Table S1. Information of the 33 cities included in this study. Population and area are based on the year 2020 from the Statistical Year Book. Cities numbered between 1 to 13 and 14 to 33 are defined as big (population greater than 500,000) and medium (population between 100,000-500,000) cities, respectively.

No.	Cities	Location			Area (㎢)	Population
		Longitude	Latitude	other		
1	Incheon	126° 37′ E	37° 28′ N	Coast	1,065.23	2,948,375
2	Seoul	127° 11′ E	37° 41′ N	Inland	605.23	9,509,458
3	Daejeon	127° 33′ E	36° 30′ N	Inland	539.50	1,452,251
4	Busan	129° 18′ E	35° 23′ N	Coast	769.89	3,350,380
5	Gwangju	127° 00′ E	35° 15′ N	Inland	501.13	1,441,611
6	Daegu	127° 00′ E	35° 15′ N	Inland	883.51	2,385,412
7	Suwon	127° 05′ E	37° 20′ N	Inland	121.09	1,183,714
8	Ulsan	129° 27′ E	35° 43′ N	Coast	1,061.54	1,121,592
9	Changwon	128° 50′ E	35° 23′ N	Coast	748.81	1,032,741
10	Cheongju	127° 46′ E	36° 46′ N	Inland	940.30	848,482
11	Jeonju	127° 14′ E	35° 53′ N	Inland	206.22	657,269
12	Cheonan	127° 25′ E	36° 57′ N	Inland	636.13	658,486
13	Pohang	129° 35′ E	36° 20′ N	Coast	1,128.76	503,852
14	Icheon	127° 43′ E	37° 27′ N	Inland	461.47	223,177
15	Yangpyeong	127° 49′ E	37° 49′ N	Inland	877.79	121,230
16	Chuncheon	127° 73′ E	37° 88′ N	Inland	1,116.42	284,594
17	Wonju	127° 92′ E	37° 34′ N	Inland	868.25	357,757
18	Gangneung	128° 88′ E	37° 75′ N	Coast	104.07	212,965
19	Chungju	127° 93′ E	36° 99′ N	Inland	983.62	209,358
20	Jecheon	128° 19′ E	37° 13′ N	Inland	882.77	131,591
21	Gunsan	126° 74′ E	35° 97′ N	Coast	397.45	265,304
22	Jeongeup	126° 86′ E	35° 57′ N	Inland	693.10	106,487
23	Mokpo	126° 39′ E	34° 81′ N	Coast	51.66	218,589
24	Yeosu	127° 66′ E	34° 76′ N	Coast	512.26	276,762
25	Suncheon	127° 49′ E	34° 95′ N	Coast	910.95	281,436
26	Andong	128° 73′ E	36° 57′ N	Inland	152.22	156,972

27	Gumi	128° 34′ E	36° 12′ N	Inland	615.31	412,581
28	Yeongju	128° 62′ E	36° 81′ N	Inland	670.11	101,942
29	Yeongcheon	128° 94′ E	36° 02′ N	Inland	919.19	101,888
30	Jinju	128° 11′ E	35° 18′ N	Inland	712.90	347,097
31	Tongyeong	128° 43′ E	34° 85′ N	Coast	240.21	125,383
32	Milyang	128° 79′ E	35° 50′ N	Inland	798.64	103,525
33	Geoje	128° 62′ E	34° 88′ N	Coast	403.83	241,216

Table S2. CMIP6 GCMs used in this study and their resolutions and developers.

Model	Resolution	Institution
ACCESS-ESM1-5	1.25°× 1.875°	Commonwealth Scientific and Industrial Research Organization
CanESM5	2.81°× 2.81°	Canadian Centre for Climate Modeling and Analysis
GFDL-ESM4	1.3°× 1.0°	Geophysical Fluid Dynamics Laboratory
CMCC-ESM2	0.9°× 1.25°	Euro-Mediterranean Centre on Climate Change
INM-CM4-8	2.0°× 1.5°	Institute for Numerical Mathematics
IPSL-CM6A-LR	2.5°× 1.27°	Institute Pierre-Simon Laplace
MIROC6	1.4°× 1.4°	Japan Agency for Marine-Earth Science and Technology, Atmosphere and Ocean Research Institute and National Institute for Environmental Studies
MPI-ESM1-2-LR	1.875°× 1.86°	Max Planck Institute for Meteorology(MPI-M)
MRI-ESM2-0	1.125°× 1.125°	Meteorological Research Institute
NorESM2-MM	2.5°× 1.89°	Norwegian Climate Centre

Equations S1 to S4: VIKOR procedure

The VIKOR method has the following steps:
Step 1: Determination of the best f_i^* and worst f_i^- values of all criterion functions, $i = 1, 2, \ldots, n$. If the ith function represents a benefit then:

$$f_i^* = \max_j f_{ij}\,,\ f_i^- = \min_j f_{ij} \quad \text{(S1)}$$

Step 2: Computation of the values S_j and R_j, $j = 1, 2, \ldots, J$, by the relations

$$S_j = \sum_{i=1}^{n} \frac{w_i(f_i^* - f_{ij})}{f_i^* - f_i^-}, \quad \text{(S2)}$$

$$R_j = \max_i \left[\frac{w_i(f_i^* - f_{ij})}{f_i^* - f_i^-}\right], \quad \text{(S3)}$$

where w_i are the weights of criteria, expressing their relative importance.
Step 3: Computation of the values Q_j, $j = 1, 2, \ldots, J$, by the relation

$$Q_j = \frac{v(S_j - S^*)}{(S^- - S^*)} + \frac{(1-v)(R_j - R^*)}{(R^- - R^*)} \quad \text{(S4)}$$

where $S^* = \min_j S_j$, $S^- = \max_j S_j$, $R^* = \min_j R_j$, $R^- = \max_j R_j$, and v is introduced as weight of the strategy of 'the majority of criteria' (or the maximum group utility), here $v = 0.5$.
Step 4: Rank the alternatives, sorting by the values S, R, and Q, in decreasing order. The results are three ranking lists.
Step 5: Propose as a compromise solution the alternative which is ranked the best by the measure Q (minimum).

Equations S5 to S11: TOPSIS precedure

The TOPSIS method has the following steps:
Step 1: Calculation of the normalized decision matrix. The normalized value r_{ij} is calculated as

$$r_{ij} = \frac{f_{ij}}{\sqrt{\sum_{j=1}^{J} f_{ij}^2}}, \quad j = 1, 2, \ldots, J;\ i = 1, 2, \ldots, n. \quad \text{(S5)}$$

Step 2: Calculation of the weighted normalized decision matrix. The weighted normalized value v_{ij} is calculated as

$$v_{ij} = w_i r_{ij} \quad \text{(S6)}$$

where w_i is the weight of the ith attribute or criterion, and $\sum_{i=1}^{n} w_i = 1$.
Step 3: Determination of the positive-ideal and negative-ideal solution.

$$A^* = \{v_1^*, \ldots, v_n^*\} = \left\{\left(\max_j v_{ij} \,\middle|\, i \in I'\right), \left(\min_j v_{ij} \,\middle|\, i \in I''\right)\right\} \quad \text{(S7)}$$

$$A^- = \{v_1^-, \ldots, v_n^-\} = \left\{\left(\min_j v_{ij} \,\middle|\, i \in I'\right), \left(\max_j v_{ij} \,\middle|\, i \in I''\right)\right\} \quad \text{(S8)}$$

where I' is associated with benefit criteria, and I'' is associated with cost criteria.
Step 4: Calculation of the separation measures, using the n-dimensional Euclidean distance. The separation of each alternative from the positive-ideal solution is given as

$$D_j^* = \sqrt{\sum_{i=1}^{n} \left(v_{ij} - v_i^*\right)^2} \quad \text{(S9)}$$

Similarly, the separation from the negative-ideal solution is given as

$$D_j^- = \sqrt{\sum_{i=1}^{n} \left(v_{ij} - v_i^-\right)^2} \quad \text{(S10)}$$

Step 5: Calculation of the relative closeness to the positive-ideal solution. The relative closeness of the alternative a_j with respect to A^* is defined as

$$C_j^* = D_j^- / \left(D_j^* + D_j^-\right) \quad \text{(S11)}$$

Step 6: Rank the preference order.

Equations S12 to S16: Fuzzy-TOPSIS procedure

As for the fuzziness in the decision data, linguistic variables are used to assess the weights (W_{ij}) of all criteria and the normalized performance ratings (r_{ij}) of each alternative A_i with respect to each criterion C_j. The weighted normalized fuzzy value v_{ij} is initiallycalculated as follows:

$$v_{ij} = W_j \times r_{ij} \tag{S12}$$

Then, the weighted normalized matrix $V = [v_{ij}]_{m\times n}$ is constructed. Next, the fuzzy positive ideal solutions FPISs A^+ and the negative ideal solutions FNISs A^- are calculated as follows:

$$A^+ = (v_1^+, v_2^+, \dots, v_n^+) \; \& \; A^- = (v_1^-, v_2^-, \dots, v_n^-) \tag{S13}$$

Where, $v_j^+ = \max_i v_{ij}$ and $v_j^- = \min_i v_{ij}$. The distance between two TFNs $\tilde{m} = (m_1, m_2, m_3)$ and $\tilde{n} = (n_1, n_2, n_3)$ can be calculated by means of Eq. (S14). Here, the FPISs (or FNISs) for each indicator is the maximum (or minimum) of weighted normalized values regardless of benefit and cost criteria, as they are considered in the normalization process. Then, the Euclidean distances of each alternative from FPISs and FNISs and the relative closeness RC_i of each alternative with respect to FPISs are calculated as follows

$$d(\tilde{m}, \tilde{n}) = \sqrt{\frac{1}{3}[(m_1 - n_1)^2 + (m_2 - n_2)^2 + (m_3 - n_3)^2]} \tag{S14}$$

$$d_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^+)^2} \; \& \; d_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_j^-)^2} \tag{S15}$$

$$RC_i = \frac{d_i^-}{d_i^+ + d_i^-} \tag{S16}$$

where, RC_i ranges from 0 to 1. The larger the value, the better the performance of the alternative.

Equations S17 to S22: Grey-TOPSIS procedure

The procedure of applying the grey-TOPSIS method consists of the following steps:
Determining the decision criteria, the set of most important attributes and describing the alternatives.
Determining the decision matrix D, x_{ij} denotes the grey evaluations of the i_{th} alternative with respect to the j_{th} attribute by the decision-maker.
Constructing the normalized grey decision matrices:

$$r_{ij} = \frac{\otimes x_{ij}}{max_i(\bar{r}_{ij})} = \left(\frac{\underline{x}_{ij}}{max_i(\bar{x}_{ij})}; \frac{\overline{x}_{ij}}{max_i(\bar{x}_{ij})}\right) \tag{S17}$$

$$r_{ij} = 1 - \frac{\otimes x_{ij}}{max_i(\overline{x}_{ij})} = \left(1 - \frac{x_{ij}}{max_i(\bar{x}_{ij})}; 1 - \frac{\underline{x}_{ij}}{max_i(\bar{x}_{ij})}\right) \tag{S18}$$

where, $\underline{x}_{ij}$ and $\overline{x}_{ij}$ represent the lower and higher values of the interval.
Determining the positive and negative ideal alternatives. The positive ideal alternative $\boldsymbol{A}^+$, and the negative ideal alternative $\boldsymbol{A}^-$are shown in Eq.(S19).

$$\boldsymbol{A}^+ = (v_1^+, v_2^+, \dots, v_n^+) \; \& \; \boldsymbol{A}^- = (v_1^-, v_2^-, \dots, v_n^-) \tag{S19}$$

Where, $v_j^+ = \max_i v_{ij}$ and $v_j^- = \min_i v_{ij}$
Calculating the separation measure of the positive and negative ideal alternatives, d_i^+ and d_i^- using Eqs. (S20) and (S21). In the equations w_i represents the weight of each criterion.

$$d_i^+ = \sqrt{\frac{1}{2}\sum_{j=1}^{m} w_i \left[\left|r_j^+ - \underline{r}_{ij}\right|^2 + \left|r_j^+ - \overline{r}_{ij}\right|^2\right]} \tag{S20}$$

$$d_i^- = \sqrt{\frac{1}{2}\sum_{j=1}^{m} w_i \left[\left|r_j^- - \underline{r}_{ij}\right|^2 + \left|r_j^- - \overline{r}_{ij}\right|^2\right]} \tag{S21}$$

Calculating the relative closeness, C_i^+, to the positive ideal alternative using Eq. (S22).

$$C_i^+ = \frac{d_i^-}{d_i^+ + d_i^-} \tag{S22}$$

where $0 \leqslant C_i^+ \leqslant 1$. The larger the index value is, the better the evaluation of alternative will be.