#### Supplementary 2. InVEST models

The InVEST (Version.3.3.3) suite of tools has been developed to enable decision-makers to assess trade-offs within and among ecosystem services and to compare the consequences of different future change scenarios, for example those related to land use or climate [11]. For this study, we selected the water yield model (for water yield service), and the carbon storage and sequestration model (for carbon sequestration service), to evaluate the corresponding ecosystem services in Taihu Lake Basin (TLB).

Supplementary information 2.1 Water yield (WY) model

Annual water yield for pixel  on land use/land cover (LULC),  (mm/yr), is estimated based on mean annual precipitation and the Budyko curve:



where  (mm/yr) is the actual annual evapotranspiration for pixel  on LULC and  (mm/yr) is the annual precipitation for pixel .

For vegetated LULC, the evapotranspiration portion of the water balance, , is based on an expression of the Budyko curve proposed by Fu [12] and Zhang[13]:



where  is potential evapotranspiration and  is a non-physical parameter that characterizes the natural climate-soil properties.

Potential evapotranspiration, , is defined as:



where is the reference evapotranspiration from pixel  and is the vegetation evapotranspiration coefficient associated with the pixel on LULC





whereis a non-physical parameter that characterizes the natural climate-soil properties; is a dimensionless constant, ranging from 1 to 30, that captures the local precipitation pattern and hydrogeological characteristics;  (mm) is the volumetric plant-available water content; 1.25 is the minimum value of ; is the evapotranspiration coefficient for pixel on LULC;  (mm/yr) is the reference evapotranspiration for pixel ; and (mm) is the plant-available water capacity.

For non-vegetated LULC (e.g., water, construction land), the actual annual evapotranspiration is computed directly from the reference evapotranspiration and has an upper limit defined by the precipitation:



where is the evapotranspiration coefficient for pixel on LULC ;  (mm/yr) is the reference evapotranspiration for pixel  , and  (mm/yr) is the annual precipitation for pixel .

SupplementaryTable 1 Biophysical tables used in the water yield model

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| lucode | LULC | Kc | pawc | ro\_depth | | LL\_veg |
| 1 | agriculture | 0.6 | 0.5 | | 700 | 1 |
| 2 | woodland | 1 | 0.4 | | 6300 | 1 |
| 3 | grass | 0.65 | 0.35 | | 1350 | 1 |
| 4 | shrub land | 0.85 | 0.4 | | 6300 | 1 |
| 5 | wetland | 0.8 | 0.6 | | 6300 | 0 |
| 6 | water | 1 | 0.6 | | 1000 | 0 |
| 7 | construction | 0.3 | 0.05 | | 9 | 0 |

Supplementary information 2.2 Carbon storage and sequestration (CSS) model

Using maps of land use and land cover types and data on the amount of carbon stored in carbon pools, this model estimates the net amount of carbon stored in a land parcel over time:

where is the total amount (Mg/hm2) of carbon storage; and , , , and represent the amount (Mg/ hm2) of carbon stored in aboveground biomass, belowground biomass, soil, and dead organic matter, respectively,.

Supplementary Table 2 Biophysical tables used in the carbon sequestration model

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| lucode | LULC | Cabove | Cunder | Csoil | Cdead |
| 1 | agriculture | 5 | 1 | 25.6 | 0 |
| 2 | woodland | 36.93 | 10 | 42.4 | 40 |
| 3 | grass | 6 | 0.75 | 18.2 | 5.2 |
| 4 | shrub land | 9.303 | 2 | 25.6 | 3 |
| 5 | wetland | 1 | 0 | 33 | 0 |
| 6 | water | 0 | 0 | 0 | 0 |
| 7 | construction | 0 | 0 | 21 | 0 |

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