

# **Supplemental Data**

## **Spatial heterogeneity analysis of hydrologic and water quality processes in Three Gorges Reservoir Area after 175 m Impoundment**

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**Table S1 Area, annual average total runoff depth and unit area water pollution loads of 23 parts in the TGRA**

| <b>Part name</b> | <b>Area (ha)<br/>(amount/proportion/rank)</b> | <b>Total runoff depth (mm)<br/>(amount/proportion/rank)</b> | <b>TN (kg/ha)<br/>(amount/proportion/rank)</b> | <b>TP (kg/ha)<br/>(amount/proportion/rank)</b> |
|------------------|-----------------------------------------------|-------------------------------------------------------------|------------------------------------------------|------------------------------------------------|
| L-1              | 337364(5.23%, 8)                              | 568.15(4.99%, 8)                                            | 5.55(4.99%, 8)                                 | 0.86(3.48%, 8)                                 |
| L-2              | 167826(2.60%, 16)                             | 655.93(5.76%, 4)                                            | 4.68(5.76%, 11)                                | 1.20(4.83%, 11)                                |
| L-3              | 489591(7.59%, 3)                              | 577.83(5.07%, 6)                                            | 3.34(5.07%, 16)                                | 0.26(1.05%, 16)                                |
| L-4              | 247770(3.84%, 12)                             | 508.08(4.46%, 12)                                           | 4.52(4.46%, 13)                                | 0.37(1.50%, 13)                                |
| L-5              | 175781(2.72%, 15)                             | 852.08(7.48%, 1)                                            | 3.32(7.48%, 17)                                | 0.80(3.23%, 17)                                |
| L-6              | 528078(8.18%, 2)                              | 454.70(3.99%, 14)                                           | 4.59(3.99%, 12)                                | 0.82(3.31%, 12)                                |
| L-7              | 59604(0.92%, 23)                              | 509.43(4.47%, 11)                                           | 21.02(4.47%, 1)                                | 3.88(15.7%, 1)                                 |
| L-8              | 92728(1.44%, 22)                              | 576.40(5.06%, 7)                                            | 2.02(5.06%, 18)                                | 0.53(2.13%, 18)                                |
| L-9              | 95807(1.48%, 21)                              | 193.60(1.70%, 22)                                           | 1.26(1.70%, 22)                                | 0.35(1.43%, 22)                                |
| L-10             | 148908(2.31%, 17)                             | 423.48(3.72%, 17)                                           | 6.82(3.72%, 7)                                 | 1.96(7.93%, 7)                                 |
| L-11             | 387984(6.01%, 6)                              | 591.50(5.19%, 5)                                            | 9.54(5.19%, 3)                                 | 2.23(9.01%, 3)                                 |
| L-12             | 410612(6.36%, 5)                              | 447.50(3.93%, 15)                                           | 7.24(3.93%, 6)                                 | 1.96(7.93%, 6)                                 |
| L-13             | 208212(3.23%, 13)                             | 725.93(6.37%, 3)                                            | 8.75(6.37%, 4)                                 | 2.44(9.87%, 4)                                 |
| L-14             | 260414(4.04%, 11)                             | 440.20(3.86%, 16)                                           | 11.58(3.86%, 2)                                | 1.92(7.75%, 2)                                 |
| R-9              | 142683(2.21%, 18)                             | 381.38(3.35%, 18)                                           | 4.06(3.35%, 14)                                | 1.00(4.06%, 14)                                |
| R-8              | 760537(11.79%, 1)                             | 256.30(2.25%, 21)                                           | 1.65(2.25%, 20)                                | 0.53(2.14%, 20)                                |
| R-7              | 141657(2.20%, 19)                             | 457.75(4.02%, 13)                                           | 7.95(4.02%, 5)                                 | 1.04(4.22%, 5)                                 |
| R-6              | 468785(7.27%, 4)                              | 536.63(4.71%, 9)                                            | 5.42(4.71%, 9)                                 | 1.23(4.96%, 9)                                 |
| R-5              | 335977(5.21%, 9)                              | 182.75(1.60%, 23)                                           | 3.86(1.60%, 15)                                | 0.06(0.23%, 15)                                |
| R-4              | 379532(5.88%, 7)                              | 532.65(4.68%, 10)                                           | 1.35(4.68%, 21)                                | 0.13(0.52%, 21)                                |
| R-3              | 118481(1.84%, 20)                             | 839.63(7.37%, 2)                                            | 0.60(7.37%, 23)                                | 0.01(0.04%, 23)                                |
| R-2              | 191601(2.97%, 14)                             | 376.95(3.31%, 19)                                           | 1.78(3.31%, 19)                                | 0.48(1.95%, 19)                                |
| R-1              | 302400(4.69%, 10)                             | 302.83(2.66%, 20)                                           | 5.15(2.66%, 10)                                | 0.67(2.72%, 10)                                |

**Table S2 Correlation between total runoff depth and land use types in tributaries**

| Part Name | AGRL           | ORCD            | FRST           | PAST           | WATR           | WETL           | URLD           | URML           | URHD           | UINS           | UIDU           | UCOM           |
|-----------|----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| L-1       | -0.057         | <b>-0.311**</b> | -0.04          | <b>.278**</b>  | <b>-.225*</b>  | . <sup>a</sup> | -0.016         | <b>-.257*</b>  | 0.042          | 0.115          | . <sup>a</sup> | -0.029         |
| L-2       | 0.12           | -0.237          | -0.144         | 0.105          | -0.124         | . <sup>a</sup> | 0.161          | 0.069          | 0.069          | . <sup>a</sup> | . <sup>a</sup> | 0.214          |
| L-3       | <b>.214*</b>   | -0.144          | 0.156          | <b>-.425**</b> | <b>-.184*</b>  | . <sup>a</sup> | 0.091          | -0.073         | -0.054         | 0.006          | 0.031          | -0.09          |
| L-4       | 0.036          | . <sup>a</sup>  | <b>.499**</b>  | <b>-.586**</b> | <b>-.319*</b>  | . <sup>a</sup> | <b>-.401**</b> | -0.208         | -0.255         | -0.178         | . <sup>a</sup> | <b>-.351**</b> |
| L-5       | <b>-.305*</b>  | -0.143          | <b>.312*</b>   | 0.254          | <b>-.410**</b> | . <sup>a</sup> | <b>-.412**</b> | <b>-.375**</b> | . <sup>a</sup> | . <sup>a</sup> | . <sup>a</sup> | <b>-.368*</b>  |
| L-6       | <b>-.269**</b> | <b>-.174*</b>   | 0.039          | <b>.423**</b>  | -0.052         | -0.116         | -0.104         | -0.169         | -0.098         | . <sup>a</sup> | . <sup>a</sup> | -0.064         |
| L-7       | <b>-.619*</b>  | 0.004           | <b>.629*</b>   | <b>-.675**</b> | 0.099          | . <sup>a</sup> | -0.149         | -0.365         | 0.335          | . <sup>a</sup> | . <sup>a</sup> | -0.411         |
| L-8       | <b>-.455*</b>  | -0.356          | <b>.679**</b>  | 0.057          | -0.308         | . <sup>a</sup> | -0.327         | -0.13          | -0.322         | . <sup>a</sup> | . <sup>a</sup> | 0.36           |
| L-9       | 0.349          | -0.113          | -0.28          | -0.265         | -0.035         | . <sup>a</sup> | 0.057          | -0.045         | -0.16          | . <sup>a</sup> | . <sup>a</sup> | 0.073          |
| L-10      | -0.042         | <b>.658**</b>   | <b>-.352*</b>  | 0.142          | <b>.677**</b>  | . <sup>a</sup> | 0.136          | <b>.505**</b>  | 0.097          | . <sup>a</sup> | . <sup>a</sup> | 0.181          |
| L-11      | 0.172          | <b>-.441**</b>  | -0.002         | -0.055         | -0.16          | -0.045         | 0.048          | <b>-.309**</b> | <b>-.335**</b> | -0.14          | . <sup>a</sup> | <b>-.279**</b> |
| L-12      | 0.174          | -0.126          | -0.089         | <b>-.232*</b>  | 0.148          | . <sup>a</sup> | 0.101          | 0.043          | <b>-.190*</b>  | . <sup>a</sup> | -0.025         | <b>-.229*</b>  |
| L-13      | 0.263          | 0.062           | <b>-.272*</b>  | -0.116         | -0.204         | . <sup>a</sup> | -0.158         | -0.193         | 0.027          | 0.133          | . <sup>a</sup> | -0.099         |
| L-14      | -0.071         | -0.057          | -0.21          | -0.097         | <b>.789**</b>  | . <sup>a</sup> | 0.019          | 0.014          | -0.043         | -0.144         | . <sup>a</sup> | -0.076         |
| R-9       | 0.099          | 0.071           | -0.12          | 0.318          | -0.147         | . <sup>a</sup> | -0.247         | -0.141         | -0.001         | -0.094         | . <sup>a</sup> | -0.02          |
| R-8       | 0.098          | 0.11            | <b>-.193**</b> | 0.109          | <b>.188**</b>  | . <sup>a</sup> | 0.077          | <b>.194**</b>  | 0.048          | <b>.145*</b>   | . <sup>a</sup> | 0.015          |
| R-7       | -0.001         | -0.07           | -0.009         | -0.078         | 0.259          | . <sup>a</sup> | 0.286          | 0.302          | -0.031         | 0.044          | 0.127          | 0.005          |
| R-6       | 0.141          | 0.088           | -0.161         | 0.088          | -0.049         | . <sup>a</sup> | -0.106         | -0.056         | -0.051         | . <sup>a</sup> | -0.026         | -0.058         |
| R-5       | <b>-.335*</b>  | -0.145          | 0.198          | .415*          | -0.196         | . <sup>a</sup> | -0.211         | -0.187         | -0.19          | . <sup>a</sup> | . <sup>a</sup> | 0.151          |
| R-4       | 0.089          | -0.049          | -0.118         | 0.04           | 0.047          | . <sup>a</sup> | 0.023          | -0.007         | -0.007         | . <sup>a</sup> | -0.024         | 0.105          |
| R-3       | <b>-.227*</b>  | -0.005          | 0.164          | 0.131          | -0.139         | . <sup>a</sup> | -0.077         | -0.091         | -0.076         | . <sup>a</sup> | . <sup>a</sup> | 0.024          |
| R-2       | -0.067         | . <sup>a</sup>  | <b>.284*</b>   | -0.191         | <b>-.377**</b> | . <sup>a</sup> | <b>-.312*</b>  | -0.214         | . <sup>a</sup> | . <sup>a</sup> | . <sup>a</sup> | -0.067         |
| R-1       | -0.152         | -0.018          | 0.071          | 0.04           | 0.078          | . <sup>a</sup> | -0.182         | -0.07          | -0.005         | . <sup>a</sup> | -0.061         | -0.039         |

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

.<sup>a</sup> Cannot be computed because at least one of the variables is constant.

Red numbers indicate a positive correlation, while blue numbers indicate a negative correlation.

**Table S3 Correlation between unit area load of TN and land use types in tributaries**

| Part Name | AGRL          | ORCD           | FRST           | PAST           | WATR          | WETL           | URLD          | URML          | URHD           | UINS           | UIDU           | UCOM          |
|-----------|---------------|----------------|----------------|----------------|---------------|----------------|---------------|---------------|----------------|----------------|----------------|---------------|
| L-1       | <b>.509**</b> | <b>.602**</b>  | <b>-.524**</b> | <b>-.233*</b>  | <b>.427**</b> | . <sup>a</sup> | <b>.334**</b> | <b>.534**</b> | <b>.261*</b>   | <b>.287**</b>  | . <sup>a</sup> | -0.053        |
| L-2       | <b>.745**</b> | 0.078          | <b>-.757**</b> | <b>-.462**</b> | 0.124         | . <sup>a</sup> | <b>.549**</b> | <b>.328*</b>  | <b>.381**</b>  | . <sup>a</sup> | . <sup>a</sup> | 0.207         |
| L-3       | <b>.261**</b> | -0.024         | <b>-.258**</b> | -0.127         | 0.045         | . <sup>a</sup> | <b>.219**</b> | <b>.370**</b> | 0.009          | 0.022          | <b>.635**</b>  | <b>.318**</b> |
| L-4       | -0.03         | . <sup>a</sup> | 0.14           | -0.199         | 0.059         | . <sup>a</sup> | -0.096        | 0.08          | -0.069         | -0.051         | . <sup>a</sup> | 0.063         |
| L-5       | 0.06          | -0.02          | -0.184         | 0.076          | 0.166         | . <sup>a</sup> | 0.041         | -0.087        | . <sup>a</sup> | . <sup>a</sup> | . <sup>a</sup> | -0.08         |
| L-6       | <b>.296**</b> | -0.138         | <b>-.378**</b> | -0.046         | -0.115        | -0.091         | -0.089        | -0.129        | -0.022         | . <sup>a</sup> | . <sup>a</sup> | -0.067        |
| L-7       | <b>.702**</b> | 0.256          | -0.391         | 0.221          | <b>-.577*</b> | . <sup>a</sup> | 0.253         | -0.294        | 0.205          | . <sup>a</sup> | . <sup>a</sup> | 0.339         |
| L-8       | -0.134        | -0.015         | <b>-.494*</b>  | 0.05           | <b>.614**</b> | . <sup>a</sup> | -0.227        | 0.303         | <b>.596**</b>  | . <sup>a</sup> | . <sup>a</sup> | 0.01          |
| L-9       | 0.187         | -0.042         | -0.174         | -0.077         | 0.101         | . <sup>a</sup> | 0.147         | 0.085         | 0.003          | . <sup>a</sup> | . <sup>a</sup> | 0.151         |
| L-10      | 0.265         | -0.171         | <b>-.404**</b> | -0.069         | -0.251        | . <sup>a</sup> | -0.06         | -0.249        | -0.004         | . <sup>a</sup> | . <sup>a</sup> | 0.144         |
| L-11      | 0.075         | -0.082         | -0.043         | -0.017         | -0.177        | -0.038         | <b>.627**</b> | -0.066        | -0.065         | -0.039         | . <sup>a</sup> | -0.066        |
| L-12      | 0.034         | -0.016         | 0.077          | 0.174          | -0.157        | . <sup>a</sup> | -0.165        | -0.151        | -0.121         | . <sup>a</sup> | -0.049         | -0.011        |
| L-13      | <b>.404**</b> | 0.008          | 0.125          | -0.167         | -0.012        | . <sup>a</sup> | -0.031        | <b>-.278*</b> | <b>-.362**</b> | 0.03           | . <sup>a</sup> | -0.249        |
| L-14      | -0.21         | 0.016          | 0.162          | <b>.421**</b>  | 0.03          | . <sup>a</sup> | 0.123         | 0.226         | 0.05           | 0.004          | . <sup>a</sup> | -0.023        |
| R-9       | 0.119         | 0.181          | -0.18          | <b>.560**</b>  | 0.332         | . <sup>a</sup> | -0.019        | -0.018        | 0.165          | -0.072         | . <sup>a</sup> | -0.101        |
| R-8       | 0.037         | -0.058         | -0.011         | 0.009          | -0.057        | . <sup>a</sup> | -0.035        | -0.041        | -0.049         | -0.025         | . <sup>a</sup> | -0.013        |
| R-7       | 0.142         | -0.037         | -0.023         | -0.043         | -0.087        | . <sup>a</sup> | -0.03         | 0.032         | -0.087         | -0.045         | -0.023         | -0.062        |
| R-6       | -0.112        | -0.051         | -0.101         | <b>.419**</b>  | -0.077        | . <sup>a</sup> | -0.065        | -0.066        | -0.029         | . <sup>a</sup> | -0.008         | -0.042        |
| R-5       | -0.202        | -0.057         | 0.215          | 0.074          | -0.052        | . <sup>a</sup> | -0.043        | -0.085        | -0.093         | . <sup>a</sup> | . <sup>a</sup> | 0.017         |
| R-4       | -0.054        | -0.002         | -0.004         | 0.107          | -0.084        | . <sup>a</sup> | 0.154         | 0.077         | 0.083          | . <sup>a</sup> | 0.059          | -0.063        |
| R-3       | -0.032        | -0.03          | -0.061         | 0.039          | 0.186         | . <sup>a</sup> | -0.088        | -0.018        | -0.008         | . <sup>a</sup> | . <sup>a</sup> | -0.067        |
| R-2       | 0.017         | . <sup>a</sup> | <b>-.415**</b> | <b>.446**</b>  | 0.21          | . <sup>a</sup> | -0.259        | -0.057        | . <sup>a</sup> | . <sup>a</sup> | . <sup>a</sup> | -0.106        |
| R-1       | <b>.302**</b> | <b>.290*</b>   | <b>-.327**</b> | -0.028         | 0.103         | . <sup>a</sup> | <b>-.254*</b> | -0.009        | 0.074          | . <sup>a</sup> | -0.049         | 0.026         |

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

.<sup>a</sup> Cannot be computed because at least one of the variables is constant.

Red numbers indicate a positive correlation, while blue numbers indicate a negative correlation.

**Table S4 Correlation between unit area load of TP and land use types in each tributary**

| Part Name | AGRL          | ORCD           | FRST           | PAST           | WATR           | WETL   | URLD           | URML          | URHD          | UINS          | UIDU          | UCOM          |
|-----------|---------------|----------------|----------------|----------------|----------------|--------|----------------|---------------|---------------|---------------|---------------|---------------|
| L-1       | <b>.782**</b> | <b>.331**</b>  | <b>-.718**</b> | <b>-.306**</b> | <b>.425**</b>  | .a     | 0.14           | <b>.247*</b>  | <b>.422**</b> | <b>.261*</b>  | .a            | -0.069        |
| L-2       | <b>.851**</b> | 0.075          | <b>-.869**</b> | <b>-.507**</b> | 0.134          | .a     | <b>.575**</b>  | <b>.373**</b> | <b>.442**</b> | .a            | .a            | 0.234         |
| L-3       | <b>.329**</b> | 0.029          | <b>-.369**</b> | -0.12          | 0.138          | .a     | <b>.228**</b>  | <b>.336**</b> | 0.038         | 0.054         | <b>.670**</b> | <b>.364**</b> |
| L-4       | -0.076        | .a             | -0.088         | -0.037         | <b>.683**</b>  | .a     | 0.261          | 0.21          | -0.04         | -0.033        | .a            | 0.064         |
| L-5       | <b>.421**</b> | 0.033          | <b>-.422**</b> | -0.075         | -0.186         | .a     | -0.031         | -0.125        | .a            | .a            | .a            | -0.066        |
| L-6       | <b>.185*</b>  | -0.093         | <b>-.284**</b> | -0.102         | -0.088         | -0.032 | -0.049         | -0.048        | 0.06          | .a            | .a            | -0.032        |
| L-7       | <b>.811**</b> | 0.501          | -0.482         | -0.064         | <b>-.584*</b>  | .a     | 0.344          | -0.334        | 0.346         | .a            | .a            | 0.294         |
| L-8       | 0.132         | 0.026          | <b>-.757**</b> | 0.16           | <b>.568**</b>  | .a     | -0.113         | 0.386         | <b>.565**</b> | .a            | .a            | 0.154         |
| L-9       | <b>.432*</b>  | 0.106          | <b>-.430*</b>  | -0.042         | 0.305          | .a     | 0.356          | 0.291         | 0.036         | .a            | .a            | 0.355         |
| L-10      | -0.115        | <b>-.409**</b> | <b>.343*</b>   | 0.074          | <b>-.480**</b> | .a     | -0.276         | <b>-.357*</b> | 0.063         | .a            | .a            | 0.199         |
| L-11      | 0.021         | -0.024         | 0.175          | 0.087          | <b>-.473**</b> | -0.041 | -0.056         | -0.006        | -0.061        | -0.049        | .a            | -0.046        |
| L-12      | -0.084        | 0.072          | <b>.224*</b>   | <b>.392**</b>  | <b>-.241*</b>  | .a     | <b>-.248**</b> | -0.114        | <b>-.196*</b> | .c            | -0.042        | 0.005         |
| L-13      | 0.168         | 0.004          | -0.045         | -0.221         | <b>.283*</b>   | .a     | 0.093          | -0.330*       | -0.067        | -0.037        | .a            | -0.135        |
| L-14      | <b>.356**</b> | -0.06          | <b>-.242*</b>  | <b>.233*</b>   | <b>-.256*</b>  | .a     | -0.072         | -0.002        | -0.088        | <b>-.252*</b> | .a            | -0.034        |
| R-9       | 0.148         | 0.162          | -0.209         | <b>.566**</b>  | 0.326          | .a     | -0.035         | -0.031        | 0.163         | -0.072        | .a            | -0.093        |
| R-8       | 0.08          | -0.057         | -0.045         | -0.009         | -0.059         | .a     | -0.022         | -0.011        | -0.054        | -0.01         | .a            | -0.001        |
| R-7       | 0.175         | -0.014         | -0.003         | 0.007          | -0.096         | .a     | -0.12          | -0.083        | -0.126        | -0.086        | -0.055        | -0.058        |
| R-6       | -0.066        | -0.033         | -0.156         | <b>.447**</b>  | -0.073         | .a     | -0.093         | -0.076        | -0.033        | .a            | -0.002        | -0.064        |
| R-5       | -0.166        | -0.07          | 0.061          | 0.221          | -0.025         | .a     | -0.117         | -0.097        | -0.105        | .a            | .a            | 0.176         |
| R-4       | -0.043        | -0.016         | -0.017         | 0.11           | -0.076         | .a     | 0.14           | 0.081         | 0.082         | .a            | 0.06          | -0.059        |
| R-3       | -0.069        | -0.036         | 0.092          | -0.042         | -0.016         | .b     | -0.099         | -0.043        | 0.008         | .a            | .a            | -0.013        |
| R-2       | -0.001        | .a             | <b>-.515**</b> | <b>.583**</b>  | 0.17           | .a     | -0.272         | -0.023        | .a            | .a            | .a            | -0.071        |
| R-1       | <b>.580**</b> | <b>.443**</b>  | <b>-.747**</b> | <b>-.234*</b>  | <b>.356**</b>  | .a     | -0.117         | 0.114         | <b>.460**</b> | .a            | -0.081        | <b>.450**</b> |

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

.a Cannot be computed because at least one of the variables is constant.

Red numbers indicate a positive correlation, while blue numbers indicate a negative correlation.

**Table S5 Correlation between total runoff depth and soil types in tributaries**

| Part Name | Paddy soil     | Limestone soil | Skeleton soil  | Purple soil    | Mountain meadow soil | Dark brown forest soil | Brown soil     | Yellow brown soil | Yellow soil    | Yellow cinnamon soil |
|-----------|----------------|----------------|----------------|----------------|----------------------|------------------------|----------------|-------------------|----------------|----------------------|
| L-1       | <b>-.285**</b> | 0.11           | . <sup>a</sup> | -0.196         | . <sup>a</sup>       | 0.149                  | <b>.211*</b>   | 0.106             | <b>-.404**</b> | . <sup>a</sup>       |
| L-2       | <b>-.484**</b> | <b>.396**</b>  | . <sup>a</sup> | <b>-.456**</b> | . <sup>a</sup>       | 0.058                  | 0.108          | 0.055             | 0.018          | . <sup>a</sup>       |
| L-3       | . <sup>a</sup> | <b>-.381**</b> | <b>.325**</b>  | 0.056          | 0.109                | . <sup>a</sup>         | 0.075          | 0.051             | <b>.205*</b>   | 0.066                |
| L-4       | 0.005          | <b>-.320*</b>  | -0.197         | <b>-.325*</b>  | . <sup>a</sup>       | . <sup>a</sup>         | 0.148          | <b>.264*</b>      | <b>.597**</b>  | -0.003               |
| L-5       | -0.022         | -0.076         | . <sup>a</sup> | <b>-.782**</b> | . <sup>a</sup>       | . <sup>a</sup>         | 0.209          | <b>.494**</b>     | <b>.565**</b>  | . <sup>a</sup>       |
| L-6       | <b>-.306**</b> | <b>.294**</b>  | .194*          | <b>-.533**</b> | . <sup>a</sup>       | . <sup>a</sup>         | <b>.451**</b>  | <b>.636**</b>     | <b>.287**</b>  | . <sup>a</sup>       |
| L-7       | 0.144          | <b>-.645**</b> | . <sup>a</sup> | 0.329          | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | -0.383         | . <sup>a</sup>       |
| L-8       | -0.279         | 0.367          | . <sup>a</sup> | <b>-.485*</b>  | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | . <sup>a</sup> | . <sup>a</sup>       |
| L-9       | 0.088          | <b>.675**</b>  | . <sup>a</sup> | <b>-.575**</b> | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | 0.082          | . <sup>a</sup>       |
| L-10      | <b>.340*</b>   | -0.02          | . <sup>a</sup> | <b>-.371*</b>  | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | -0.102         | . <sup>a</sup>       |
| L-11      | -0.183         | 0.015          | . <sup>a</sup> | <b>.210*</b>   | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | -0.023         | . <sup>a</sup>       |
| L-12      | 0.061          | -0.118         | . <sup>a</sup> | <b>.215*</b>   | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | 0.08              | <b>-.232*</b>  | . <sup>a</sup>       |
| L-13      | <b>-.390**</b> | 0.052          | . <sup>a</sup> | <b>.292*</b>   | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | 0.093             | 0.032          | . <sup>a</sup>       |
| L-14      | <b>-.307**</b> | -0.116         | . <sup>a</sup> | -0.081         | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | -0.059         | . <sup>a</sup>       |
| R-9       | 0.188          | . <sup>a</sup> | . <sup>a</sup> | -0.184         | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | -0.144            | -0.009         | . <sup>a</sup>       |
| R-8       | 0.114          | 0.002          | -0.002         | <b>-.155*</b>  | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | 0.076             | 0.056          | . <sup>a</sup>       |
| R-7       | -0.058         | 0              | . <sup>a</sup> | 0.04           | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | 0.031          | . <sup>a</sup>       |
| R-6       | <b>.477**</b>  | -0.069         | . <sup>a</sup> | -0.055         | -0.027               | . <sup>a</sup>         | . <sup>a</sup> | -0.03             | <b>-.201*</b>  | . <sup>a</sup>       |
| R-5       | <b>-.438**</b> | 0.061          | . <sup>a</sup> | <b>-.358*</b>  | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | <b>.415*</b>      | <b>.388*</b>   | . <sup>a</sup>       |
| R-4       | 0.029          | 0.049          | . <sup>a</sup> | -0.065         | . <sup>a</sup>       | . <sup>a</sup>         | 0.117          | 0.088             | -0.022         | . <sup>a</sup>       |
| R-3       | -0.116         | <b>.279**</b>  | -0.016         | <b>-.246*</b>  | 0.105                | . <sup>a</sup>         | 0.114          | 0.043             | -0.063         | -0.093               |
| R-2       | -0.02          | -0.103         | . <sup>a</sup> | -0.07          | . <sup>a</sup>       | . <sup>a</sup>         | 0.13           | 0.103             | 0.049          | -0.105               |
| R-1       | -0.024         | 0.159          | . <sup>a</sup> | <b>-.238*</b>  | . <sup>a</sup>       | . <sup>a</sup>         | 0.094          | 0.104             | -0.139         | . <sup>a</sup>       |

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

.<sup>a</sup> Cannot be computed because at least one of the variables is constant.

Red numbers indicate a positive correlation, while blue numbers indicate a negative correlation.

**Table S6 Correlation between unit area load of TN and soil type in tributaries**

| Part Name | Paddy soil     | Limestone soil | Skeleton soil  | Purple soil    | Mountain meadow soil | Dark brown forest soil | Brown soil     | Yellow brown soil | Yellow soil   | Yellow cinnamon soil |
|-----------|----------------|----------------|----------------|----------------|----------------------|------------------------|----------------|-------------------|---------------|----------------------|
| L-1       | -0.127         | 0.053          | . <sup>a</sup> | 0.14           | . <sup>a</sup>       | -0.039                 | -0.074         | -0.021            | -0.196        | . <sup>a</sup>       |
| L-2       | -0.145         | <b>.490**</b>  | . <sup>a</sup> | 0.272          | . <sup>a</sup>       | -0.181                 | <b>-.494**</b> | <b>-.448**</b>    | -0.091        | . <sup>a</sup>       |
| L-3       | . <sup>a</sup> | 0.048          | 0.002          | 0.016          | 0.017                | . <sup>a</sup>         | -0.114         | <b>-.251**</b>    | <b>.324**</b> | -0.105               |
| L-4       | 0.038          | -0.053         | 0.124          | -0.201         | . <sup>a</sup>       | . <sup>a</sup>         | -0.025         | -0.021            | 0.256         | -0.042               |
| L-5       | <b>.389**</b>  | -0.163         | . <sup>a</sup> | -0.019         | . <sup>a</sup>       | . <sup>a</sup>         | -0.032         | -0.069            | -0.062        | . <sup>a</sup>       |
| L-6       | -0.149         | -0.004         | 0.036          | <b>-.275**</b> | . <sup>a</sup>       | . <sup>a</sup>         | 0.112          | 0.164             | <b>.321**</b> | . <sup>a</sup>       |
| L-7       | 0.226          | <b>.673**</b>  | . <sup>a</sup> | <b>-.841**</b> | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | <b>.713**</b> | . <sup>a</sup>       |
| L-8       | -0.006         | <b>.446*</b>   | . <sup>a</sup> | -0.197         | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | -0.02         | . <sup>a</sup>       |
| L-9       | 0.003          | <b>.660**</b>  | . <sup>a</sup> | <b>-.505**</b> | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | 0.06          | . <sup>a</sup>       |
| L-10      | -0.173         | 0.197          | . <sup>a</sup> | -0.129         | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | <b>.353*</b>  | . <sup>a</sup>       |
| L-11      | 0.004          | 0.035          | . <sup>a</sup> | -0.05          | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | 0.07          | . <sup>a</sup>       |
| L-12      | -0.117         | -0.013         | . <sup>a</sup> | 0.014          | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | -0.022            | 0.109         | . <sup>a</sup>       |
| L-13      | <b>-.417**</b> | 0.2            | . <sup>a</sup> | 0.249          | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | <b>.307*</b>      | 0.252         | . <sup>a</sup>       |
| L-14      | -0.156         | 0.038          | . <sup>a</sup> | 0.092          | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | 0.034         | . <sup>a</sup>       |
| R-9       | <b>.491*</b>   | . <sup>a</sup> | . <sup>a</sup> | <b>-.443*</b>  | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | -0.087            | -0.192        | . <sup>a</sup>       |
| R-8       | -0.004         | 0              | -0.006         | -0.003         | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | 0.009             | 0.005         | . <sup>a</sup>       |
| R-7       | 0.255          | -0.074         | . <sup>a</sup> | -0.042         | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | -0.162        | . <sup>a</sup>       |
| R-6       | -0.057         | -0.08          | . <sup>a</sup> | -0.089         | -0.006               | . <sup>a</sup>         | . <sup>a</sup> | <b>.445**</b>     | -0.093        | . <sup>a</sup>       |
| R-5       | -0.001         | -0.125         | . <sup>a</sup> | 0.15           | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | -0.085            | -0.098        | . <sup>a</sup>       |
| R-4       | -0.087         | 0.007          | . <sup>a</sup> | -0.003         | . <sup>a</sup>       | . <sup>a</sup>         | <b>.560**</b>  | <b>.229*</b>      | -0.134        | . <sup>a</sup>       |
| R-3       | 0.043          | -0.175         | -0.043         | 0.16           | -0.024               | . <sup>a</sup>         | -0.018         | 0.174             | -0.132        | -0.03                |
| R-2       | -0.07          | 0.192          | . <sup>a</sup> | -0.14          | . <sup>a</sup>       | . <sup>a</sup>         | -0.136         | -0.208            | 0.051         | -0.04                |
| R-1       | 0.049          | 0.209          | . <sup>a</sup> | 0.079          | . <sup>a</sup>       | . <sup>a</sup>         | -0.114         | -0.145            | -0.097        | . <sup>a</sup>       |

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

.<sup>a</sup> Cannot be computed because at least one of the variables is constant.

Red numbers indicate a positive correlation, while blue numbers indicate a negative correlation.

**Table S7 Correlation between unit area load of TP and soil type in tributaries**

| Part Name | Paddy soil     | Limestone soil | Skeleton soil  | Purple soil    | Mountain meadow soil | Dark brown forest soil | Brown soil     | Yellow brown soil | Yellow soil   | Yellow cinnamon soil |
|-----------|----------------|----------------|----------------|----------------|----------------------|------------------------|----------------|-------------------|---------------|----------------------|
| L-1       | -0.14          | <b>.212*</b>   | . <sup>a</sup> | <b>.387**</b>  | . <sup>a</sup>       | -0.182                 | <b>-.296**</b> | <b>-.237*</b>     | <b>-.234*</b> | . <sup>a</sup>       |
| L-2       | -0.153         | <b>.557**</b>  | . <sup>a</sup> | 0.283          | . <sup>a</sup>       | -0.218                 | <b>-.492**</b> | <b>-.562**</b>    | -0.017        | . <sup>a</sup>       |
| L-3       | . <sup>a</sup> | 0.022          | -0.062         | 0.075          | -0.083               | . <sup>a</sup>         | <b>-.192*</b>  | <b>-.293**</b>    | <b>.361**</b> | -0.049               |
| L-4       | -0.059         | <b>.334*</b>   | -0.012         | -0.187         | . <sup>a</sup>       | . <sup>a</sup>         | -0.01          | -0.029            | -0.031        | -0.014               |
| L-5       | <b>.501**</b>  | -0.236         | . <sup>a</sup> | -0.006         | . <sup>a</sup>       | . <sup>a</sup>         | -0.021         | -0.09             | -0.095        | . <sup>a</sup>       |
| L-6       | -0.132         | -0.028         | -0.009         | <b>-.188*</b>  | . <sup>a</sup>       | . <sup>a</sup>         | 0.021          | 0.041             | <b>.298**</b> | . <sup>a</sup>       |
| L-7       | 0.438          | 0.363          | . <sup>a</sup> | <b>-.655**</b> | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | 0.331         | . <sup>a</sup>       |
| L-8       | 0.158          | 0.039          | . <sup>a</sup> | -0.019         | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | -0.18         | . <sup>a</sup>       |
| L-9       | 0.052          | <b>.438*</b>   | . <sup>a</sup> | -0.254         | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | -0.195        | . <sup>a</sup>       |
| L-10      | -0.182         | <b>.386*</b>   | . <sup>a</sup> | -0.202         | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | <b>.590**</b> | . <sup>a</sup>       |
| L-11      | <b>-.315**</b> | <b>.247**</b>  | . <sup>a</sup> | -0.137         | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | <b>.545**</b> | . <sup>a</sup>       |
| L-12      | -0.123         | 0.155          | . <sup>a</sup> | <b>-.245*</b>  | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | -0.005            | <b>.303**</b> | . <sup>a</sup>       |
| L-13      | <b>-.451**</b> | 0.151          | . <sup>a</sup> | <b>.395**</b>  | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | <b>.327*</b>      | 0.094         | . <sup>a</sup>       |
| L-14      | <b>-.347**</b> | 0.018          | . <sup>a</sup> | <b>.349**</b>  | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | 0.141         | . <sup>a</sup>       |
| R-9       | <b>.507*</b>   | . <sup>a</sup> | . <sup>a</sup> | <b>-.431*</b>  | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | -0.102            | -0.22         | . <sup>a</sup>       |
| R-8       | 0.022          | -0.028         | -0.034         | 0.022          | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | -0.006            | -0.007        | . <sup>a</sup>       |
| R-7       | 0.27           | -0.089         | . <sup>a</sup> | -0.045         | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | . <sup>a</sup>    | -0.163        | . <sup>a</sup>       |
| R-6       | 0.013          | -0.069         | . <sup>a</sup> | -0.097         | 0.007                | . <sup>a</sup>         | . <sup>a</sup> | <b>.443**</b>     | -0.142        | . <sup>a</sup>       |
| R-5       | 0.182          | -0.126         | . <sup>a</sup> | -0.026         | . <sup>a</sup>       | . <sup>a</sup>         | . <sup>a</sup> | -0.08             | 0.043         | . <sup>a</sup>       |
| R-4       | -0.077         | 0.003          | . <sup>a</sup> | 0.004          | . <sup>a</sup>       | . <sup>a</sup>         | <b>.575**</b>  | <b>.227*</b>      | -0.147        | . <sup>a</sup>       |
| R-3       | -0.102         | 0.018          | 0.02           | 0.016          | -0.051               | . <sup>a</sup>         | 0.014          | -0.025            | 0.033         | -0.034               |
| R-2       | -0.089         | 0.263          | . <sup>a</sup> | -0.091         | . <sup>a</sup>       | . <sup>a</sup>         | -0.163         | -0.26             | -0.013        | -0.018               |
| R-1       | <b>.412**</b>  | 0.177          | . <sup>a</sup> | <b>.242*</b>   | . <sup>a</sup>       | . <sup>a</sup>         | -0.187         | <b>-.474**</b>    | 0.118         | . <sup>a</sup>       |

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

.<sup>a</sup> Cannot be computed because at least one of the variables is constant.

Red numbers indicate a positive correlation, while blue numbers indicate a negative correlation.



**Table S8 Correlation between total runoff, TN, TP and ELEV, SLO and SLL in tributaries**

| Part Name | Q              |                |                | TN             |                |                | TP             |                |                |
|-----------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|           | ELEV           | SLO            | SLL            | ELEV           | SLO            | SLL            | ELEV           | SLO            | SLL            |
| L-1       | <b>.206*</b>   | <b>.350**</b>  | <b>-.283**</b> | <b>-.327**</b> | -0.007         | 0.013          | <b>-.571**</b> | -0.056         | 0.026          |
| L-2       | 0.14           | 0.203          | -0.274         | <b>-.546**</b> | <b>-.593**</b> | <b>.454**</b>  | <b>-.631**</b> | <b>-.600**</b> | <b>.448**</b>  |
| L-3       | <b>.237**</b>  | 0.089          | -0.115         | <b>-.289**</b> | <b>-.387**</b> | <b>.525**</b>  | <b>-.458**</b> | <b>-.314**</b> | <b>.537**</b>  |
| L-4       | <b>.472**</b>  | -0.239         | <b>.370**</b>  | -0.117         | 0.127          | -0.002         | <b>-.332*</b>  | -0.101         | -0.024         |
| L-5       | <b>.413**</b>  | <b>.507**</b>  | <b>-.470**</b> | -0.196         | -0.057         | 0.074          | -0.12          | -0.088         | 0.157          |
| L-6       | <b>.639**</b>  | <b>.503**</b>  | 0.102          | <b>.257**</b>  | <b>.179*</b>   | -0.16          | 0.164          | 0.056          | -0.134         |
| L-7       | 0.417          | 0.096          | -0.372         | 0.085          | -0.03          | -0.327         | -0.107         | -0.293         | -0.399         |
| L-8       | <b>.566**</b>  | 0.348          | -0.35          | <b>-.430*</b>  | -0.085         | <b>.547**</b>  | <b>-.661**</b> | -0.193         | <b>.520*</b>   |
| L-9       | 0.307          | -0.385         | 0.189          | <b>.505**</b>  | 0.102          | -0.247         | 0.203          | 0.063          | -0.279         |
| L-10      | <b>-.438**</b> | <b>-.351*</b>  | 0.114          | -0.013         | 0.179          | -0.037         | <b>.462**</b>  | 0.272          | -0.057         |
| L-11      | <b>.269**</b>  | <b>-.406**</b> | <b>.383**</b>  | 0.025          | -0.049         | 0.083          | <b>.460**</b>  | <b>.399**</b>  | <b>-.385**</b> |
| L-12      | -0.144         | -0.182         | 0.179          | 0.099          | 0.096          | 0.013          | <b>.380**</b>  | <b>.276**</b>  | <b>-.205*</b>  |
| L-13      | 0.238          | 0.107          | -0.161         | <b>.459**</b>  | <b>.565**</b>  | <b>-.412**</b> | <b>.377**</b>  | <b>.503**</b>  | <b>-.347*</b>  |
| L-14      | <b>-.337**</b> | 0.129          | -0.016         | 0.013          | <b>.300**</b>  | <b>-.289*</b>  | <b>.251*</b>   | <b>.358**</b>  | <b>-.302**</b> |
| R-9       | -0.067         | -0.103         | -0.088         | <b>-.434*</b>  | <b>-.453*</b>  | <b>.554**</b>  | <b>-.451*</b>  | <b>-.469*</b>  | <b>.543**</b>  |
| R-8       | -0.092         | -0.064         | <b>.171*</b>   | -0.013         | -0.027         | 0.01           | -0.044         | -0.085         | 0.043          |
| R-7       | <b>.397*</b>   | 0.216          | -0.212         | -0.077         | 0.085          | -0.073         | -0.205         | 0.015          | -0.021         |
| R-6       | -0.091         | -0.073         | -0.025         | -0.079         | -0.1           | 0.018          | -0.09          | -0.143         | 0.012          |
| R-5       | <b>.472**</b>  | <b>-.505**</b> | <b>.332*</b>   | -0.041         | -0.309         | 0.118          | <b>-.430**</b> | -0.217         | 0.183          |
| R-4       | -0.127         | 0.032          | -0.037         | <b>-.372**</b> | <b>-.189*</b>  | 0.039          | <b>-.357**</b> | <b>-.195*</b>  | 0.049          |
| R-3       | <b>.318**</b>  | <b>.441**</b>  | <b>-.338**</b> | <b>-.339**</b> | <b>-.231*</b>  | 0.144          | <b>-.331**</b> | -0.172         | <b>.213*</b>   |
| R-2       | <b>.439**</b>  | <b>-.315*</b>  | <b>.546**</b>  | -0.278         | -0.083         | <b>.538**</b>  | <b>-.357*</b>  | 0.01           | <b>.472**</b>  |
| R-1       | -0.125         | 0.213          | -0.02          | <b>-.416**</b> | 0.061          | 0.067          | <b>-.657**</b> | <b>-.231*</b>  | <b>.492**</b>  |

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

Red numbers indicate a positive correlation, while blue numbers indicate a negative correlation.