

## Supplementary Information

### **Enhancing informed decisions for coastal groundwater sustainability: a network analysis of water-related indicator results from 122 cities**

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#### **S1. The correlation heatmaps of indicators by the type of cities (All, coastal, and non-coastal)**

We analyzed Spearman's correlation coefficients of three types of cities (i.e. all cities, coastal cities, and non-coastal cities). The range of coefficients are from -1 (red) to +1 (blue). The deepest color is close to  $\pm 1$ . From the far left is node #1 and the number in the cell is node ID. Coastal groundwater is connected to more indicators than all cities and non-coastal cities.

Table S1. The correlation heatmap of entire cities.

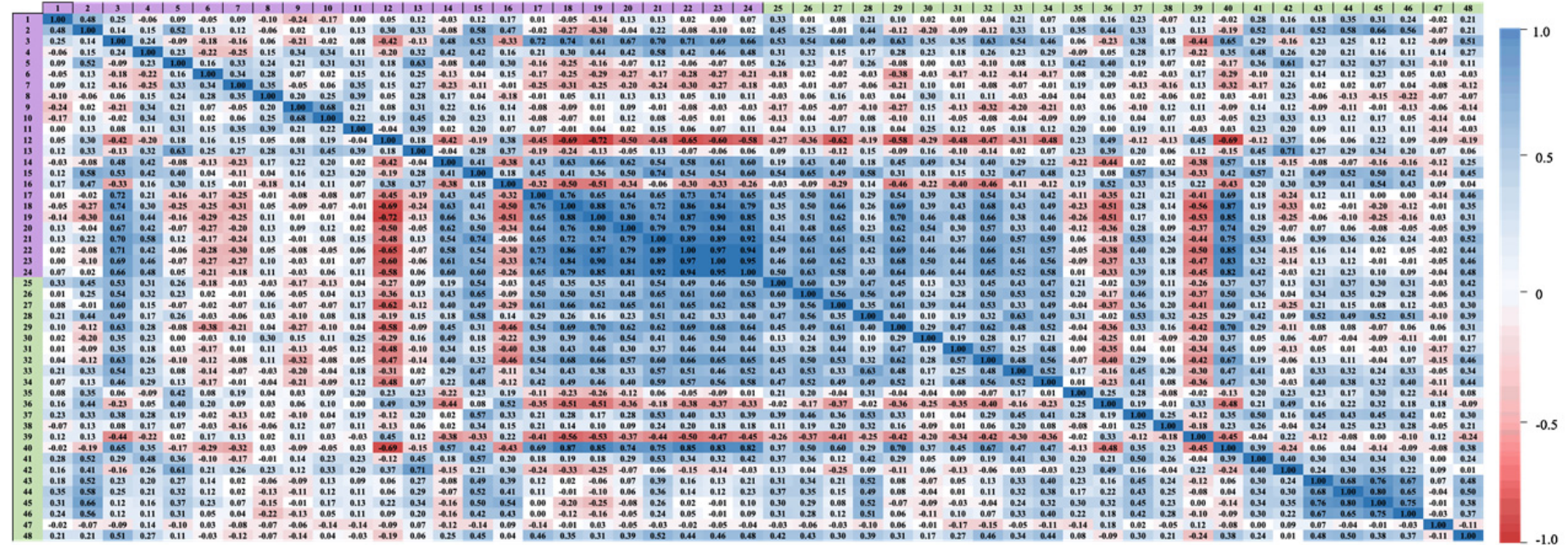


Table S2. The correlation heatmap of coastal cities

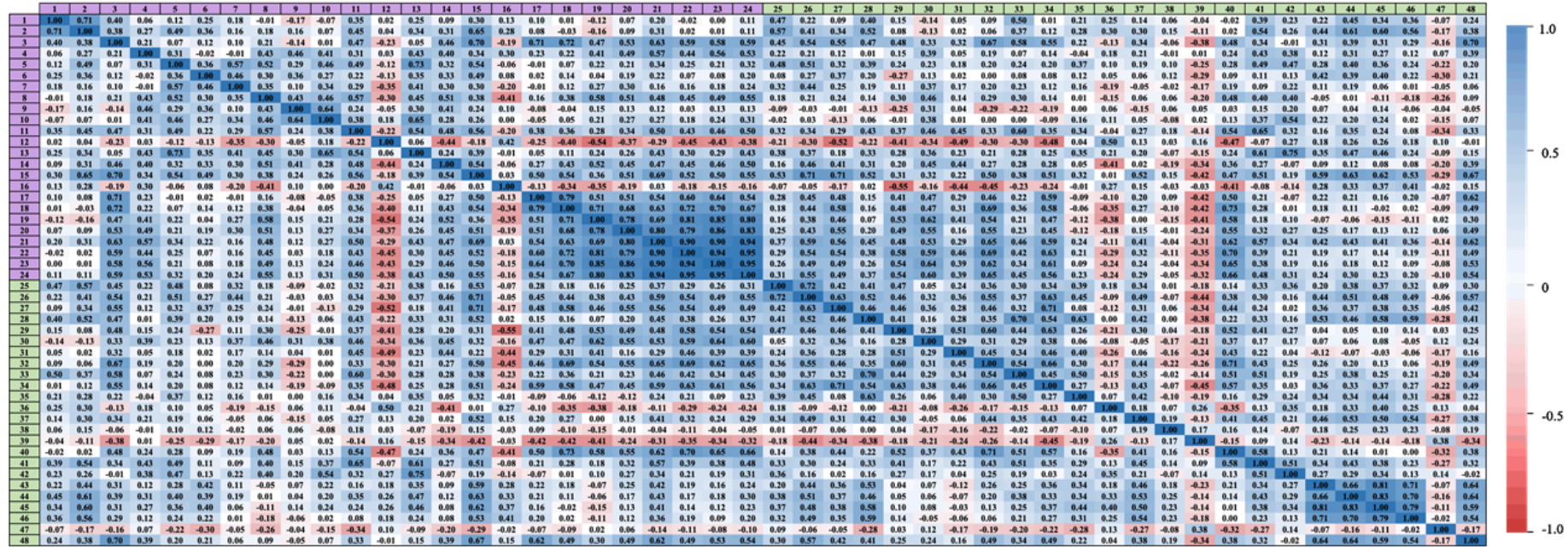
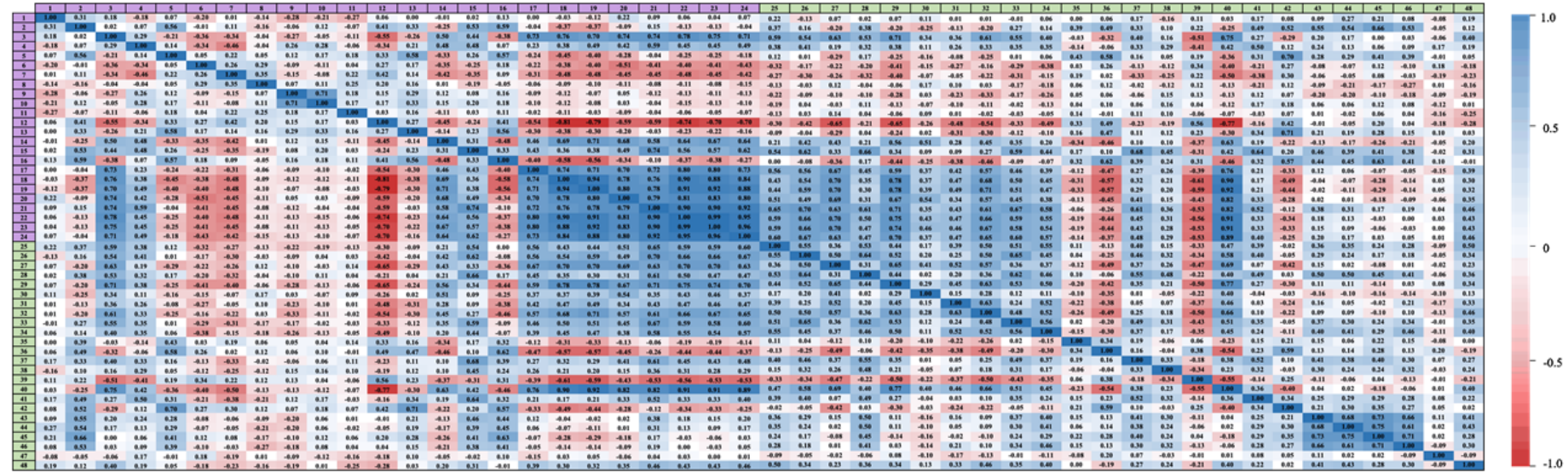




Table S3. The correlation heatmap of non-coastal cities



## S2. Network metric values of groundwater-centered networks

Below are the lists of metric values (node strength, closeness, and betweenness) in descending order for all cities (Table S4), coastal cities (Table S5), and non-coastal cities (Table S6). In *Table S4*, node #9 and #10 are only connected each other.

**Table S4.** The results of network metrics of all cities.

ID	Node strength	ID	Closeness	ID	Betweenness
21	37.06	9	0.7000	21	74.95
24	32.75	10	0.7000	23	61.45
23	32.35	24	0.0227	24	54.95
22	28.19	25	0.0223	25	49.95
19	25.56	23	0.0222	22	0.7
20	24.69	21	0.0213	3	0
14	17.43	22	0.0184	4	0
30	12.00	20	0.0161	9	0
3	10.81	41	0.0159	10	0
26	10.67	15	0.0146	14	0
27	10.00	3	0.0143	15	0
40	9.38	19	0.0143	17	0
29	9.29	29	0.0142	18	0
32	9.29	32	0.0142	19	0
15	9.10	14	0.0137	20	0
18	9.07	28	0.0133	26	0
17	9.05	27	0.0129	27	0
34	8.67	34	0.0128	28	0
25	8.00	17	0.0122	29	0
33	7.67	30	0.0122	30	0
48	6.00	40	0.0118	31	0
4	5.67	26	0.0113	32	0
28	2.00	33	0.0113	33	0
31	2.00	31	0.0112	34	0
37	2.00	4	0.0110	37	0
41	2.00	48	0.0110	40	0
9	1.43	18	0.0105	41	0
10	1.43	37	0.0105	48	0

**Table S5.** The results of network metrics of coastal cities.

<b>ID</b>	<b>Node strength</b>	<b>ID</b>	<b>Closeness</b>	<b>ID</b>	<b>Betweenness</b>
24	38.69	21	0.0114	32	146.86
21	38.11	24	0.0110	22	87.50
23	34.55	23	0.0106	8	79.62
22	32.45	22	0.0100	18	73.67
17	29.35	11	0.0096	9	61.50
19	28.86	20	0.0096	14	57.51
20	28.54	19	0.0095	13	33.86
11	28.43	15	0.0090	20	32.92
18	25.68	8	0.0090	26	30.75
8	21.33	41	0.0090	34	26.69
5	21.10	18	0.0090	23	21.67
30	18.67	40	0.0087	30	17.08
15	16.76	26	0.0084	15	11.83
40	16.71	17	0.0084	3	8.64
3	15.52	3	0.0083	33	5.25
27	15.00	30	0.0083	24	2.50
14	14.00	5	0.0082	17	2.20
29	13.67	32	0.0077	5	1.46
32	13.52	14	0.0077	19	1.00
48	13.33	13	0.0076	12	0.50
13	12.19	34	0.0076	21	0
34	12.00	27	0.0075	11	0
26	11.33	33	0.0075	41	0
41	10.76	4	0.0074	40	0
4	9.33	48	0.0074	27	0
10	9.33	29	0.0071	4	0
42	7.43	31	0.0071	48	0
33	5.67	10	0.0069	29	0
2	4.00	42	0.0065	31	0
12	4.00	2	0.0063	10	0
31	4.00	12	0.0061	42	0
9	3.67	9	0.0059	2	0
25	2.00	7	0.0056	7	0
44	2.00	25	0.0052	25	0
45	2.00	44	0.0050	44	0
7	1.67	45	0.0050	45	0
13	12.19	34	0.0076	21	0

**Table S6.** The results of network metrics of non-coastal cities.

<b>ID</b>	<b>Node strength</b>	<b>ID</b>	<b>Closeness</b>	<b>ID</b>	<b>Betweenness</b>
23	37.77	23	0.0210	23	283.50
20	35.23	20	0.0182	20	54.50
14	28.05	14	0.0150	14	29
30	6.00	22	0.0143	3	0
12	5.10	24	0.0143	4	0
3	4.68	18	0.0139	6	0
17	4.68	19	0.0139	7	0
29	4.52	21	0.0138	12	0
21	4.03	40	0.0138	15	0
40	4.03	3	0.0130	16	0
4	4.00	17	0.0130	17	0
7	4.00	29	0.0125	18	0
36	4.00	12	0.0123	19	0
22	3.92	27	0.0121	21	0
24	3.92	32	0.0120	22	0
18	3.79	26	0.0119	24	0
19	3.79	15	0.0111	25	0
15	3.67	25	0.0111	26	0
25	3.67	33	0.0111	27	0
33	3.67	30	0.0105	28	0
26	3.43	4	0.0102	29	0
32	3.10	7	0.0102	30	0
27	2.86	28	0.0098	31	0
6	2.00	31	0.0098	32	0
16	2.00	34	0.0098	33	0
28	2.00	39	0.0098	34	0
31	2.00	36	0.0095	36	0
34	2.00	6	0.0092	39	0
39	2.00	16	0.0083	40	0