

Supplementary materials are listed as follows to support the main text:

Table S1. The Landsat images for accuracy assessment

Landsat PathRow	Date	Name
123039	1990.12.07(Landsat5)	Time1
	2000.02.26(Landsat7)	Time2
	2020.08.03(Landsat8)	Time3
125039	1990.12.05(Landsat5)	Time4
	2000.11.06(Landsat7)	Time5
	2020.09.18(Landsat8)	Time6
121037	1990.04.13(Landsat5)	Time7
	2000.04.16(Landsat7)	Time8
	2020.04.15(Landsat8)	Time9

Table S2. Accuracy of water body extraction under different water body indices in different study backgrounds

Sensor Tiles		NDWI	MNDWI	MBWI	USI	Rule1	Rule2	Rule3	Rule4	Rule4-GAIA
City: Landsat-8-SR-123039-20200803	OA	91.00	94.00	89.50	91.00	70.50	78.50	89.50	93.00	98.50
	kap	76.62	85.19	67.94	75.68	31.79	55.44	71.81	82.93	96.08
	PA	86.00	100.00	60.00	80.00	64.00	100.00	78.00	100.00	100.00

City: Landsat-7- SR-123039- 20000226	UA	79.6 3	80.65	96.7 7	83.3 3	43. 84	53.7 6	79.5 9	78.1 3	94.3 4
	OA	88.0 0	84.40	90.5 0	78.9 5	72. 25	85.6 5	78.4 7	90.4 3	96.1 7
	kap pa	70.0 5	67.87	71.4 3	32.8 6	30. 08	69.0 3	42.4 2	78.3 8	90.8 4
	PA	66.2 5	97.50	64.0 0	25.4 2	47. 46	98.3 1	49.1 5	98.3 1	98.3 1
City: Landsat-5- SR-123039- 19901207	UA	94.6 4	67.83	96.9 7	100. 00	50. 91	66.6 7	65.9 1	75.3 2	89.2 3
	OA	81.7 2	78.62	82.0 0	83.1 0	70. 00	78.2 8	76.9 0	87.2 4	91.3 8
	kap pa	55.8 2	55.97	53.2 5	54.5 6	27. 02	55.1 4	48.3 9	71.6 7	80.1 6
	PA	64.4 4	90.00	68.0 0	48.8 9	44. 44	88.8 9	71.1 1	88.8 9	88.8 9
Mountain: Landsat-8- SR-125039- 20200918	UA	73.4 2	60.45	62.9 6	93.6 2	51. 95	60.1 5	60.9 5	74.7 7	84.2 1
	OA	97.9 2	94.58	79.5 8	95.4 2	79. 17	82.9 2	82.9 2	98.7 5	
	kap pa	94.2 9	86.10	52.6 6	86.9 8	51. 46	61.8 6	61.8 6	96.6 1	
	PA	91.6 7	95.00	81.6 7	81.6 7	80. 00	95.0 0	95.0 0	95.0 0	
Mountain: Landsat-7- SR- 125039_200 01106	UA	100. 00	85.07	56.3 2	100. 00	55. 81	60.0 0	60.0 0	100. 00	
	OA	97.0 0	72.00	68.5 0	95.0 0	61. 50	65.5 0	66.0 0	97.5 0	
	kap pa	91.6 7	45.63	39.7 1	87.0 1	26. 32	36.9 9	37.6 1	93.5 5	
	PA	88.0 0	100.0 0	96.0 0	94.0 0	82. 00	100. 00	100. 00	100. 00	
	UA	100. 00	47.17	44.0 4	87.0 4	37. 61	42.0 2	42.3 7	90.9 1	

Mountain: Landsat-5- SR- 123039- 19901207	OA	87.6 2	64.50	62.3 8	83.8 1	58. 00	64.0 0	64.0 0	87.5 0
	kap pa	66.6 7	34.56	31.4 7	54.9 2	15. 15	33.9 4	33.3 3	70.4 1
	PA	63.3 3	96.00	91.6 7	51.6 7	64. 00	96.0 0	94.0 0	94.0 0
	UA	90.4 8	41.03	42.6 4	86.1 1	32. 65	40.6 8	40.5 2	68.1 2
Field: Landsat-8- SR- 121037- 20200415	OA	93.6 0	80.00	91.2 0	94.4 0	88. 40	76.4 0	75.6 0	98.4 0
	kap pa	78.0 2	54.55	76.3 9	81.0 8	55. 38	48.8 7	46.5 8	95.0 0
	PA	72.0 0	100.0 0	100. 00	76.0 0	46. 00	100. 00	96.0 0	96.0 0
	UA	94.7 4	50.00	69.4 4	95.0 0	92. 00	45.8 7	44.8 6	96.0 0
Field: Landsat-7- SR-121037- 20000416	OA	84.0 7	78.52	84.4 4	80.3 7	90. 37	81.8 5	81.1 1	94.4 4
	kap pa	49.9 4	55.61	63.5 6	34.6 3	72. 64	59.6 8	57.7 0	85.3 3
	PA	42.8 6	98.57	87.1 4	28.5 7	68. 57	91.4 3	88.5 7	87.1 4
	UA	90.9 1	54.76	64.8 9	86.9 6	92. 31	59.8 1	59.0 5	91.0 4
Field: Landsat-5- SR- 121037- 19900413	OA	81.1 5	84.23	91.1 5	83.8 5	81. 54	88.4 6	82.3 1	97.3 1
	kap pa	52.5 3	68.24	81.1 9	60.1 5	53. 91	75.6 6	61.1 2	93.9 7
	PA	46.6 7	97.78	95.5 6	54.4 4	48. 89	93.3 3	75.5 6	93.3 3
	UA	97.6 7	69.29	81.9 0	98.0 0	95. 65	77.7 8	73.9 1	98.8 2

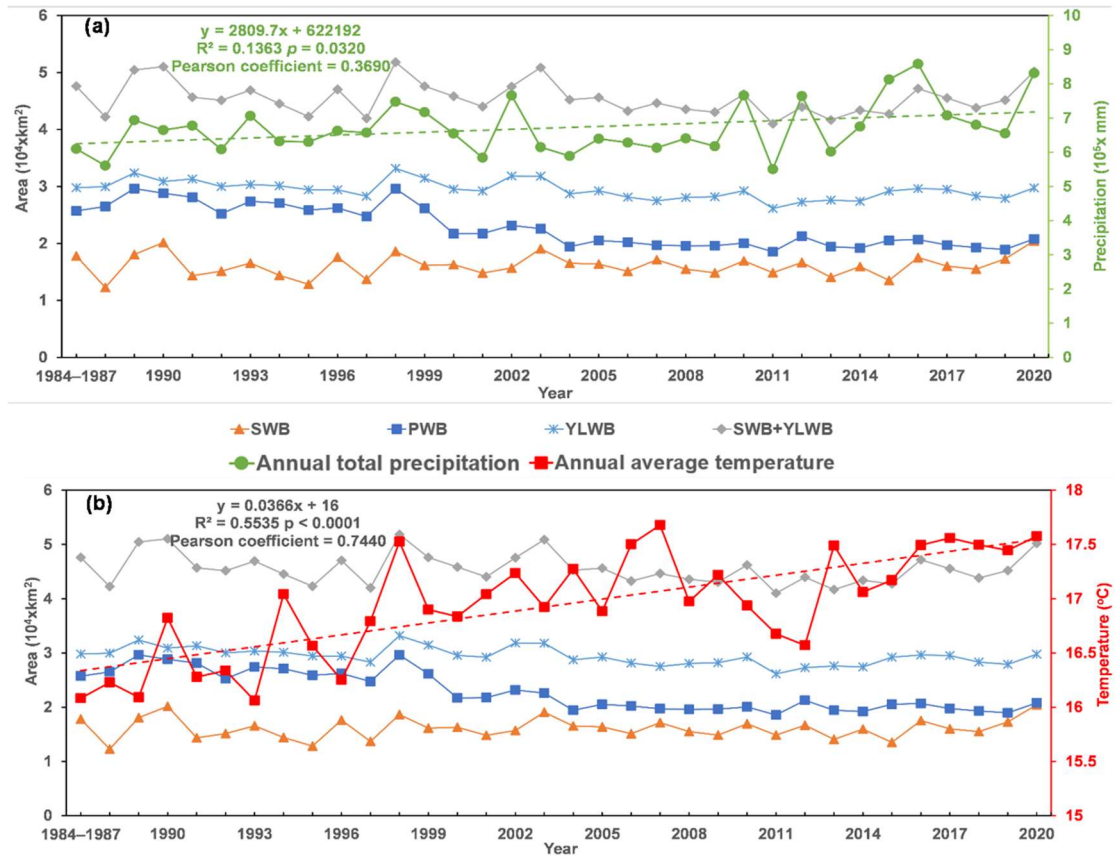


Figure S1. Annual variations in (a) the water area and precipitation and (b) the water area and temperature based on the area of each open surface water type from 1984 to 2020 in the MLYP

Table S3 Pearson correlation coefficients and p-value between the surface water area and precipitation and temperature in the MLYP during 1984–2020.

		SWB	PWB	YLWB	SWB+YLWB
Pearson correlation	Precipitation	0.3636	0.0193	0.2970	0.4075
	Temperature	0.1314	−0.609	−0.2411	−0.0458
<i>p</i> -value	Precipitation	0.0350	0.5380	0.0540	0.0170
	Temperature	0.4590	0.0001	0.1700	0.7970

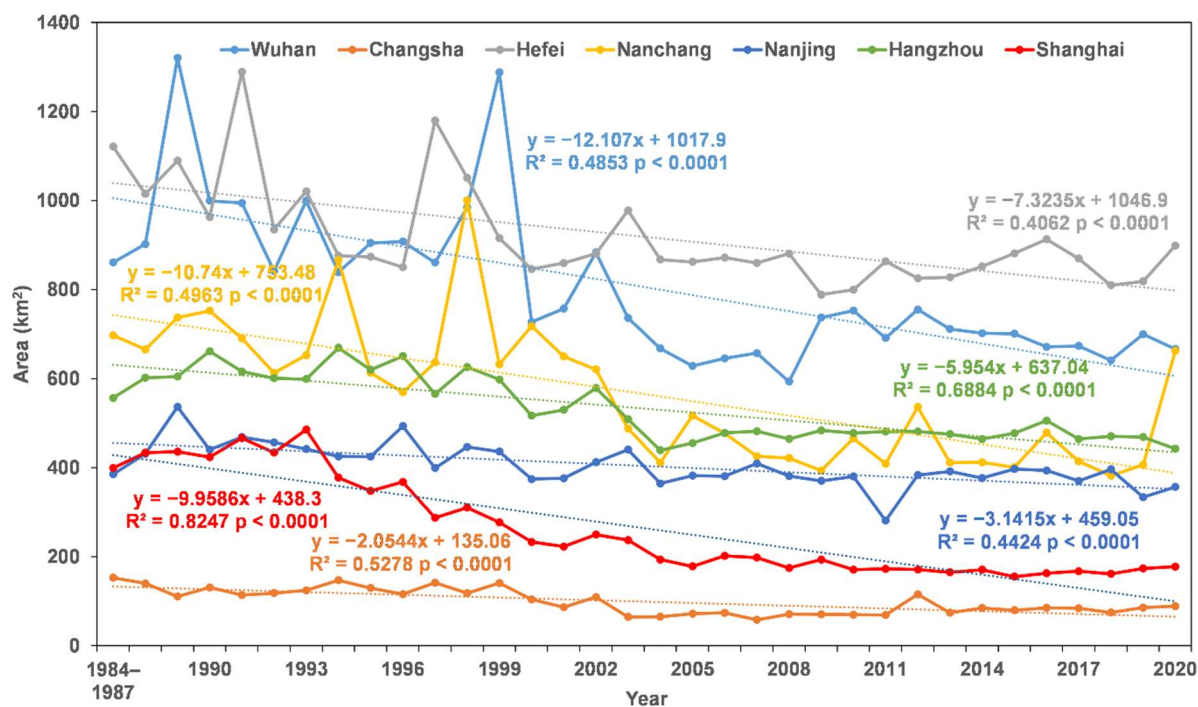


Figure S2 The temporal variation and linear trend regression of open surface permanent water area for seven provincial capitals in the MLYP.

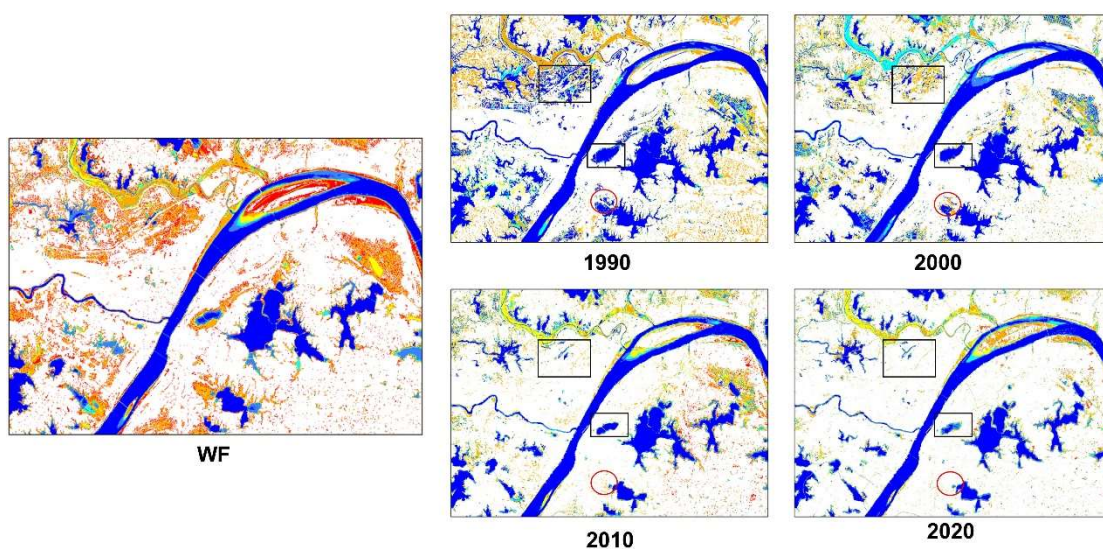


Figure S3. The decreases in water bodies due to urban development.

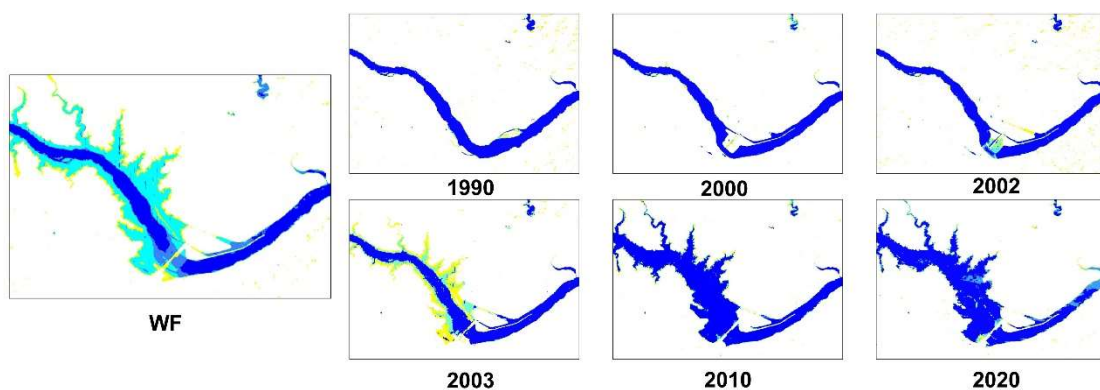


Figure S4. The increases in water bodies due to the construction of the Three Gorges Dam hydraulic facility.

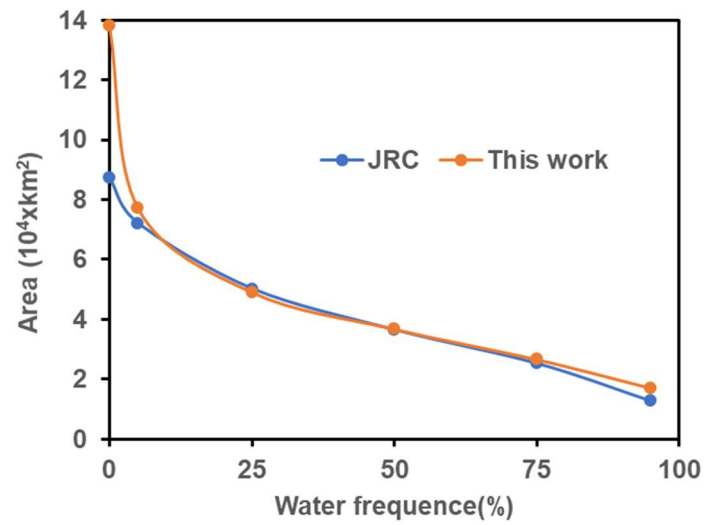


Figure S5. Comparing the area of each classified water frequency in JRC and this paper.