

Table S1. Landsat images used for compositing for 2000, 2005, 2010, 2015, and 2020

Year	Datasets	Date	Paths	Raws	Number	Total of images
2000	Landsat 7 Surface Reflectance Tier 1	1999.03.01~1999.10.31; 2000.03.01~2000.10.31; 2001.03.01~2001.10.31;	117	031	2	104
			117	032	5	
			118	030	8	
			118	031	8	
			118	032	11	
			119	030	13	
			119	031	11	
			119	032	13	
			120	030	11	
			120	031	11	
			120	032	11	
2005	Landsat 7 Surface Reflectance Tier 1	2004.03.01~2004.10.31; 2005.03.01~2005.10.31; 2006.03.01~2006.10.31;	117	031	9	139
			117	032	12	
			118	030	13	
			118	031	12	
			118	032	14	
			119	030	11	
			119	031	14	
			119	032	16	
			120	030	16	
			120	031	12	
			120	032	10	
2010	Landsat 7 Surface Reflectance Tier 1	2009.03.01~2009.10.31; 2010.03.01~2010.10.31; 2011.03.01~2011.10.31;	117	031	8	128
			117	032	10	
			118	030	10	
			118	031	8	
			118	032	8	
			119	030	13	
			119	031	14	
			119	032	13	
			120	030	15	
			120	031	15	
			120	032	14	
2015	Landsat 8 Surface Tier 1	2014.03.01~2014.10.31; 2015.03.01~2015.10.31; 2016.03.01~2016.10.31;	117	031	9	162
			117	032	11	
			118	030	19	
			118	031	16	
			118	032	14	
			119	030	19	
			119	031	19	
			119	032	13	
			120	030	14	
			120	031	15	
			120	032	13	
2020	Landsat 8 Surface Tier 1	2019.03.01~2019.10.31; 2020.03.01~2020.10.31; 2021.03.01~2021.06.31;	117	031	8	100
			117	032	9	
			118	030	8	
			118	031	8	
			118	032	7	
			119	030	13	
			119	031	12	
			119	032	10	
			120	030	7	
			120	031	10	
			120	032	8	

Table S2. Land-use type description[1-3]

	Land-use type	Description
1	Water body	Rivers, streams, lakes, reservoirs, and fish ponds, etc
2	Forest land	Natural forest, secondary forest, and artificial forest, etc
3	Built-up area	Land used for residential, industrial, commercial, and transportation purposes, including settlements, factories, quarries, mining, transportation facilities, etc
4	Cropland	paddy field, glebe field
5	Grassland	Natural grassland and constructed grassland and meadow, etc
6	Unused land	Lands unused or difficult to use, including sandy land, saline land, bare land, and others

Table S3. Equivalent value per unit area of land-use type for ecosystem service values

land-use type	Provision service			Regulation service				Support service		Cultural service	
	Food supply	Raw material supply	Water supply	Air regulation	Climate regulation	Purifying the environment	Hydrology adjustment	Soil formation	Nutrient cycling	Biological control	Culture and amenity
Water body	0.8	0.23	8.29	0.77	2.29	5.55	102.24	0.93	0.07	2.55	1.89
Forest land	0.31	0.71	0.37	2.35	7.03	1.99	3.51	2.86	0.22	2.6	1.14
Build-up area	0	0	0	0	0	0	0	0	0	0	0
Cropland	0.85	0.4	0.02	0.67	0.36	0.1	0.27	1.03	0.12	0.13	0.06
Grassland	0.23	0.34	0.19	1.21	3.19	1.05	2.34	1.47	0.11	1.34	0.59
Unused land	0	0	0	0.02	0	0.1	0.03	0.02	0	0.02	0.01

Table S4. Statistical summary of land-use changes for 2000-2005, 2005-2010, 2010-2015, 2015-2020, and 2000-2020

Land-use type	2000-2005		2005-2010		2010-2015		2015-2020		2000-2020	
	area	%	area	%	area	%	area	%	area	%
Water	110.97	15.18	-19.98	-2.37	51.95	6.32	-57.13	-6.54	85.81	11.74
Forest land	-101.38	-0.48	-119.14	-0.57	-342.33	-1.64	46.54	0.23	-516.32	-2.44
Build-up land	310.92	11.4	495.38	16.31	548.10	15.51	520.03	12.74	1874.43	68.74
Cropland	-475.36	-2.25	-363.97	-1.76	-107.16	-0.53	-358.60	-1.78	-1305.09	-6.18
Grassland	151.17	20.59	-40.59	-4.59	-172.68	-20.44	-139.56	-20.77	-201.66	-27.47
Unused land	3.92	3.42	47.88	40.47	21.45	12.91	-28.04	-14.94	45.21	39.52

Area: km³; %: change by proportion.

Table S5. Total ecosystem service values by land-use type

Land-use type	2000		2005		2010		2015		2020	
	value	%	value	%	value	%	value	%	value	%
Water	94.54	11.61	227.31	14.70	226.49	17.64	163.01	14.23	207.95	15.64
Forest land	628.28	77.18	1161.66	75.10	932.61	72.65	859.56	75.02	993.85	74.74
Build-up land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cropland	80.87	9.93	135.68	8.77	108.46	8.45	110.64	9.66	116.98	8.80
Grassland	10.33	1.27	22.14	1.43	16.17	1.26	12.51	1.09	10.99	0.83
Unused land	0.02	0.00	0.03	0.00	0.04	0.00	0.05	0.00	0.05	0.00
Total	814.04	100.00	1546.82	100.00	1283.78	100.00	1145.76	100.00	1329.81	100.00

Value: hundred million Chinese Yuan; %: proportion.

Table S6. Ecosystem service values by ecosystem service functions

Land use type	2000		2005		2010		2015		2020	
	value	%	value	%	value	%	value	%	value	%
Food supply	38.27	4.7	52.65	3.4	40.72	3.17	48.02	4.19	48.86	3.67
Raw material	28.25	3.47	50.23	3.25	38.05	2.96	38.25	3.34	41.54	3.12
Water supply	17.18	2.11	39.2	2.53	39.65	3.09	26.37	2.3	35.62	2.68
Gas regulation	81.34	9.99	144.94	9.37	109.23	8.51	109.73	9.58	119.89	9.02
Climate regulation	212.13	26.06	378.8	24.49	283.93	22.12	285.13	24.89	313.81	23.6
Purifying environment	62.12	7.63	111.49	7.21	83.51	6.51	84.25	7.35	92.39	6.95
Hydrology adjustment	183.95	22.6	422.46	27.31	427.13	33.27	285.68	24.93	383.82	28.86
Soil formation	67.79	8.33	127.05	8.21	96.6	7.52	102.43	8.94	111.74	8.4
Nutrient cycling	8.68	1.07	15.44	1	11.69	0.91	11.75	1.03	12.77	0.96
Biological control	79.22	9.73	141.69	9.16	106.16	8.27	106.73	9.32	117.32	8.82
Culture & Recreation	35.1	4.31	62.87	4.06	47.1	3.67	47.42	4.14	52.07	3.92
Total	814.04	100	1546.82	100	1283.78	100	1145.76	100	1329.81	100

Value: hundred million Chinese Yuan; %: proportion.

Table S7. Ecosystem service values changes by land-use type

Land use type	2000-2005		2005-2010		2010-2015		2015-2020		2000-2020	
	value	%	value	%	value	%	value	%	value	%
Water	132.77	140.44	-0.82	-0.36	-63.48	-28.03	44.94	27.57	113.41	119.96
Forestland	533.38	84.9	-229.1	-19.72	-73.05	-7.83	134.3	15.62	365.57	58.19
Build-up area	0	0	0	0	0	0	0	0	0	0
Cropland	54.81	67.78	-27.22	-20.06	2.18	2.01	6.34	5.73	36.11	44.65
Grassland	11.81	114.33	-5.97	-26.96	-3.66	-22.63	-1.52	-12.2	0.66	6.39
Unused land	0.01	50	0.01	33.33	0.01	25	0	0	0.03	150
TOTAL	732.78	90.02	-263	-17.01	-138.02	-10.75	184.1	16.06	515.77	63.36

Value: ecosystem service values (hundred million Chinese Yuan); %: proportion.

Table S8. Ecosystem service value changes by ecosystem service functions

Ecosystem service function	2000-2005		2005-2010		2010-2015		2015-2020		2000-2020	
	value	%	value	%	value	%	value	%	value	%
Food supply	14.38	37.58	-11.93	-22.66	7.3	17.93	0.84	1.75	10.59	27.67
Raw material	21.98	77.81	-12.18	-24.25	0.2	0.53	3.29	8.6	13.29	47.04
Water supply	22.02	128.17	0.45	1.15	-13.28	-33.49	9.25	35.08	18.44	107.33
Gas regulation	63.6	78.19	-35.71	-24.64	0.5	0.46	10.16	9.26	38.55	47.39
Climate regulation	166.67	78.57	-94.87	-25.04	1.2	0.42	28.68	10.06	101.68	47.93
Purifying environment	49.37	79.48	-27.98	-25.1	0.74	0.89	8.14	9.66	30.27	48.73
Hydrology adjustment	238.51	129.66	4.67	1.11	-141.45	-33.12	98.14	34.35	199.87	108.65
Soil formation	59.26	87.42	-30.45	-23.97	5.83	6.04	9.31	9.09	43.95	64.83
Nutrient cycling	6.76	77.88	-3.75	-24.29	0.06	0.51	1.02	8.68	4.09	47.12
Biological control	62.47	78.86	-35.53	-25.08	0.57	0.54	10.59	9.92	38.1	48.09
Culture & Recreation	27.77	79.12	-15.77	-25.08	0.32	0.68	4.65	9.81	16.97	48.35
TOTAL	732.78	90.02	-263	-17.01	-138.02	-10.75	184.1	16.06	515.77	63.36

Value: hundred million Chinese Yuan; %: proportion.

Table S9. Ecosystem service values of land use type for the five prefecture-level cities

City	Land-use type	2000		2005		2010		2015		2020	
		value	%	value	%	value	%	value	%	value	%
Shenyang	Water	27.31	37.8	69.46	46.24	71.18	52.09	62.21	49.71	68.2	50.24
	Forestland	7.29	10.09	11.37	7.57	9.21	6.74	11.16	8.92	12.65	9.32
	Build-up area	0	0	0	0	0	0	0	0	0	0
	Cropland	37	51.22	68.12	45.35	53.83	39.4	50.49	40.34	51.58	38
	Grassland	0.64	0.88	1.27	0.84	2.43	1.78	1.29	1.03	3.31	2.44
	Unused land	0	0	0.01	0	0	0	0	0	0	0
	total	72.24	100	150.22	100	136.65	100	125.16	100	135.75	100
Anshan	Water	11.81	7.79	27.69	10.11	23.42	11.17	22.54	10.99	25.03	11.32
	Forestland	117.69	77.63	212.51	77.6	156.08	74.45	155.69	75.93	164.09	74.21
	Build-up area	0	0	0	0	0	0	0	0	0	0
	Cropland	16.34	10.78	27.13	9.91	21.4	10.21	22.01	10.73	28.41	12.85
	Grassland	5.76	3.8	6.49	2.37	8.71	4.16	4.8	2.34	3.57	1.61
	Unused land	0.01	0	0.01	0	0.01	0.01	0.01	0.01	0.02	0.01
	total	151.6	100	273.84	100	209.63	100	205.05	100	221.12	100
Fushun	Water	13.89	5.08	36.76	6.87	34.79	7.86	22.52	5.7	32.31	7.12
	Forestland	245.6	89.87	477.06	89.1	391.64	88.47	353.73	89.46	404.12	89.09
	Build-up area	0	0	0	0	0	0	0	0	0	0
	Cropland	12.61	4.61	17.38	3.25	14.7	3.32	16.42	4.15	15.75	3.47
	Grassland	1.18	0.43	4.24	0.79	1.54	0.35	2.72	0.69	1.41	0.31
	Unused land	0	0	0	0	0	0	0.01	0	0.01	0
	total	273.28	100	535.44	100	442.67	100	395.39	100	453.61	100
Benxi	Water	26.4	10.83	57.39	12.8	64.48	16.86	37.31	11.37	57.92	14.1
	Forestland	209.46	85.95	375.47	83.75	309.61	80.97	278.59	84.92	343.71	83.68
	Build-up area	0	0	0	0	0	0	0	0	0	0
	Cropland	6.5	2.67	9.2	2.05	7.26	1.9	10.14	3.09	8.23	2
	Grassland	1.35	0.55	6.26	1.4	1.02	0.27	2.02	0.62	0.88	0.21
	Unused land	0.01	0	0.01	0	0.01	0	0.01	0	0.01	0
	total	243.71	100	448.33	100	382.39	100	328.07	100	410.76	100
Liaoning	Water	15.12	20.7	35.97	25.92	32.6	29.03	18.42	20.01	24.48	22.55
	Forestland	48.13	65.89	85.11	61.35	65.98	58.77	60.36	65.58	69.28	63.8
	Build-up area	0	0	0	0	0	0	0	0	0	0
	Cropland	8.39	11.49	13.79	9.94	11.23	10	11.57	12.57	13	11.97
	Grassland	1.41	1.92	3.87	2.79	2.46	2.19	1.68	1.83	1.81	1.67
	Unused land	0	0	0	0	0.01	0.01	0.01	0.01	0.01	0.01
	TOTAL	73.05	100	138.74	100	112.27	100	92.04	100	108.59	100

Value: hundred million Chinese Yuan; %: proportion.

Table S10. Ecosystem service values of ecosystem service function for the five prefecture-level cities

City	Ecosystem service functions	2000 value	%	2005 value	%	2010 value	%	2015 value	%	2020 value	%
Shenyang	Food supply	14.51	20.08	23.06	15.35	17.73	12.97	18.55	14.82	18.64	13.73
	Raw material supply	3.46	4.79	6.71	4.47	5.24	3.82	4.89	3.91	4.98	3.66
	Water supply	2.25	3.11	5.53	3.69	5.75	4.2	4.84	3.87	5.48	4.03
	Air regulation	6.25	8.65	11.98	7.99	9.41	6.87	8.92	7.14	9.22	6.78
	Climate regulation	5.57	7.7	10.06	6.71	8.11	5.92	8.36	6.69	9.17	6.74
	Purifying environment	2.08	2.88	4.14	2.76	3.29	2.4	3.63	2.9	3.76	2.76
	Hydrology adjustment	27.59	38.16	68.12	45.41	70.77	51.66	59.49	47.59	67.31	49.49
	Soil formation	6.21	8.59	12.42	8.28	9.81	7.16	9.75	7.8	10.02	7.37
	Nutrient cycling	1.04	1.44	2.02	1.35	1.58	1.15	1.47	1.18	1.5	1.1
	Biological control	2.22	3.07	4.14	2.76	3.33	2.43	3.51	2.81	3.8	2.79
	Culture and amenity	1.08	1.49	2.07	1.38	1.65	1.2	1.77	1.42	1.88	1.38
	Total	72.26	100	150.25	100	136.67	100	125.18	100	135.76	100
Anshan	Food supply	7.39	4.87	10.5	3.83	7.2	3.43	8.95	4.36	9.38	4.24
	Raw material supply	5.59	3.68	9.5	3.47	6.89	3.29	7.23	3.53	7.88	3.56
	Water supply	2.81	1.85	6.25	2.28	5.79	2.76	4.38	2.14	5.41	2.45
	Air regulation	15.97	10.53	27.1	9.89	19.41	9.25	20.46	9.98	21.53	9.74
	Climate regulation	41.1	27.09	69.79	25.47	49.09	23.41	52.21	25.46	52.74	23.85
	Purifying environment	12.08	7.96	20.55	7.5	14.43	6.88	15.52	7.57	15.56	7.04
	Hydrology adjustment	29.47	19.43	65.81	24.02	60.98	29.08	46.6	22.72	57.28	25.9
	Soil formation	13.35	8.8	23.84	8.7	17.26	8.23	19.18	9.35	20.41	9.23
	Nutrient cycling	1.72	1.13	2.92	1.07	2.12	1.01	2.22	1.08	2.42	1.09
	Biological control	15.4	10.15	26.13	9.54	18.4	8.77	19.6	9.56	19.74	8.93
	Culture and amenity	6.82	4.5	11.59	4.23	8.16	3.89	8.72	4.25	8.77	3.97
	Total	151.7	100	273.98	100	209.73	100	205.07	100	221.12	100
Fushun	Food supply	7.51	2.75	8.13	1.52	7.68	1.73	8.82	2.23	9.12	2.01
	Raw material supply	9.32	3.41	17.09	3.19	13.12	2.96	13.16	3.33	14.12	3.11
	Water supply	4.91	1.8	11.45	2.14	11.58	2.62	7.33	1.85	10.1	2.23
	Air regulation	28.75	10.52	53.51	9.99	41.01	9.26	40.79	10.32	44.15	9.73
	Climate regulation	80.61	29.5	152.18	28.42	116.51	26.32	114.94	29.07	125.51	27.67
	Purifying environment	23.09	8.45	43.7	8.16	33.41	7.55	33	8.35	36.07	7.95
	Hydrology adjustment	49.69	18.18	116.87	21.83	117.65	26.58	74.59	18.86	102.85	22.67
	Soil formation	23.44	8.58	45.81	8.56	35.38	7.99	37.22	9.41	40.2	8.86
	Nutrient cycling	2.88	1.05	5.28	0.99	4.05	0.91	4.06	1.03	4.36	0.96
	Biological control	29.91	10.94	56.52	10.56	43.24	9.77	42.68	10.79	46.61	10.28
	Culture and amenity	13.17	4.82	24.89	4.65	19.04	4.3	18.8	4.75	20.53	4.53
	Total	273.28	100	535.43	100	442.67	100	395.39	100	453.62	100
Benxi	Food supply	4.59	1.88	5.3	1.18	4.3	1.12	6.53	1.99	6.15	1.5
	Raw material supply	7.56	3.1	12.84	2.86	9.74	2.55	9.98	3.04	11.3	2.75
	Water supply	5.28	2.17	11.69	2.61	12.43	3.25	7.39	2.25	11.28	2.75
	Air regulation	23.87	9.79	40.89	9.12	31	8.11	31.33	9.55	36.04	8.77
	Climate regulation	68.49	28.1	117.96	26.31	89.56	23.42	89.32	27.23	104.33	25.4
	Purifying environment	19.88	8.16	34.2	7.63	26.05	6.81	25.95	7.91	30.35	7.39
	Hydrology adjustment	55.62	22.82	123.29	27.5	131.59	34.41	78	23.78	119.14	29
	Soil formation	19.32	7.93	34.84	7.77	26.61	6.96	28.49	8.68	32.63	7.94
	Nutrient cycling	2.33	0.96	3.97	0.89	3.01	0.79	3.08	0.94	3.49	0.85
	Biological control	25.51	10.47	43.96	9.81	33.37	8.73	33.28	10.14	38.87	9.46
	Culture and amenity	11.26	4.62	19.4	4.33	14.75	3.86	14.7	4.48	17.18	4.18
	Total	243.71	100	448.34	100	382.41	100	328.05	100	410.76	100
Liaoyang	Food supply	4.27	5.84	5.66	4.08	3.81	3.39	5.16	5.61	5.57	5.13
	Raw material supply	2.32	3.17	4.1	2.95	3.06	2.72	3	3.26	3.26	3
	Water supply	1.93	2.64	4.28	3.08	4.1	3.65	2.42	2.63	3.35	3.09
	Air regulation	6.49	8.88	11.46	8.25	8.41	7.49	8.23	8.94	8.95	8.24
	Climate regulation	16.36	22.39	28.8	20.74	20.66	18.39	20.31	22.06	22.06	20.32
	Purifying environment	4.99	6.83	8.9	6.41	6.32	5.63	6.15	6.68	6.65	6.12
	Hydrology adjustment	21.57	29.52	48.37	34.84	46.15	41.09	26.99	29.32	37.25	34.31
	Soil formation	5.48	7.5	10.14	7.3	7.54	6.71	7.79	8.46	8.47	7.8
	Nutrient cycling	0.71	0.97	1.26	0.91	0.94	0.84	0.92	1	1	0.92
	Biological control	6.19	8.47	10.94	7.88	7.82	6.96	7.66	8.32	8.31	7.65
	Culture and amenity	2.77	3.79	4.92	3.54	3.51	3.13	3.43	3.73	3.71	3.42
	Total	73.08	100	138.83	100	112.32	100	92.06	100	108.58	100

Value: hundred million Chinese Yuan; %: proportion.

References

1. Xu, X.; Liu, J.; Zhang, S.; Li, R.; Yan, C.; Wu, S., eds. China Multi-period Land Use and Land Cover Remote Sensing Monitoring Data Set (CNLUCC) (<http://www.resdc.cn/DOI>): Data Registration and Publishing System of the Resource and Environmental Science Data Center of the Chinese Academy of Sciences, 2018.
2. He, Y.; Kuang, Y.; Zhao, Y.; Ruan, Z. Spatial Correlation between Ecosystem Services and Human Disturbances: A Case Study of the Guangdong–Hong Kong–Macao Greater Bay Area, China. *Remote Sens.-Basel*. **2021**, 13, 1174.
3. Ye, Y.; Zhang, J.; Wang, T.; Bai, H.; Wang, X.; Zhao, W. Changes in Land-Use and Ecosystem Service Value in Guangdong Province, Southern China, from 1990 to 2018. *Land*. **2021**, 10, 426.