Supplementary Material

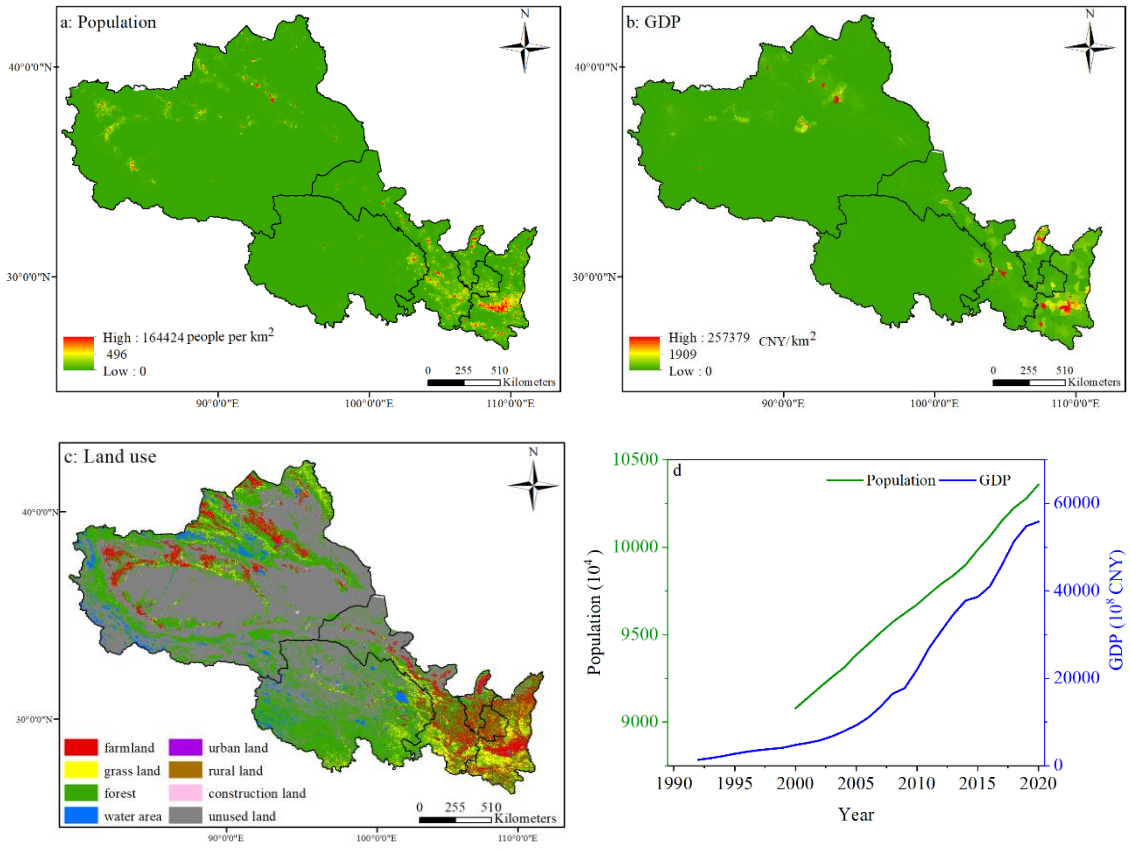

Figure. S1. Spatial patterns of Population (a), GDP (b), and land use type (c) in 2015 and the temporal socio-economic development (d) in Northwest China.

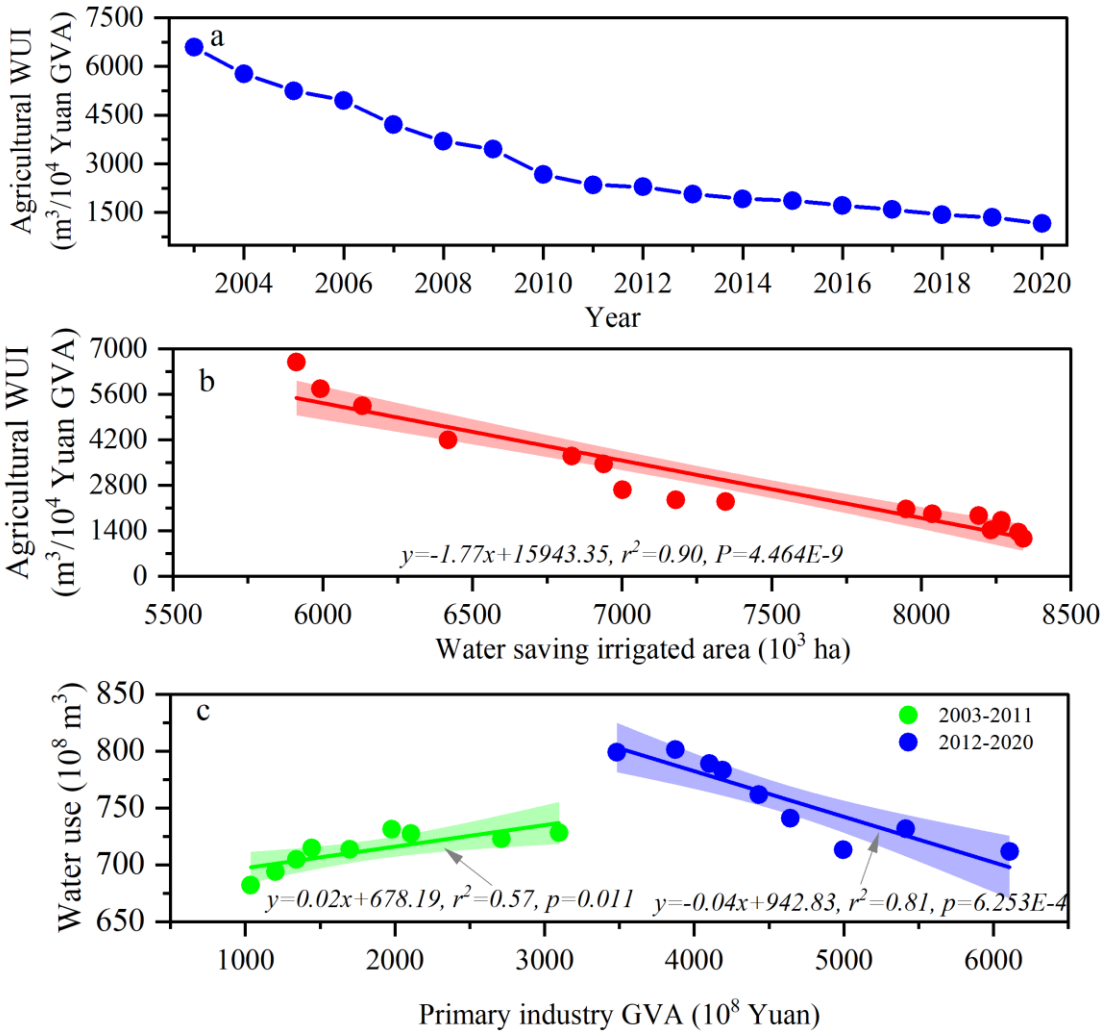

Figure. S2. Trends of the agricultural WUI in Northwest China (a) and its relationship between water saving irrigated area (b), and the corresponding regional primary industry GVA and the agricultural water use (c).

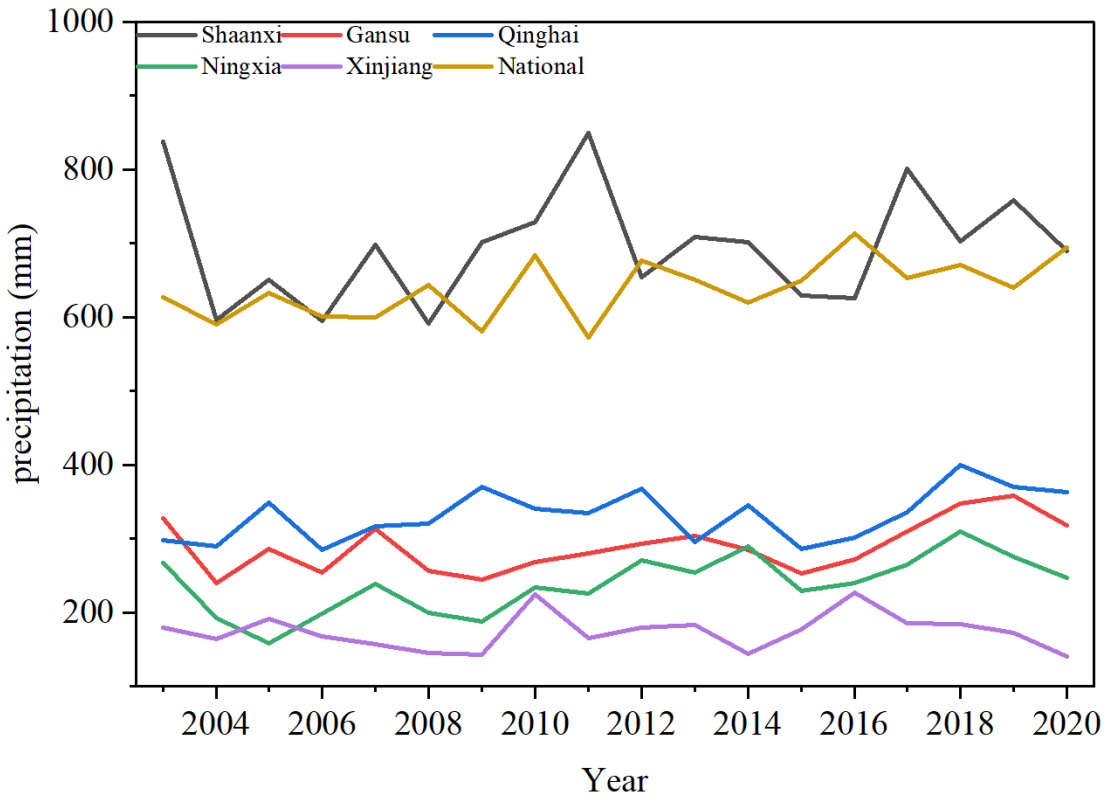

Figure. S3. The annual precipitation in Northwest China during the period of 2003 to 2020.

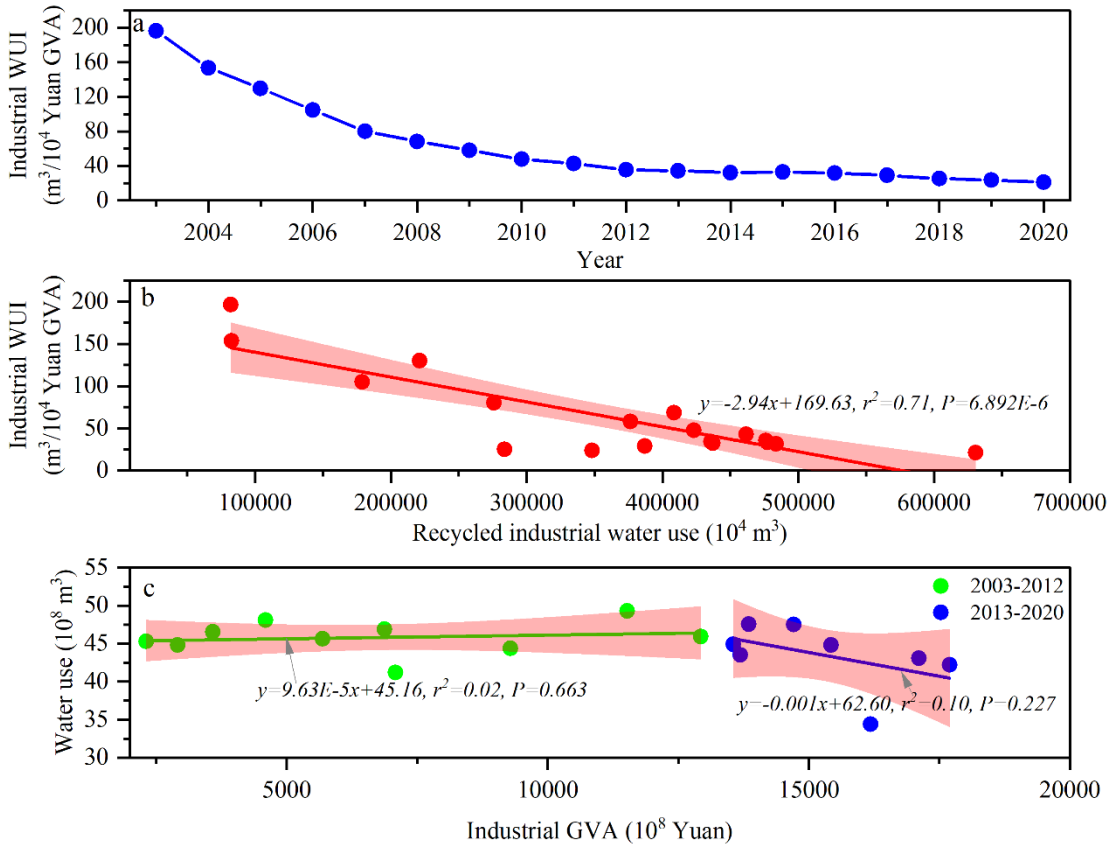

Figure. S4. Trends of the industrial WUI in Northwest China (a) and its relationship between recycled industrial water use (b), and the corresponding regional industrial GVA and the industrial water use (c).

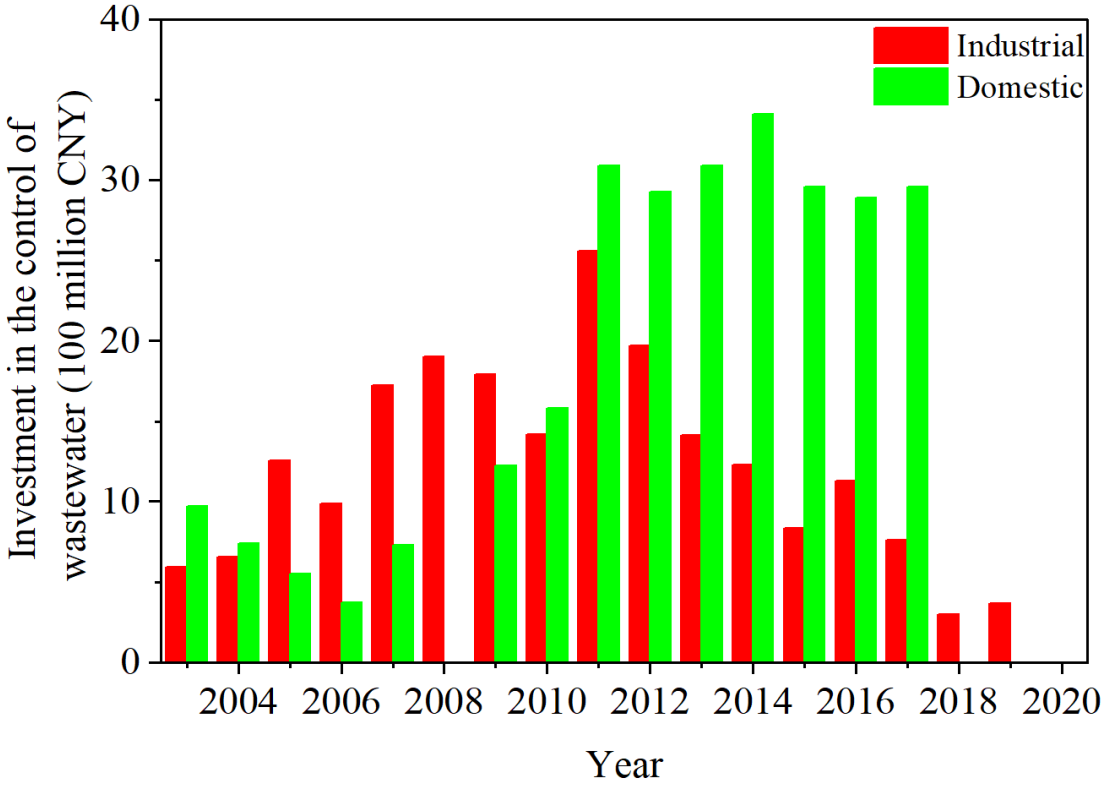

Figure. S5. The national investment (100 million CNY) in facilities for domestic and industrial wastewater treatment in Northwest China.

Table S1. Mann-Kendall trend and Pettitt test results of the total water use in Northwest China

Province or nation	Mann-Kendall trend		Pettitt test	
	Z-statistics	P-value	Probable change point time	P-value
Shaanxi	4.77	1.819e-06	2011	0.003
Gansu	-3.79	1.520e-04	2013	0.008
Qinghai	-3.56	3.701e-04	2011	0.003
Ningxia	-2.42	0.015	2011	0.053
Xinjiang	3.33	8.584e-04	2011	0.003
Northwest	3.18	1.46E-03	2011	0.003
National	2.35	0.019	2009	0.015

Note: positive values of Z indicate increasing trends, while negative values indicate decreasing trends in the time series.

Table S2. Mann-Kendall trend and Pettitt test results of the water use in different departments of Northwest China

Northwest	Mann-Kendall trend		Pettitt test	
	Z-statistics	P-value	Probable change point time	P-value
Agriculture	1.89	0.058	2010	0.075
Industry	-1.93	0.053	2014	0.105
Household	3.79	1.52E-04	2008	0.040
Eco-environment	0.45	0.649	2017	0.278

Table S3 Timeline of key policy interventions of China's water-related laws and regulations and comprehensive plans for water saving and conservation since 2002 (Table S3 is supplemented based on the work of Zhou et al. (2020).

Date of issuance	**Name**	**Main objectives**
2022/10/30	Yellow River Protection Law of the People's Republic of China	Water saving and ensuring river baseflow
2020/12/26	Yangtze River Protection Law of the People's Republic of China	Aquatic ecosystem safety and water sustainability
2020/12/1	National standards of irrigation water quotas for 14 crops	Agriculture water saving
2019/4/15	National water conservancy action plan	Water saving
2017/1/17	The Thirteenth Five-year Plan of 'water-saving society development	Water saving
2013/12/9	The master plan of high-standard croplands construction in China (2013-2020)	Agriculture water saving
2013/6/25	Strict water volume quota management	Water saving
2012/12/15	Strategic plan for agricultural water conservation in China (2012-2020)	Agriculture water saving
2012/4/12	National Assessment Criteria for Water-saving Cities	Domestic and industrial water saving
2012/2/15	Strategic plan for the most stringent water resources management system in China	Water saving
2010/11/25	National integrated water resource plan (2010-2030)	Water allocation
2010/7/29	The Twelfth Five-year Plan for 'water-saving society' development	Water saving
2010/5/4	Strategic Plan for promotion of industrial water conservation	Industrial water saving
2006/11/7	The Eleventh Five-year Plan for 'water-saving society' development	Water saving
2006/4/15	Regulation of water license system and water resource fee collection	Water saving
2005/5/23	Policy priorities in water-saving technologies in China	Water saving
2004/4/19	Regulation of the promotion of water pricing reform in China	Water saving and water allocation
2003/1/1	Refinement of the National standards of water volume quota for different industries	Water saving
2002/10/1	Water Law of the People's Republic of China Amendments of 2002	Water saving and water pollution control
2002/8/20	National long-term water saving strategic plan (2001-2010)	Water saving

Table S4 Recent laws, plans, guidelines, and regulations related to improving China's water quality (Table S4 is supplemented based on the work of Huang et al. (2019) and Tong et al. (2017).

Date of issuance	**Name of laws, plans, guidelines, and regulations**
2022/10/30	Yellow River Protection Law of the People's Republic of China
2022/9/19	Deepen action plan for the deepen crucial battle to protect and restore the Yangtze River
2022/3/28	Implementation plan for the battle against black and smelly water bodies in cities
2020/12/26	Yangtze River Protection Law of the People's Republic of China
2017/11/20	Guidelines on the lake chief system
2016/12/11	Guidelines on the river chief system
2016/3/16	Program of national surface water quality monitoring network in 13th Five-Year (2016-2020)
2015/7/9	Rules of funding management on water pollution control
2015/6/16	Measures for special funds management of substitute subsidies with rewards for urban sewage treatment facilities supporting pipe network construction
2015/4/16	Action plan for water pollution controls in China
2015/2/4	Regulations on pollution control from the large-scale livestock breeding
2014/9/26	Ecological overall planning for lakes with good water quality in China (2013-2020)
2014/6/16	Guidelines on how to improve rural sanitation and living environment
2014/4/25	Environmental Protection Law of the People's Republic
2014/3/26	Guidelines on further strengthening the environmental impact assessment of water conservancy facilities
2013/12/11	Guidelines on the funding for ecological environmental protection of rivers and lakes in China
2013/11/11	Guidelines on construction and investment of rural domestic sewage treatment facilities
2013/11/11	Guidelines for the construction of facilities treating the rural domestic waste
2013/11/11	Guidelines for the construction of facilities to protect the rural drinking water sources
2013/11/11	Guidelines for the construction of facilities to control the pollution from the

Date of issuance	Name of laws, plans, guidelines, and regulations
	scatter-farming in the rural
2013/10/18	Regulation on Urban Drainage and Sewage Treatment
2013/7/17	Guidelines for funding the ecological environment protection of rivers and lakes
2013/2/17	12th Five-Year plan of national environmental protection standard in China (2011-2015)
2013/1/24	Statistics and monitoring on reduction of major water pollutants emissions in 12th Five-Year (2011-2015)
2012/5/16	Pollution control plan in the main watersheds in China (2011-2015)
2011/12/22	Accounting rules for reduction of major pollutants in 12th Five-Year (2011-2015)
2011/12/21	12th Five-Year plan for environmental Protection in China
2011/12/8	Guide on strengthening the special funds' management of rural environmental protection during 12th Five-Year (2011-2015)
2011/9/16	Management regulations of Taihu Basin
2011/9/12	Water pollution prevention and control plans of middle and lower reaches of the Yangtze River (2011-2015)
2011/4/17	Measures for fund management of medium and small-sized rivers in China
2010/12/30	Guidelines for prevention and control technology of pollution from livestock and poultry breeding
2010/2/8	Guidelines for prevention and control technology of domestic pollution in the rural
2009/8/26	Special fund management measures of sewage treatment and related facilities in the urban
2009/7/15	Guidelines to manage the funding for environmental protections in rural areas
2008/8/30	Major science and technology program for water pollution control and treatment, Ministry of Ecology and Environment
2008/1/22	Guidelines on strengthening water environmental protection for critical lakes
2008/2/29	Law of the People's Republic of China on the Prevention and Control of Water Pollution
2007/11/26	11th Five-Year-Plan of national environmental protection in China (2006-2010)
2007/11/21	Guidelines on strengthening rural environmental protection
2007/7/15	Guidelines to manage to fund on the reduction of main pollutants funded by the central government

Date of issuance	Name of laws, plans, guidelines, and regulations
2005/1/14	Key special plans for ecological improvement and environmental protection of the 10th National Five-Year Plan (2001-2005)