Supplementary Materials

1. Assessing land use change

In the study, four indicators (the net total area of change, the annual area of change, the annual rate of change and the dynamic degree) were used to analyze land use change characteristics. The following equation was used to calculate the annual rate of change (Ki) of the land use type of i.

$$K_i = \frac{1}{t} * \left\{ \sum\nolimits_j^n \left(\frac{\Delta S_{i,j}}{S_t} \right) \right\} * 100\%$$

where Si is the area of i at the start of monitoring, ΔSi,j is the total net area of the other changed land use type of j from and to i, and t is the period. Ki reflects the annual change rate of i within the study area during t.

Meanwhile, the following equation was used to calculate the dynamic degree (Si) of the land use type of i.

$$S_i = \frac{1}{t} * \left\{ \sum\nolimits_j^n \left(\frac{\left| \Delta S_{i,j} \right|}{S_a} \right) \right\} * 100\%$$

where Sa is the total study area, ∣ΔSi,j∣ is the total area of absolute value of the other changed land use type of j from and to i. Si reflects the change intensity of i within the study area during t.

2. Kernel density analysis

Kernel density analysis was used to monitor land use change and ecosystem ser-vices and to characterize their spatial distribution in terms of quantity, direction and intensity. Kernel density analysis estimates the spatial density of the whole region based on the distribution of point targets in the target area. It calculates the density of point elements around each output raster element. The points that fall into the target area have the same weight. Kernel density analysis can generate a continuous surface to reflect the point aggregation of the entire region, which could reflect the spatial dis-tribution characteristics. The ArcGIS software was used in this paper to convert the land use change pixels into the vector data, and calculates the kernel density of these points through the "Kernel Density" tool. According to the land use characteristics, the search radius is determined to be 2 km on the basis of testing.

3. The characteristics and roles of these parameters

We considered the land-use in 2014 as the reference map for the simulation, and used the following parameters as inputs of the Scenario Generator Rule Based Module.

(1) Land use map（Raster data）

In this study, the land use map of 2014 was used as the basis, and there were 8 land use types, including water bodies, construction land, bare land, aquaculture land, farmland, forestland, orchard and mud flat.

(2) Transition table（CSV）

It is the most critical table in the InVEST model. The table header includes the land use type, the land use transfer likelihood, the land use change percent and the priority. In this paper, we combined the land use scenarios with the area of land use types in 2014 to calculate the land use change proportion for different land use types under each scenario. Besides, we also obtained the priority of different land use types in each scenario by the historical land use transfer matrix and the expert scoring method (Table S1). Considering the significant proximity effect of some land use types, we assigned a value of 10 km to the proximity distance of construction land, while the aquaculture land and mud flat were assigned a value of 5 km and 10 km respectively due to the limitation of natural resources.

Table S1. Percent change and priority of each land use type for three scenarios

Land use type	Natural growth		Ecological protection		Ecotourism development	
	area change %	priority	area change %	priority	area change %	priority
water	0	0.198	0	0.198	0	0.198
construction land	79.45	0.901	0	0.207	39.73	0.846
bare land	0	0.198	0	0.207	0	0.198
aquaculture land	20.65	0.656	0	0.656	10.33	0.656
farmland	0	0.532	0	0.532	0	0.532
forestland	0	0.512	20.35	0.846	10.18	0.932
orchard	6.12	0.656	3.06	0.732	3.06	0.556
mud flat	0	0.198	515.00	0.901	515.00	0.901

(3) Calculate priorities

The Scenario Generator requires that the stakeholders rank the land use types to assign weight. When multiple objectives compete for a single land parcel, the one with the higher weight or priority wins. In this paper, the priority for different land use types in Table S1 was calculated by hierarchical analysis based on the expert scoring. And we calculated the priority by ArcGIS and assigned the value in the Transition table (Table S1).

(4) Specify transitions

The specify transitions was utilized to determine whether the transfer probability matrix would be used. The transition table has set the transfer probabilities for each land use type in the three scenarios. This command used the transfer probabilities and factors to check and apply the likelihood probability matrix.

(5) Use factors

The transition likelihood values are based on expert opinion and policy drivers. However, certain physical and environmental factors also affect the pixel suitability for conversion, hence determining where on the landscape the land use changes are likely to happen. So, the tool allows the user to provide these factors and their relationship with land suitability. The impacts of these factors differ between land use types, therefore we entered more than one factor for each of the land use types, and applied one factor to multiple land use types.

In the natural growth scenario, the main purpose is urban expansion and economic development. So, the impact factors in this scenario are mainly those affecting the three land types of construction land, aquaculture land and orchard. In the ecological protection scenario, forestland, orchard and mud flat are critical land use types, their impact factors and its weights are shown in Table S2.

Ecotourism development scenario not only need to tradeoff between regional economic development and ecological protection, but also consider the potential regional distribution of ecotourism development and its current level of development. Therefore, we added two additional impact factors of the current distribution of tourism areas and the distribution of ecotourism development potential based on natural growth and ecological protection scenarios. The former is the spatial distribution of tourist attractions in the Beibu Gulf area, while the latter is the potential distribution that is set for the integrated tourism information and land use distribution.

Table S2. Factors and weights for three land use scenarios

Scenario	Type	Factor	Weight
Natural growth scenario	Construction land	Elevation	2
	Construction land	Slope	3
	Construction land	Road	6
	Construction land	Buffer range of construction land status	5
	Construction land	Planned built-up area	8
	Aquaculture land	Elevation	3
	Aquaculture land	Buffer range of aquaculture land status	3
	Orchard	Elevation	3
	Orchard	Slope	5
	Orchard	Buffer range of orchard status	5
Ecological protection scenario	Forestland	Elevation	3
	Forestland	Slope	5
	Forestland	Buffer range of forestland status	5
	Orchard	Elevation	3
	Orchard	Slope	5
	Orchard	Buffer range of forestland status	5
	Mud flat	Elevation	5
	Mud flat	Coastline	5
	Mud flat	Buffer range of mud flat status	2
Ecotourism development scenario	Construction land	Elevation	2
	Construction land	Slope	3
	Construction land	Road	6
	Construction land	Buffer range of construction land status	5
	Construction land	Planned built-up area	8
	Aquaculture land	Elevation	3
	Aquaculture land	Buffer range of aquaculture land status	3
	Orchard	Elevation	3

Orchard	Slope	5
Orchard	Buffer range of orchard status	5
Forestland	Elevation	3
Forestland	Slope	5
Forestland	Buffer range of forestland status	5
Orchard	Elevation	3
Orchard	Slope	5
Orchard	Buffer range of orchard status	5
Mud flat	Elevation	5
Mud flat	Coastline	5
Mud flat	Buffer range of mud flat status	2
Construction land	The current distribution of tourism areas	3
Construction land	The distribution of ecotourism development potential	5
Forestland	The current distribution of tourism areas	2
Forestland	The distribution of ecotourism development potential	2
Mud flat	The current distribution of tourism areas	2
Mud flat	The distribution of ecotourism development potential	2

Note: The impact factor is shp data. If it is surface data, the metadata needs to add the suit field to distinguish the suitability of different blocks. If it is point/line data, the impact distance needs to be set in the factor weight.

(6) Constraints layer

The constraint layer is equivalent to the restricted area, which is an area where development is prohibited such as the National Nature Reserves and the Heritage Reserves, or an area that is difficult to develop due to its topography and natural environmental. However, protected areas have different designations which determine their ability to prevent land use change. Therefore, we entered an access value that determines the extent to which the protected area would effectively prevent habitat conversion under the scenario in consideration. We selected the appropriate constraints layer by integrating the boundaries. In this study, there are 7 constraint zones, and the constraint degree of each constraint zone is varied, as detailed in Table S3. The protect level ranges from 0 to 1, and a higher value means a lower probability of land use change.

Table S3. ID and protection level in the constraints layer

ID	Region name	Protect level
1	the National Nature Reserve	1.00
2	the Provincial/Municipal Nature Reserves	0.80
3	Basic Farmland Protection Area	0.80
4	the Scenic Spots	0.80
5	the Heritage Reserves	0.90
6	Marine area	0.50
7	High mountainous areas with slope >35	0.50