Supplementary material

Table S1. Sub-regional land use transfer matrix.

Zone	Type	Cropland	Forest	Grassland	Water	Barren	Impervious	Total
NN	Cropland		3944	15088	82	51	19	19184
	Forest	16826		10594	8	0	0	27428
	Grassland	27188	737		52	883	0	28860
	Water	541	10	99		8	232	890
	Unused land	40	0	473	2		0	515
	Construction	2226	81	431	136	13		2887
	Total	46821	4772	26685	280	955	251	
WN	Cropland	0	16816	22968	567	1584	55	41990
	Forest	26723	0	18801	125	20	1	45670
	Grassland	29316	3438	0	1302	62238	1	96295
	Water	1462	58	5228	0	7858	404	15010
	Unused land	267	1	57594	1497	0	1	59360
	Construction	5275	209	841	303	165	0	6793
	Total	63043	20522	105432	3794	71865	462	
SN	Cropland	0	36482	5189	407	4	37	42119
	Forest	29434	0	5610	60	1	1	35106
	Grassland	2992	1123	0	27	22	0	4164
	Water	1151	80	125	0	11	216	1583
	Unused land	3	1	13	3	0	0	20
	Construction	3384	259	108	79	10	0	3840
	Total	36966	37945	11047	578	48	255	

The unit is km^2.

Table S2. The average change in ESs.

Year	Zone	Index	CS	HQ	SC	WF	WY
2000	SN	0.15	844.14	0.82	629.86	22.31	1233.62
	NN	0.15	608.72	0.73	570.19	78.03	610.80
	WN	0.12	427.58	0.60	614.11	66.34	469.35
	Total	0.14	532.26	0.66	611.61	65.32	634.37
2005	SN	0.15	868.02	0.82	618.75	48.27	1111.54
	NN	0.13	675.21	0.74	500.15	86.04	591.31
	WN	0.11	460.78	0.60	546.54	93.50	444.40
	Total	0.12	567.84	0.66	553.89	79.63	592.78

2013	SN	0.16	1050.17	0.81	623.39	46.34	1098.79
	NN	0.15	821.69	0.75	538.58	93.14	617.61
	WN	0.11	520.13	0.60	571.69	77.80	442.71
	Total	0.12	662.32	0.66	576.96	73.55	592.78
2015	SN	0.17	1064.14	0.81	889.24	38.45	1336.16
	NN	0.15	805.20	0.76	528.94	90.57	588.39
	WN	0.12	457.17	0.60	537.09	93.01	394.28
	Total	0.14	620.34	0.66	599.44	81.95	602.40
2018	SN	0.17	1122.8	0.81	722.46	34.35	1262.52
	NN	0.16	850.99	0.76	424.35	94.30	583.87
	WN	0.13	471.22	0.61	638.67	90.93	464.76
	Total	0.14	647.15	0.67	627.71	80.21	635.29

The unit of CS is $kgC \cdot m^{-2}$; HQ is dimensionless and ranges from 0 to 1; the unit of SC and WF are $t \cdot hm^{-2}$; the unit of WY is mm.

Table S3. MGWR model index.

	Bandwidth	**ENP_j**	**Adj t-val(95%)**	**DoD_j**
Intercept	43	39.97	3.241	0.434
Cropland	658	1.19	2.040	0.972
Forest	508	1.64	2.168	0.924
Grassland	257	6.53	2.675	0.712
Water	676	1.05	1.985	0.992
Unused land	587	3.18	2.422	0.822
Construction	676	1.88	2.222	0.903
Land use intensity	676	1.43	2.114	0.945
Population Urbanization	524	2.51	2.336	0.858
Economic Urbanization	91	17.33	2.991	0.562
Economic Urbanization	445	3.15	2.418	0.824

R^2 is 0.759.

Table S4. Future land prediction under different SSP-RCP scenarios.

	Cropland	**Forest**	**Grassland**	**Water**	**Barren**	**Impervious**
SSP1-2.6	306533	874213	2271264	50705	389110	32663
SSP2-4.5	310402	819107	2321950	51237	389119	32673
SSP4-6.0	314998	828969	2307787	50968	389106	32660
SSP5-8.5	312032	837005	2302612	51055	389115	32669

The unit is km^2.

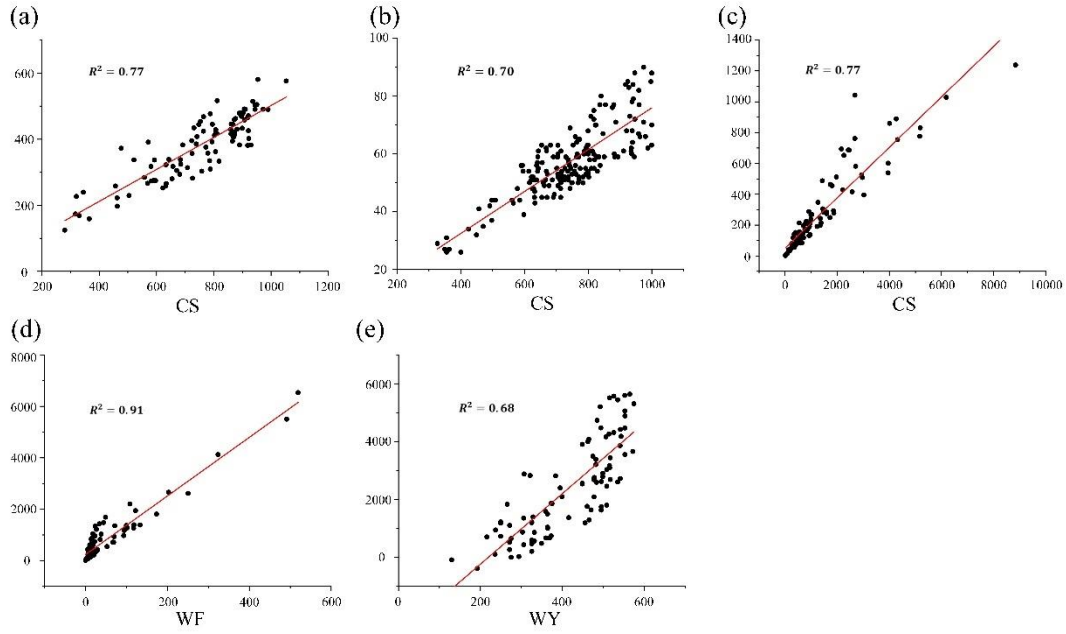

Figure S1. a-e are linear regression scatter plots of carbon sequestration, habitat quality, soil conservation, windbreak sand fixation, and water yield and verification data.

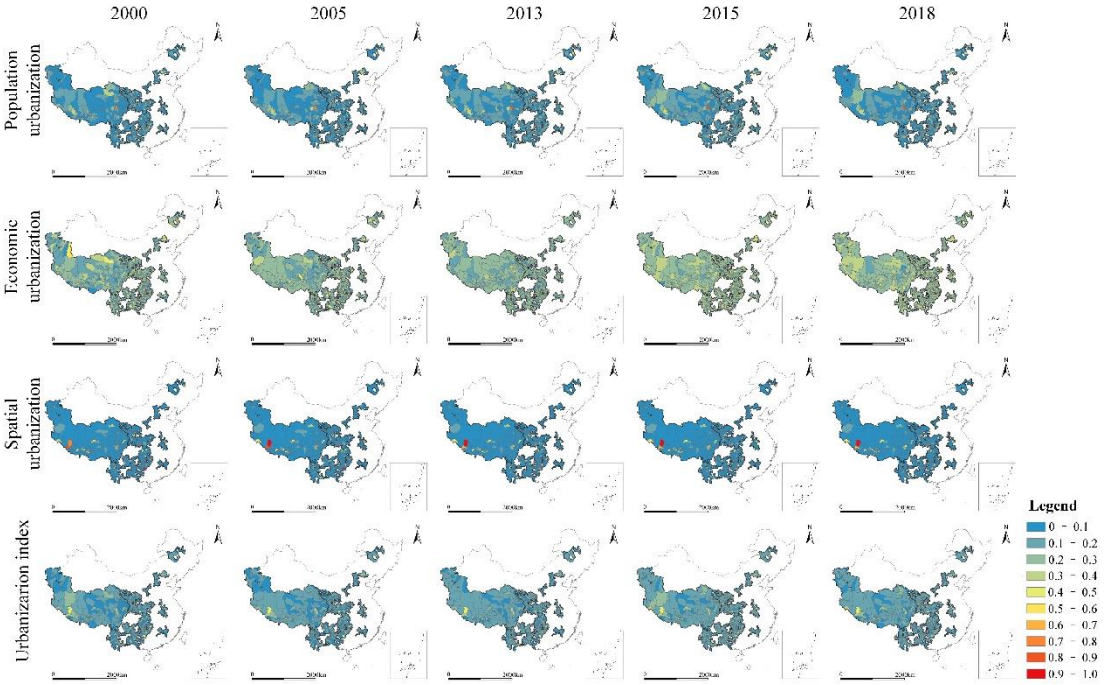

Figure S2. Spatial distribution of urbanization indicators

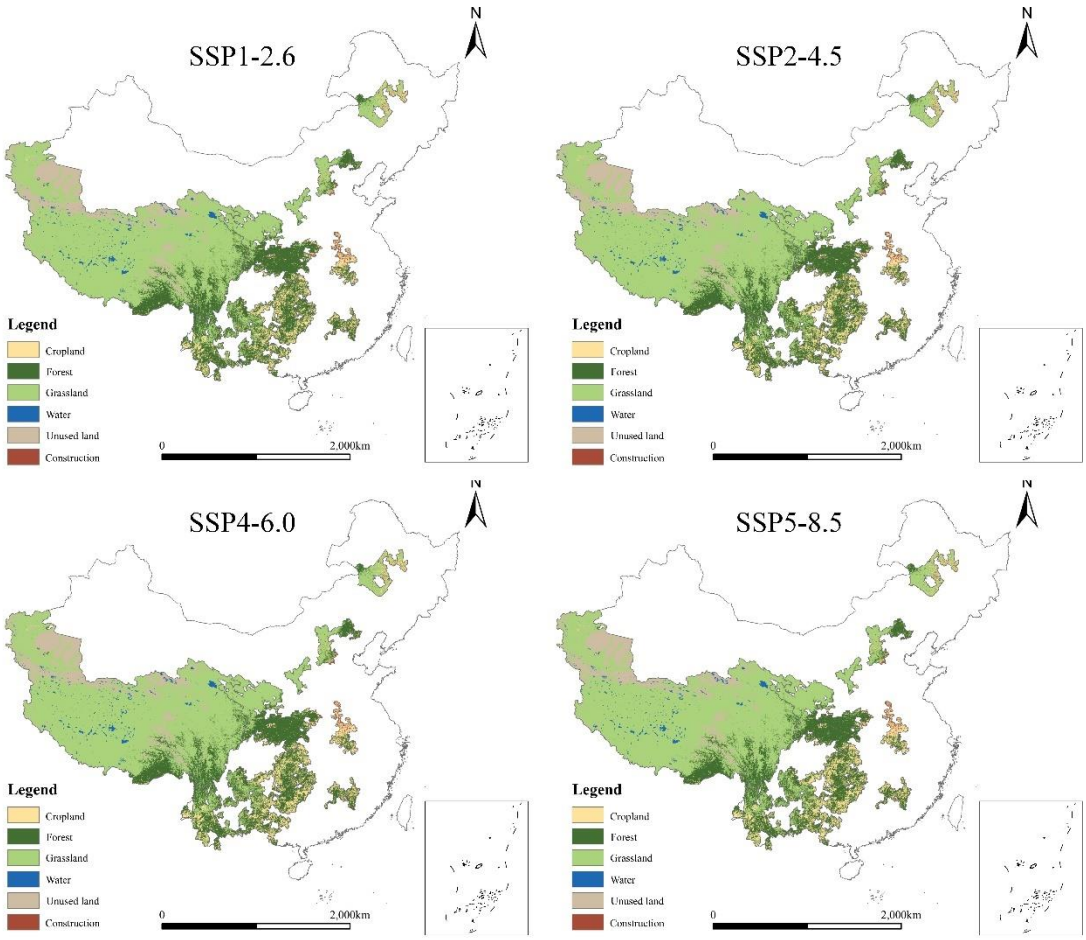

Figure S3. Land use distribution in 2035 under different SSP-RCP scenarios.