Supplementary Materials

Table S1. mathematical notation

Notation	Description
T	number of time points
Y_t	year at time point t
t	index for a time point
J	number of categories
i	index for a category
j	index for a category
C_{tij}	number of pixels that are category i at time point t and category j at time point $t+1$
C_{tji}	number of pixels that are category j at time point t and category i at time point $t+1$
R_{tij}	intensity of annual transition from category i to category j during time interval $[Y_t, Y_{t+1}]$ relative to size of category i at time point t
W_{tj}	uniform intensity of annual transition from all non-j categories to category j during time interval $[Y_t, Y_{t+1}]$ relative to size of all non-j categories at time point t
y	dependent variable
a	constant
b	determination coefficient
x	independent variable

Text S1. Equations for linear regression analysis

Equation 1 gives the linear regression, which identifies the correlation between gross domestic product and total population.

$$y = a + b_x \quad (1)$$

Text S2. The calculation methods for transition pattern analysis

The transition pattern analysis investigates the relationship between the transition intensity R_{tij} from category i to category j and the uniform transition intensity W_{tj}, considering the increase in category j during the time interval $[Y_t, Y_{t+1}]$. If $R_{tij} < W_{tj}$, then the gain of j avoids i, indicating that the gain of j transitions from i with less intensity during the time interval $[Y_t, Y_{t+1}]$ compared to if the gain of j had transitioned uniformly from a location other than j at time Y_t. If the gain of target j, denoted as R_{tij}, is greater than the gain of target i, denoted as W_{tj}, then throughout the time period $[Y_t, Y_{t+1}]$, the transition of gain from target j to target i is more intense compared to a uniform transition from a different target at time Y_t. The intended sequencing of subscripts j and i in C_{tji} ensures that while summing over i, category j is subtracted at the initial time Y_t.

$$R_{tij} = \frac{C_{tij}100\%}{(Y_{t+1} - Y_t)\sum_{j=1}^{J} C_{tij}}$$

$$W_{tj} = \frac{\left[\left(\sum_{i=1}^{J} C_{tij}\right) - C_{tij}\right]100\%}{(Y_{t+1} - Y_t)\sum_{i=1}^{J}\left[\left(\sum_{j=1}^{J} C_{tij}\right) - C_{tji}\right]}$$