68	1563	91	1.80	1630	58	1.5—	x	72	2.00	1390	99	2.20
1968/69	1850	54	1.10	2010	64	1.70	x	85	2.30	1530	100	2.90
1969/70	806	52	1.10	826	40	1.10	x	41	1.10	781	65	1.80
1970/71	802	51	1.00	904	41	1.10	x	43	1.20	789	64	1.70
1971/72	770	38	0.76	734	37	0.98	x	37	1.00	773	63	1.70
1972/73	481	28	0.57	485	30	0.78	x	26	0.71	463	44	1.20
1973/74	297	31	0.62	2.86	23	0.60	x	17	0.46	288	31	0.84
1974/75	324	54	1.10	299	24	0.64	x	18	0.49	284	31	0.84
1975/76	805	65	1.30	783	40	1.00	x	40	1.10	646	55	1.50
1976/77	1010	61	1.20	966	46	1.20	x	48	1.30	1040	81	2.20
1977/78	920	58	1.20	812	43	1.10	x	43	1.20	918	73	2.00
1978/79	832	61	1.20	791	42	1.10	x	41	1.10	920	74	2.00
1979/80	944	63	1.30	906	44	1.20	x	45	1.10	967	76	2.10
1980/81	969	64	1.30	882	44	1.20	x	45	1.20	929	74	2.00
1981/82	983	x	x	885	44	1.20	x	45	1.20	1042	81	2.20
Mean	870	50	1.00	902	41	1.10	x	43	1.20	921	68	1.90

*Explanation*

A° = discharge,  $m^3 s^{-1}$ , B<sup>+</sup> = rate of erosion,  $t km^{-2}$ , and C\* = annual total transported dissolved load,  $10^7 t$ .

Table 4. Annual suspended sediment yield and concentration in some of the rivers and wadis in the Arab Region (figures cited in Walling 1984 and 1986, Heusch & Cayla, 1986, and Bouzaiane & Lafforgue, 1986)

River (R)/ Wadi (O)	Location	Country	Basin area, km <sup>2</sup>	Runoff mm y <sup>-1</sup>	Sediment yield, t km <sup>-2</sup> y <sup>-1</sup>	Concentration gm l <sup>-1</sup>
<i>High magnitude</i>						
O. Isser	N.A.	Algeria	3595	N.A.	2610	N.A.
O. Isser	N.A.	Algeria	31615	N.A.	1712	N.A.
O. Allalah	Sidi Akacha	Algeria	295	120	4654	38.8
O. Ebda	Arib Ebda	Algeria	270	338	2493	7.4
O. Agrioun	Eril Emda	Algeria	635	360	5300	13.9
O. Fodda	Lamatrine	Algeria	767	110	4700	42.7
Inaouene	N.A.	Morocco	3324	167	1100	6.6
Lebene	N.A.	Morocco	792	280	2250	8.0
O. Ouerrha	Bab Ounder	Morocco	1756	326	3590	11.0
O. M'Jara	N.A.	Morocco	5190	N.A.	2910	N.A.
O. Aoudour	Tafrannt	Morocco	1039	490	3850	7.9
O. Sra	Pont du Sker	Morocco	493	683	3500	5.1
O. Merguellil	Haffouz	Tunisia	675	25	620	24.8
O. Merguellil	Sidi Boujdaria	Tunisia	890	34	1080	31.8
O. Nebanna	Sidi Massoud	Tunisia	855	43	1330	30.9
O. Kebir	Sidi Auouidet	Tunisia	225	77	1313	17.1
O. Kasseb	Bar.ge Kasseb	Tunisia	101	588	5070	8.6
Diyala R.	Derbendikhan	Iraq	11900	N.A.	4110	N.A.
<i>Low magnitude</i>						
O. Soubella	S. Oudah	Algeria	176	21	36	1.7
O. Chouly	R.N.7	Algeria	178	115	25	0.2
O. Mefrouch	Tlemcen	Algeria	90	218	25	0.1
O. Hamman	Trois Rivières	Algeria	7605	20	26	1.3
Tigris R*.	N. Baghdad	Iraq	134000	140	59	3.2
Adhaim R.	Narrows St.	Iraq	9840	80	55	0.7
Jordan River	N.A.	Jordan/Israel	1590	N.A.	44	N.A.

\* The figures for the Tigris at northern Baghdad are for 1983–84, an exceptionally dry year

*Table 5(a).* Annual erosion and sedimentation rates as obtained from three sets of experimental basins in the drainage basin of the Isser River, Algeria (from Bouguerra, 1986)

Experimental basin, code No.	Area, ha	Rainfall, mm	Runoff depth, mm	Runoff volume, m <sup>3</sup>	coefficient, %	Sediment yield, t	concentration, gm l <sup>-1</sup>	Erosion rate, gm m <sup>-2</sup>
BS 21 No. I	169	255	14.5	24563	5.7	779.8	31.8	461.4
BS 21 No. II	84	255	7.4	6239	2.9	256.9	41.2	305.9
Soua- No.I	27	245	13.2	3578	5.4	787.9	220.2	2918.2
gui No. II	27	245	15.4	4167	6.2	1307	313.7	4841.8
Bad- No.I	18	318	97.9	7834	30.8	388.3	49.6	4853.7
lands No. II	8	309	60.5	10986	19.6	508.9	46.7	2827.4

Table 5(b). Annual erosion and sedimentation rates as obtained from six experimental basins within the drainage basin of wadi Mina, Algeria (from Touaibia et al, 1999)

Experimental basin, code No.	Area, ha	Rainfall, mm	Runoff depth, mm	Runoff volume, m <sup>3</sup>	coefficient, %	Sediment yield, t	concentration, gm l <sup>-1</sup>	Erosion rate, gm m <sup>-2</sup>
1	76.2	94	6.92	5271	7.4	1294	245.5	1698
2	44.1	82	5.28	2323	6.4	5581	237.2	1249
3	56.2	129	13.03	7323	10.1	1032	140.9	1836
4	71.3	121	10.23	7295	8.5	883	121.0	1238
5	21.7	175	41.41	8986	23.7	967	107.6	4456
5*		35	24.15	5205	69.0	571	110.0	2631
6	26.5	204	45.57	12075	22.3	1291	106.9	4872
6*		35	32.9	8764	94.0	997	114.0	3763

*Explanation*

\* Runoff, erosion and sedimentation data of the rainstorm of 11 May, 1990.

The mean gradients of the drainage channels are: 11.3, 13.2, 10.2, 9.9, 18.6 and 19.0% for basins 1 thru' 6.

The maximum concentration for 5\* and 6\* were 165 and 267 gm l<sup>-1</sup>, respectively.



Table 6. Electric conductivity of surface water in some wadis in the southern part of Yemen (from ECWA, 1981)

Wadi	Flow, $10^6 \text{ m}^3 \text{ y}^{-1}$	Electric conductivity, mmhos $\text{cm}^{-1}$	Wadi	Flow, $10^6 \text{ m}^3 \text{ y}^{-1}$	Electric conductivity, mmhos $\text{cm}^{-1}$
Maadin	12	1500	Shuaib	0.75	x
Azarik	12	440	Masila	28	1250
Rabwah	(10–15)	620	Jiza	100?	x
			Al-Wadi	12	x
Hturah )	10	x	Bayhan	54	500
Tarran )			Ahwar	75	1780
			Hajar	230	x
Harran )					
Tu'a )	10	x	Aden )		
Kabran)			Sarr )	144	550
			Ben-Ali)		
Wajar	10	x			
Der'a	9	620	Tuban	210	x
Abadan	7	620	Bana	176	x
Yesham	7	x	Hassan	30	x
Miafa'h	30	x			

Table 7. Sedimentation in some reservoirs in Morocco\*

Name of storage reservoir	Initial capacity, $10^6 \text{ m}^3$	Catchment area, $\text{km}^2$	Average annual flow, $10^6 \text{ m}^3$	Volume of sediments, $10^6 \text{ m}^3 \text{ y}^{-1}$	Annual sedimentation, as %ge of reservoir capacity
M.B. Abdel-Karim	43.0	780	80	2.7	6.3
Ibn Battouta	54.5	436	65	0.49	0.9
Nakhla	13.0	107	68	0.12	0.9
El-Makhazine	789	1820	829	1.8	0.2
Moulay Youssef	198	1441	386	1.4	0.7
Lalla Teberkoust	34.4	1707	165	1.0	2.9
Idris 1st	1271	3680	577	2.0	0.2
Bin el-Ouaidane	1484	6400	1127	3.3	0.2
Mansour Eddahabi	567	15000	400	4.7	0.8
Al-Massira	2724	28500	2954	9.0	0.3
El-Kansera	330	4540	373	1.4	0.4
Mohammed V	725	49920	768	14.5	2.0
Youssef B. Tachline	310	3784	122	1.1	0.4
Sidi Mohammed	493	9800	836	2.5	0.5
Bin Abdallah					
Tamzaourt	216.3	1300	87	0.2	0.1
Total	9252.2	383215	8837	46.21	wt. average=0.5

\* Sources

Laboratory of Physical Geography, University of Liege, Belgium (personal communication, 2000) and Country Report of Morocco (1986).

Table 8. Reservoir sedimentation in Tunisia\*

Item	Reservoir					
	Mellegue	Nebhana	Besik	Chiba	Masri	Lakhmess
Catchment area, km <sup>2</sup>	10300	855	N.A.	64	40	131
Initial reservoir capacity, 10 <sup>6</sup> m <sup>3</sup>	268	86.4	6.64	7.86	6.82	8.0
Period of operation, y	21.5	9.9	14.8	12	7.5	9.3
Accumulated sediments, 10 <sup>6</sup> m <sup>3</sup>	47.6	12.9	1.68	2.65	1.32	2.01
Accumulated sediments, %	17.8	14.9	26	33.7	19.3	25.1
Annual sedimentation rate, %	0.83	1.50	1.76	2.81	2.58	2.69
Total catchment sediment yield, 10 <sup>6</sup> m <sup>3</sup>	126.7	16.4	2.42	2.7	1.52	2.92
catchment sediment yield, 10 <sup>6</sup> m <sup>3</sup> y <sup>-1</sup>	5.94	1.65	0.164	0.225	0.202	0.313
annual inflow to reservoir, 10 <sup>6</sup> m <sup>3</sup>	188	41.4	4.32	3.72	2.86	4.15
maximum denudation, t km <sup>-2</sup> y <sup>-1</sup>	695	2300	2430	4200	6050	2865
average concentration, gm l <sup>-1</sup>	38	47.5	45.6	72.5	85	53

\* source

laboratory of physical geography, university of liege, belgium (personal communication).

Table 9. Sediments deposited in the reservoir of the Aswan High Dam, Egypt/The Sudan in the period 1964–89\*

Year	Annual flow, $10^6 \text{ m}^3$	Suspended load, $10^6 \text{ t y}^{-1}$	Deposited sediments, $10^6 \text{ m}^3 \text{ y}^{-1}$	Accumulated sediments $10^6 \text{ m}^3$
1964	97.7	253	183.9	183.9
1965	88.7	185	134.4	318.3
1966	71.5	91	66.8	385.1
1967	92.5	212	154.9	540.0
1968	74.3	104	76.0	694.9
1969	74.7	105	77.6	772.5
1970	79.1	127	93.8	866.3
1971	69.1	82	60.7	927.0
1972	57.3	44	32.9	959.9
1973	69.1	82	60.7	1020.6
1974	87.3	176	130.2	1150.8
1975	99.4	268	188.1	1338.9
1976	71.4	91	67.4	1406.3
1977	75.1	107	80.3	1486.6
1978	73.5	100	75.2	1561.8
1979	59.2	49	37.3	1599.1
1980	66.7	75	55.0	1654.1
1981	69.8	84	64.0	1718.1
1982	53.2	35	26.6	1744.7
1983	55.5	40	30.6	1775.3
1984	42.1	16	12.6	1787.9
1985	64.4	65	50.4	1838.3
1986	55.4	40	31.2	1869.5
1987	46.7	22	18.0	1887.5
1988	92.9	215	171.2	2058.7
1989	64.4	65	52.8	2111.5

\* Source

From the Files of The Aswan High Dam Authority, Egypt.

Table 10. Major ion concentrations ( $\text{mg l}^{-1}$ ) in some wells withdrawing groundwater from the coastal aquifer of Oued Nador, Algiers Region, Algeria (Messahel et al., 1997)

Year	Well ID	Ca	Mg	Na	K	Cl	HCO <sub>3</sub>	SO <sub>4</sub>	NO <sub>3</sub>
1982	F <sub>2</sub>	131	47	190	x°	359	280	215	x
	F <sub>3</sub>	149	44	197	x	390	305	170	x
	F <sub>6</sub>	169	59	195	x	364	384	217	x
	P <sub>143</sub>	135	32	130	x	230	401	195	31
	P <sub>159</sub>	470	270	1850	x	4160	869	430	2
1991	F <sub>2</sub>	640	219	790	64	2225	360	475	11
	F <sub>3</sub>	182	98	48	0	510	156	190	11
	F <sub>6</sub>	725	193	565	4	2375	360	315	10
	P <sub>143</sub>	45	42	108	0	175	154	80	53
	P <sub>159</sub>	42	37	245	10	455	242	53	4
1993	F <sub>2</sub>	600	425	1250	2	3900	357	400	25
	F <sub>3</sub>	2830	76	285	2	795	434	223	25
	F <sub>6</sub>	640	190	775	2	2425	382	385	84
	P <sub>143</sub>	140	27	98	19	155	401	88	55
	P <sub>159</sub>	214	82	223	11	550	611	140	42

*Explanation*

° x = No information

Table 11. Summary results for concentrations of chemical constituents in the Blue Nile Basin (Hussein, 2004)

Constituent	Nubian Sandstone aquifer			Al-Atshan aquifer		
	Average	Minimum	Maximum	Average	Minimum	Maximum
pH	7.9	4.4	8.6	8.0	6.7	8.5
T.D.S., mg l <sup>-1</sup>	395	168	800	340	230	2600
EC, mmohs cm <sup>-1</sup>	515	130	1066	540	216	5000
Hardness, mg l <sup>-1</sup>	145	54	166	145	62	458
Na <sup>+</sup> , mg l <sup>-1</sup>	50	1	330	46	2.0	282
K <sup>+</sup> , mg l <sup>-1</sup>	7	<1	25	6.0	<1	40
Ca <sup>++</sup> , mg l <sup>-1</sup>	27	4.0	60	27	3	77
Mg <sup>++</sup> , mg l <sup>-1</sup>	38	5.0	330	20	<1	153
HCO <sub>3</sub> <sup>-</sup> , mg l <sup>-1</sup>	210	25	439	200	61	805
Cl <sup>-</sup> , mg l <sup>-1</sup>	40	<1	206	24	3	151
SO <sub>4</sub> <sup>--</sup> , mg l <sup>-1</sup>	14	<1	115	18	<1	1.3
F <sup>-</sup> , mg l <sup>-1</sup>	18	<1	600	0.5	<1	1.3

Table 12. Chemical analyses of groundwater in the Mediterranean and Interior Basins, Lebanon (cited from ECWA Report, 1982)

Groundwater area/age	Location	Cations, meq			Anions, meq					T.D.S.	Hardness
		Ca	Mg	Na+K	Cl	SO <sub>4</sub>	CO <sub>3</sub>	HCO <sub>3</sub>	NO <sub>3</sub>		
Mediterranean Province Basin											
Karstified areas											
Jurassic	Ayoun	3.5	2.5	0.9	0.5	0.6	(-)	5.7	0.1	386	30
	Kasraouan	1.6	1.4	0.2	0.5	0.4	0.1	2.2	(-)	151	15
	Barouk/Niha	2.4	0.3	0.3	0.4	(-)	(-)	2.6	(-)	157	135
Cenomanian	Mt. Lebanon	2.5	1.1	0.3	0.6	0.1	(-)	3.2	(-)	198	18
	Ras el-Ain	4.5	1.7	0.8	1.0	0.1	(-)	5.9	(-)	374	31
	Hadath	5.9	2.6	0.1	2.0	0.9	(-)	5.7	(-)	472	42
	Hazmiya	Not Available									
Eocene	Nabatiya	3.8	1.7	1.2	1.0	0.3	0.2	5.2	(-)	358	27
	Doubbe	Not available									
Meocene	Koura	5.4	0.6	1.3	2.0	0.7	0.1	4.5	(-)	632	30
	Tripoli	Not available									
Permeable areas											
Cenomanian	Mt. Lebanon	2.4	0.9	0.4	0.4	0.8	(-)	2.5	(-)	180	167
Quaternary	Akkar	3.0	2.2	1.5	1.2	0.1	0.2	5.2	(-)	340	28
	Choueifat	4.8	3.5	3.6	6.8	2.3	(-)	2.8	(-)	792	375
	South coast	4.8	3.1	1.1	2.0	1.8	0.1	5.1	(-)	414	345
Interior Province Basins											
Karstified areas											
Jurassic	Barouk/Niha	3.5	0.9	0.4	0.5	0.3	0.1	3.8	0.1	266	22
	Idita	3.5	0.9	0.4	0.5	0.3	0.1	3.8	0.1	266	22
	Hermon	2.5	1.4	0.3	0.4	0.5	(-)	3.3	(-)	214	19.5
	Northeast of Serghaya	2.8	1.1	0.4	0.6	0.2	0.1	3.3	0.1	227	19.5
Cenomanian	Mt. Lebanon	2.2	0.8	0.1	0.3	(-)	(-)	2.8	(-)	160	15
	Anti-Lebanon	2.8	1.1	0.4	0.6	0.2	0.1	3.3	0.1	227	19.5
	Beqa' South	3.4	1.1	0.5	0.7	0.2	0.1	4.0	(-)	251	22.5
	Karaoua Tel ed-Deir	Not available									
Eocene	Beqa' South	3.2	0.9	0.6	0.7	0.3	0.1	3.4	0.2	346	20.5
	Marjayoun	Not available									
	Anjar	Not available									
	Beqa' East	4.2	1.3	0.5	0.6	0.6	0.1	4.5	0.2	364	27.5
	Ras Baalbak	Not available									
	Beqa' West	3.0	0.4	0.2	0.6	0.1	0.2	2.7	(-)	164	17
Zahla Ch.	Not available										
Permeable areas											
Quaternary	Beqa' Marj	4.1	1.8	0.8	0.9	0.6	0.1	4.8	0.3	450	29.5
	Hermel	Not available									
	Beqa' Plain	8.5	4.1	4.7	6.3	5.1	0.1	5.0	0.8	1318	63

Table 13. Chemical analysis of groundwater abstracted from wells in the Samara-Tikrit area, Iraq (Haddah et al., 1970)

Well No.	EC, mmhos $\text{cm}^{-1}$	Total soluble salts, ppm	Cations, meq $\text{l}^{-1}$		$\text{Na}^+$	Anions, meq $\text{l}^{-1}$	
			$\text{Ca}^{++}$	$\text{Mg}^{++}$		$\text{Cl}^-$	$\text{SO}_4^-$
T.R.T.	0.34	259	2.59	1.19	0.2	0.4	3.58
T.R.S.	0.32	225	2.59	1.19	0.2	0.5	3.48
H46/76	1.03	668	3.89	3.67	3.25	2.45	2.7
167/67	0.96	672	4.10	3.24	1.80	2.40	6.74
H73/B4	1.22	677	6.48	3.35	1.75	2.60	8.98
H71/40	1.29	770	3.13	8.43	1.40	1.40	11.56
82/34	1.20	840	9.50	1.84	1.40	0.80	11.94
H47/76	1.40	940	4.97	4.15	4.00	4.90	5.52
88/4B	1.72	1135	5.51	5.29	7.50	1.80	16.50
H69/4B	1.72	1267	9.07	2.81	7.00	3.00	15.88
H64/43	6.37	5815	30.24	21.60	35.00	24.40	62.44
H53/43	7.58	5940	27.00	19.98	17.65	26.95	55.27
H20/64	6.84	6146	32.35	18.14	34.50	29.00	52.00
H84/31	6.73	6164	32.00	12.00	29.00	45.14	34.00
157/56	6.11	6240	27.54	30.13	32.00	18.00	71.67
H85/11	6.28	6390	27.22	21.27	42.40	9.60	81.29
H48/75	9.00	6644	28.94	19.87	48.00	35.53	56.43
146/57	7.18	6885	25.70	29.16	47.00	19.20	82.66
H74/56	8.03	7315	27.65	29.16	53.50	30.40	79.91
H76/43	7.72	7364	32.00	24.00	48.00	37.21	60.00



*Table 14.* Groundwater chemistry of some wells in Kuwait (Al-Ruwaih & Shehata, 1998)

Well No	pH	TDS, mg l <sup>-1</sup>	Ec, mmhos cm <sup>-1</sup>	Total hardness, mg l <sup>-1</sup>	Total Alkalinity mg l <sup>-1</sup>	Cations, ppm			Anions, ppm			Salinity	
						K <sup>+</sup>	Na <sup>+</sup>	Mg <sup>2+</sup>	Ca <sup>2+</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>-</sup>		HCO <sub>3</sub> <sup>-</sup>
15	7.65	2780	3560	1298	133	1.3	370	126	312	509	1238	162	2800
26	7.70	3594	4790	1425	68	15.5	545	106	396	396	1031	83	3600
35	7.70	3379	5070	1553	88.5	17.5	585	130	408	1088	1089	108	3400
36	7.60	2685	3910	1410	135.5	15	370	144	328	532	1056	165	2700
44	7.85	3107	4270	1440	164	15	540	144	340	630	1213	200	3100
101	7.85	2910	3750	1234	122	14	415	118	300	558	1122	149	2900
102	8.10	2904	3760	1217	136	15	445	114	300	581	1089	158	2900
117	7.65	4897	6930	1745	138	28	950	172	416	1692	1337	168	3600

Table 15. Analysis of water samples from the falajes in the United Arab Emirates (from UAE Country Report, 1986)

Falaje Ser. No.	Falaje Name	E.C., mmohs cm <sup>-1</sup>	pH	Ca Melliequivalent l <sup>-1</sup>	Mg	Na	K	CO <sub>3</sub>	HCO <sub>3</sub>	Cl	SO <sub>4</sub>	S.A.R.
1	Warrah	710	8.4	1.54	3.60	2.50	0.07	0.41	3.06	2.20	1.90	1.56
2	Mutarrad	1100	8.4	1.80	4.50	5.20	0.13	0.51	3.26	4.71	3.00	2.94
3	Ghayl	1180	9.0	1.29	7.23	4.04	0.14	0.71	4.49	4.95	2.10	1.96
4	Ain Sukhnah	10940	7.9	30.38	12.25	80.40	1.41	Nil	3.06	108.53	12.60	17.40
5	Fili	1020	9.3	1.50	2.10	8.10	8.17	0.41	2.44	5.03	3.30	6.04
6	Dafdah	610	8.3	1.03	2.89	2.20	0.07	0.31	1.04	2.18	2.60	1.57
7	Hatta	400	7.9	0.77	2.90	0.65	0.04	0.10	2.24	1.05	0.90	0.40
8	al' Mualla	1840	7.8	1.29	4.59	13.04	0.23	0.20	4.49	9.50	4.90	7.60
9	Mazyad-1	960	8.8	1.29	4.10	4.70	0.13	0.50	3.06	4.20	2.40	2.90
10	Mazyad-2	2830	8.5	3.09	8.18	17.30	0.26	0.51	4.25	15.90	8.01	7.20
11	Asimah	470	8.9	0.30	3.03	1.13	0.08	Nil	1.53	2.00	1.19	0.90
12	Murad	750	8.8	1.34	3.95	2.20	0.05	0.40	3.16	2.87	1.11	1.40
13	Manama	680	8.9	1.44	4.15	1.30	0.06	0.40	3.37	2.38	0.80	0.80
14	Siji	750	9.3	1.34	4.44	1.73	0.07	0.61	3.47	1.14	2.36	1.00
15	Hafara	2000	8.7	4.60	0.60	14.50	0.08	0.20	2.77	12.38	4.43	9.00
16	Masafi	450	8.8	0.52	3.01	0.87	0.05	0.20	1.94	1.62	0.69	0.70
17	Awaina	1030	8.4	1.65	0.70	7.80	0.06	0.20	2.14	6.04	1.82	7.20
18	Masfut	750	8.7	1.54	3.55	2.30	0.07	0.50	3.4	2.70	0.86	1.40
19	Mamdoukh	600	8.4	1.20	2.40	2.48	0.06	0.50	3.57	1.90	0.17	1.80
20	Saham	650	8.8	1.03	4.47	1.30	0.05	0.40	4.40	1.80	0.25	0.80
21	Farfar	900	8.7	1.72	3.38	3.65	0.08	0.34	3.40	4.00	1.09	2.30
22	Farah	1100	8.6	2.90	4.30	4.57	0.09	0.68	5.45	4.76	0.97	2.40
23	Daudi	520	9.1	1.13	2.10	1.90	0.08	0.60	2.14	1.70	0.77	1.50
24	Sarrah	390	8.9	0.92	1.61	1.30	0.07	1.00	1.33	1.24	0.33	1.16

25	Buraimi	380	9.0	1.03	1.51	1.20	0.06	0.60	1.63	1.19	0.38	1.06
26	Al-Ain	620	9.0	1.13	2.50	2.50	0.10	0.82	2.25	2.05	1.11	1.86
27	Hatta-1	700	8.6	1.34	4.56	0.87	0.23	1.00	3.68	1.76	0.56	0.50
28	Hatta-2	900	8.6	1.34	5.35	1.95	0.36	1.12	2.65	3.70	1.53	1.00
29	Dhaid	1180	8.3	1.00	2.30	8.26	0.15	0.60	3.37	5.62	2.12	6.40
30	Jimi	750	8.0	1.00	2.23	3.91	0.16	0.82	2.04	3.14	1.30	3.00
31	Hili	750	8.6	1.75	2.25	3.48	0.10	0.40	3.47	2.57	1.14	2.50
32	Museira	1050	8.4	1.44	4.93	3.91	0.15	0.82	3.88	4.66	1.07	2.20
33	Bithna	1050	8.2	1.44	4.93	3.91	0.15	0.82	2.04	4.76	2.81	2.20
34	Usayli	2200	8.9	3.95	2.42	15.50	0.20	0.34	3.57	14.30	3.86	8.70
35	Khatt	2250	8.6	4.30	2.4	15.50	0.21	0.34	3.74	14.30	4.03	8.50
	Spring South											
36	Habisa	740	9.0	0.93	2.76	3.53	0.12	0.60	2.04	3.33	1.40	2.40
37	Habhab	2670	8.6	3.95	3.72	18.80	0.22	0.34	3.90	16.90	5.55	9.60
38	Rafaa	1700	8.3	2.75	2.48	11.70	0.13	0.51	3.06	9.40	4.09	7.20
39	Howellat	1250	8.7	1.65	2.07	8.90	0.13	0.68	3.57	5.71	2.79	6.50
40	Munai	780	9.0	1.24	2.29	4.20	0.10	0.68	4.25	2.14	0.76	3.20

Table 16. Relative salt tolerance of agricultural crops (from Asano, 1994)

Degree of tolerance	Group	Crop
Tolerant	Fiber, seed and sugar crops	Barley, cotton and sugar beets
	Grasses and forage crops	Bermuda grass, salt grass, wheat grass and wild rye
Moderately tolerant	Fiber, seed and sugar crops	Oats, rye, safflower, sorghum and wheat
	Grasses and forage crops	Clover, rye grass, fescue grass, Sudan grass, wheat and barley
	Fruit and nut crops	Fig, olive, pineapple, papaya, pomegranate and walnut
	Vegetables	Artichoke, red beets and squash
Moderately sensitive	Fiber, seed and sugar crops	Broad bean, maize, millet, groundnut, rice, sugar cane and sunflower
	Grasses and forage crops	Alfalfa, clover, corn, oat grass, rye, oats
	Fruit and nut crops	Almond and plum
	Vegetables	Spinach and cabbage
Sensitive	Fiber, seed and sugar crops	Bean and sesame
	Fruit and nut crops	Avocado, blackberry, cherry, strawberry and tangerine
	Vegetables	Bean, carrot, okra, onion, radish, sweet potato and tomato

Table 17. ARAMCO reuse criteria for various uses of water (ARAMCO, 1980)

Use	Treatment requirements	Quality requirements (no. of coliform/100 ml)
Spray irrigation of food crops	Disinfection, oxidation, coagulation clarification, filtration; or a process which provides equivalent degree of treatment and reliability	1- Median* <2.2 2- No more than one sample of >23 in any 30-day period
Surface irrigation of food crops	Disinfection, oxidation	Median <2.2
Orchards, vineyards	Primary (no fruit may contact water or ground)	None
Fodder, fiber, seed crops	Primary	None
landscape irrigation 1- <i>Limited access: roadway landscapes and other landscapes with similar access</i>	Disinfection, oxidation	1- Median <23 2- Not >240 in any two consecutive samples
2- <i>Unlimited access: parks, playgrounds, or areas with similar access</i>	disinfection, oxidation, coagulation, clarification, filtration; or a process which provides equivalent degree of treatment and reliability	1- Median < 2.2 2- Not >23 in any sample in any 30-day period
Recreational impoundments 1- <i>Non-restricted No limitation on body-contact water sports</i>	Disinfection, oxidation, coagulation, clarification, filtration; or a process which provides equivalent degree of treatment and reliability	1- Median < .2.2 2- No more than one sample of >23 in any 30-day period
2- <i>Restricted None-body-contact sports: e.g., fishing, boating</i>	Disinfection, oxidation	Median <2.2

\* Median determined from bacteriological results of the last 7 days for which analyses have been completed

Sources of information of Appendix III are the same as those listed at the end of Appendix II

