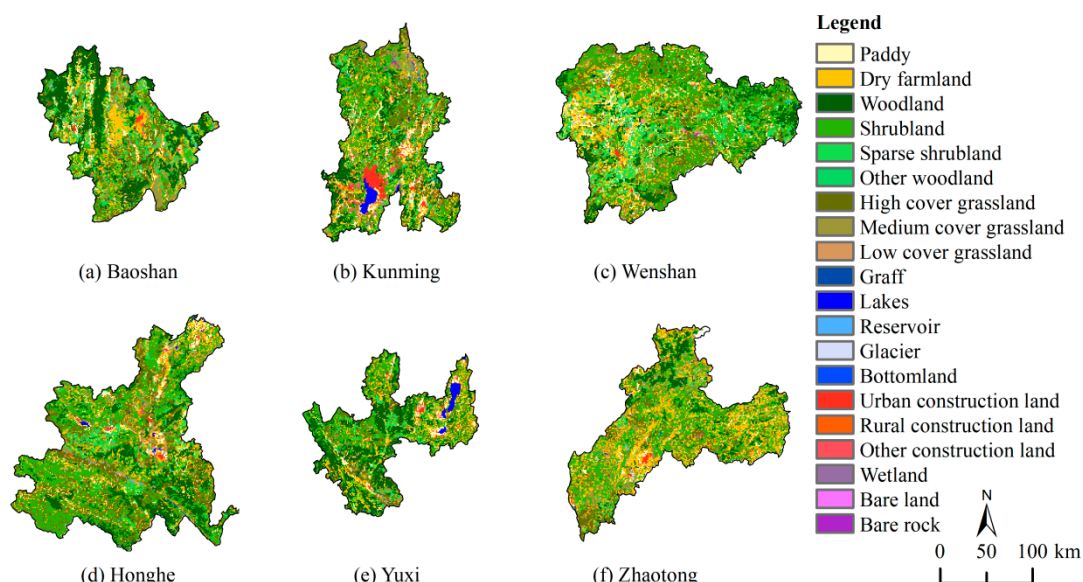
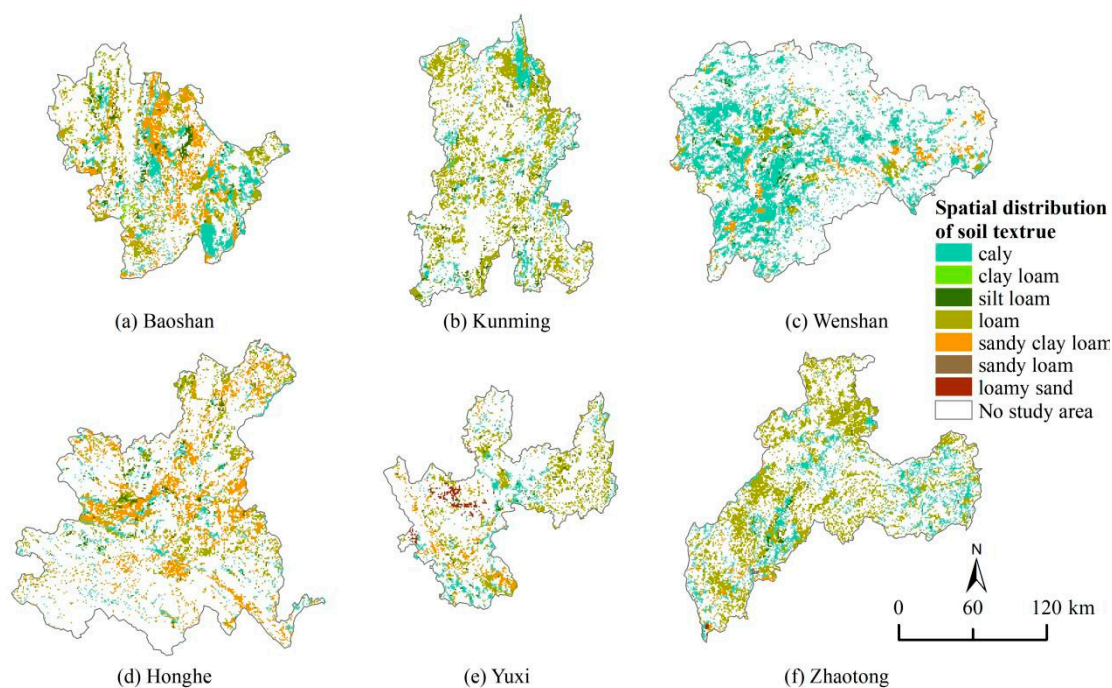


## Supplementary Material

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**Figure S1.** Land use type in six cities in 2018



**Figure S2.** Spatial distribution of soil texture types

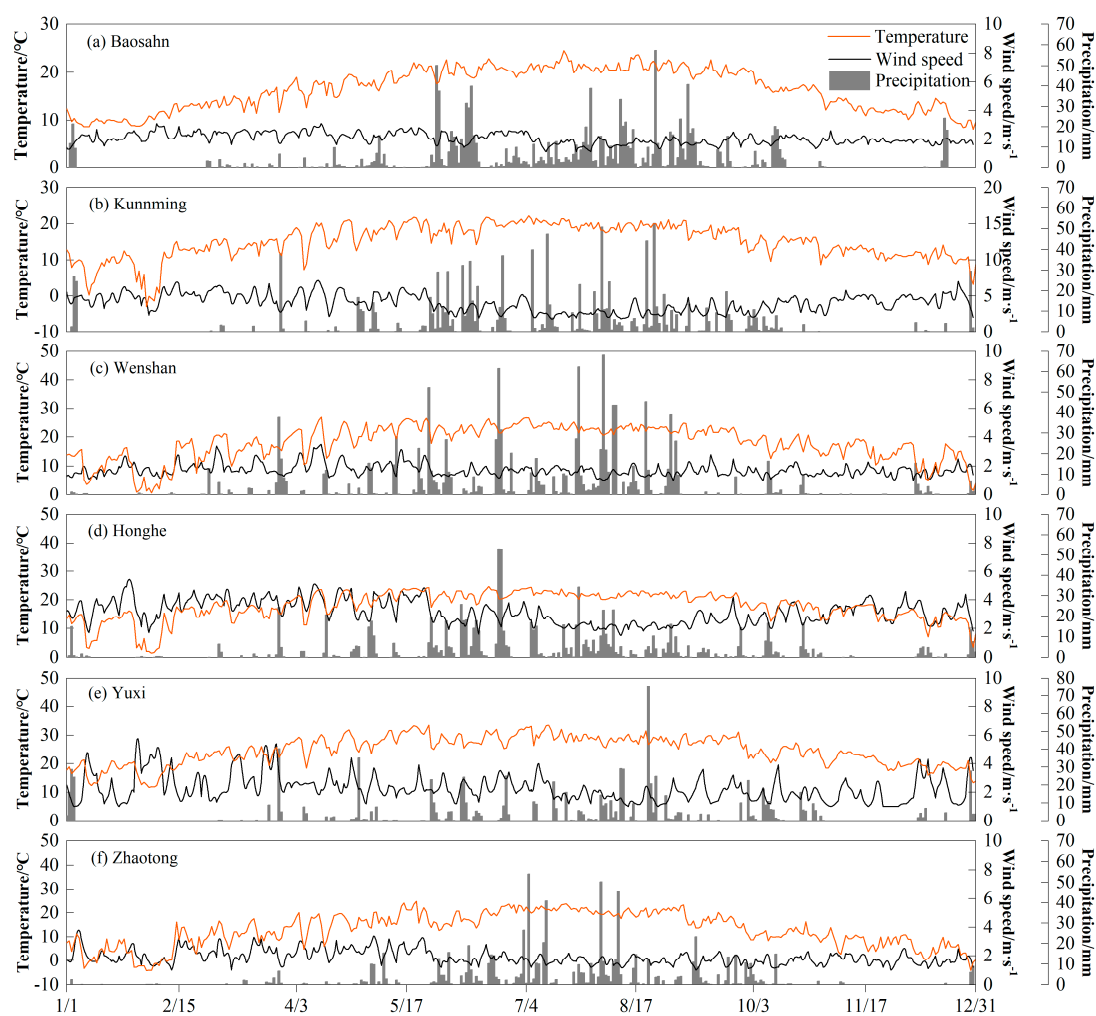


Figure S3. Daily temperature, wind speed and rainfall data in 2018

**Table S1.** Soil erodibility index (t/(hm<sup>2</sup>·a))

| Soil texture category   | Sand | Loamy sand | Loam | Sandy loam | Sandy clay loam | Silt loam | Clay loam | Silty clay loam | Silt | Clay | Silty clay | Sandy clay |
|-------------------------|------|------------|------|------------|-----------------|-----------|-----------|-----------------|------|------|------------|------------|
| Soil wind erosion index | 490  | 331        | 911  | 447        | 911             | 476       | 290       | 385             | 75   | 170  | 170        | 138        |

**Table S2.** Expose parameters of potentially toxic elements

| Parameters           | Parameter meaning           | Unit                                  | Child value                           | Adult value          |
|----------------------|-----------------------------|---------------------------------------|---------------------------------------|----------------------|
| ED                   | Exposure duration           | a                                     | 6                                     | 24                   |
| BW                   | Average body weight         | kg                                    | 15                                    | 70                   |
| EF                   | Exposure frequency          | d·a <sup>-1</sup>                     | 180                                   | 180                  |
| AT(non-carcinogenic) | Averaging time              | d                                     | 365×ED                                |                      |
| AT(carcinogenic)     | Averaging time              | d                                     | 70×ED                                 |                      |
| IngR                 | Ingestion rate              | mg·d <sup>-1</sup>                    | 200                                   | 100                  |
| InhR                 | Respiratory rate            | mg·d <sup>-1</sup>                    | 7.6                                   | 20                   |
| PEF                  | Particulate emission factor | m <sup>3</sup> ·kg <sup>-1</sup>      | 1.36×10 <sup>9</sup>                  | 1.36×10 <sup>9</sup> |
| SL                   | Skin adhesion               | mg·(cm <sup>2</sup> ·d) <sup>-1</sup> | 0.2                                   | 0.7                  |
| SA                   | Exposed skin surface area   | cm <sup>2</sup>                       | 2800                                  | 5700                 |
| ABS                  | Skin absorption factor      | /                                     | 0.001 for other elements, 0.03 for As |                      |

**Table S3.** Reference doses and slope factors of potentially toxic elements (mg/(kg·d))

| Potentially toxic elements | RFD                 |                               |                       | SF   |
|----------------------------|---------------------|-------------------------------|-----------------------|------|
|                            | oral reference dose | inhalation reference contents | dermal reference dose |      |
| Cd                         | 1.00E−03            | 1.00E−03                      | 1.00E−05              | 6.3  |
| Co                         | 2.00E−02            | 5.70E−06                      | 1.60E−02              | 9.8  |
| Cr                         | 3.00E−03            | 2.86E−05                      | 6.00E−05              | 42   |
| Ni                         | 2.00E−02            | 2.06E−02                      | 5.40E−03              | 0.84 |
| As                         | 3.00E−04            | 3.01E−04                      | 1.23E−04              | 15.1 |
| Mn                         | 4.60E−02            | 1.43E−05                      | 1.84E−03              | —    |
| Zn                         | 3.00E−01            | 3.00E−01                      | 6.00E−02              | —    |
| Pb                         | 3.50E−03            | 3.52E−03                      | 5.25E−04              | —    |
| Cu                         | 4.00E−02            | 4.02E−02                      | 1.20E−02              | —    |
| V                          | 7.00E−03            | 7.00E−03                      | 7.00E−05              | —    |

**Table S4.** Proportion of soil texture in six cities

| City     | Loamy sand | Loam   | Sandy loam | Sandy clay loam | Silt loam | Clay loam | Clay   |
|----------|------------|--------|------------|-----------------|-----------|-----------|--------|
| Baoshan  |            | 27.80% |            | 32.13%          | 8.37%     | 0.61%     | 31.10% |
| Kunming  | 0.12%      | 65.69% |            | 0.73%           | 6.59%     |           | 26.87% |
| Wenshan  |            | 8.81%  |            | 6.75%           | 3.16%     |           | 81.28% |
| Honghe   |            | 25.59% |            | 48.98%          | 7.40%     |           | 18.02% |
| Yuxi     |            | 48.37% | 6.07%      | 13.73%          | 6.15%     |           | 25.68% |
| Zhaotong | 0.14%      | 64.95% | 0.18%      | 2.60%           | 1.83%     |           | 30.31% |
| All city | 0.04%      | 37.45% | 0.53%      | 17.42%          | 5.31%     | 0.10%     | 39.14% |

**Table S5.** Annual mean values of various meteorological parameters

| Parameters                      | Baoshan | Kunming | Wenshan | Honghe | Yuxi  | Zhaotong |
|---------------------------------|---------|---------|---------|--------|-------|----------|
| Wind speed (m s <sup>-1</sup> ) | 2.0     | 4.0     | 1.7     | 3.1    | 2.3   | 1.9      |
| temperature (°C)                | 16.3    | 15.1    | 18.0    | 17.8   | 24.5  | 12.9     |
| precipitation (mm)              | 1323.6  | 1162.6  | 1273.7  | 999.0  | 934.1 | 809.8    |

**Table S6.** VCF for each months in 2018 (mean value ± standard deviation)

| Month     | Baoshan   | Kunming   | Wenshan   | Honghe    | Yuxi      | Zhaotong  | All cities |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| January   | 0.30±0.19 | 0.56±0.19 | 0.52±0.20 | 0.51±0.22 | 0.38±0.18 | 0.71±0.14 | 0.51±0.23  |
| February  | 0.38±0.23 | 0.61±0.21 | 0.52±0.20 | 0.56±0.21 | 0.45±0.19 | 0.78±0.16 | 0.56±0.24  |
| March     | 0.45±0.25 | 0.64±0.20 | 0.55±0.21 | 0.59±0.22 | 0.50±0.20 | 0.48±0.26 | 0.57±0.23  |
| April     | 0.46±0.29 | 0.61±0.23 | 0.41±0.25 | 0.56±0.25 | 0.51±0.22 | 0.36±0.23 | 0.52±0.25  |
| May       | 0.52±0.28 | 0.54±0.24 | 0.31±0.21 | 0.50±0.24 | 0.48±0.21 | 0.22±0.17 | 0.46±0.26  |
| June      | 0.63±0.25 | 0.48±0.20 | 0.18±0.13 | 0.49±0.24 | 0.51±0.21 | 0.10±0.12 | 0.42±0.26  |
| July      | 0.36±0.21 | 0.28±0.19 | 0.24±0.15 | 0.23±0.15 | 0.27±0.15 | 0.18±0.13 | 0.23±0.18  |
| August    | 0.20±0.16 | 0.33±0.20 | 0.23±0.14 | 0.28±0.16 | 0.30±0.17 | 0.27±0.19 | 0.25±0.17  |
| September | 0.27±0.22 | 0.45±0.25 | 0.44±0.22 | 0.29±0.20 | 0.30±0.21 | 0.40±0.22 | 0.30±0.21  |
| October   | 0.19±0.14 | 0.30±0.17 | 0.39±0.21 | 0.35±0.18 | 0.27±0.15 | 0.51±0.20 | 0.34±0.21  |
| November  | 0.28±0.22 | 0.51±0.24 | 0.45±0.20 | 0.39±0.24 | 0.34±0.21 | 0.70±0.17 | 0.41±0.23  |
| December  | 0.31±0.21 | 0.56±0.19 | 0.49±0.24 | 0.45±0.21 | 0.38±0.18 | 0.66±0.19 | 0.48±0.23  |

**Table S7.** Atmospheric PM<sub>2.5</sub> concentration for each month in 2018 ( $\mu\text{g}/\text{m}^3$ , mean value  $\pm$  standard deviation)

| Month     | Baoshan           | Kunming           | Wenshan           | Honghe            | Yuxi              | Zhaotong          |
|-----------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| January   | 24.10 $\pm$ 7.96  | 31.03 $\pm$ 11.41 | 24.55 $\pm$ 9.65  | 28.84 $\pm$ 8.83  | 23.00 $\pm$ 7.88  | 35.42 $\pm$ 16.46 |
| February  | 35.32 $\pm$ 9.88  | 38.50 $\pm$ 11.59 | 37.96 $\pm$ 15.36 | 38.57 $\pm$ 11.84 | 41.61 $\pm$ 15.13 | 31.68 $\pm$ 12.76 |
| March     | 41.06 $\pm$ 12.22 | 45.84 $\pm$ 11.00 | 40.10 $\pm$ 11.47 | 46.77 $\pm$ 12.01 | 40.52 $\pm$ 12.30 | 25.52 $\pm$ 12.32 |
| April     | 38.07 $\pm$ 11.30 | 38.20 $\pm$ 9.82  | 37.23 $\pm$ 13.22 | 39.30 $\pm$ 13.48 | 33.50 $\pm$ 8.68  | 22.23 $\pm$ 12.33 |
| May       | 21.48 $\pm$ 9.86  | 25.97 $\pm$ 9.49  | 22.26 $\pm$ 8.27  | 19.84 $\pm$ 8.64  | 20.48 $\pm$ 7.79  | 21.39 $\pm$ 12.24 |
| June      | 13.40 $\pm$ 9.14  | 18.43 $\pm$ 8.45  | 14.60 $\pm$ 8.26  | 11.97 $\pm$ 6.24  | 13.13 $\pm$ 6.51  | 12.43 $\pm$ 4.97  |
| July      | 10.97 $\pm$ 2.60  | 18.10 $\pm$ 8.16  | 15.45 $\pm$ 9.72  | 13.55 $\pm$ 8.17  | 14.32 $\pm$ 6.33  | 12.03 $\pm$ 4.48  |
| August    | 11.91 $\pm$ 4.01  | 25.70 $\pm$ 9.46  | 22.96 $\pm$ 12.01 | 23.59 $\pm$ 12.03 | 22.37 $\pm$ 7.86  | 16.67 $\pm$ 5.76  |
| September | 8.97 $\pm$ 2.97   | 15.82 $\pm$ 4.63  | 16.52 $\pm$ 7.17  | 14.17 $\pm$ 5.42  | 16.14 $\pm$ 7.68  | 9.55 $\pm$ 2.49   |
| October   | 11.84 $\pm$ 3.89  | 19.71 $\pm$ 5.58  | 20.23 $\pm$ 11.08 | 19.58 $\pm$ 12.96 | 17.06 $\pm$ 6.68  | 11.13 $\pm$ 2.87  |
| November  | 18.33 $\pm$ 6.61  | 22.93 $\pm$ 6.70  | 25.07 $\pm$ 10.11 | 20.87 $\pm$ 9.58  | 21.17 $\pm$ 4.43  | 18.83 $\pm$ 8.24  |
| December  | 15.80 $\pm$ 4.01  | 18.88 $\pm$ 4.50  | 20.40 $\pm$ 9.87  | 20.56 $\pm$ 13.72 | 17.33 $\pm$ 5.21  | 25.86 $\pm$ 5.96  |