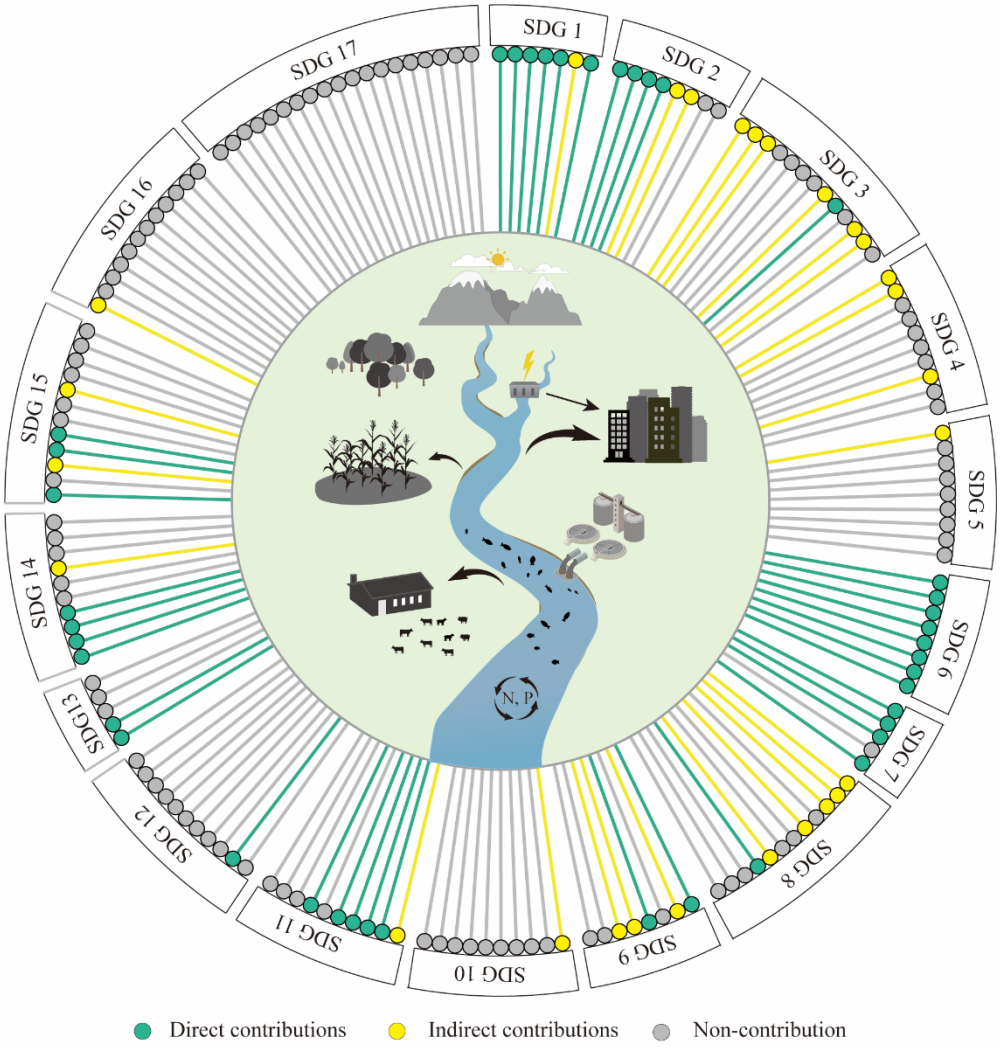
Supplementary Text S1: Criteria for Keyword Categorization

To systematically review the literature on river ecosystems, relevant studies were categorized into three core themes: water quality, water flow, and aquatic biota (see Supplementary Table 1 for search keywords). This classification is grounded in the analytical framework established by the Water Framework Directive (WFD) [1], which emphasizes that hydrological conditions ("flow") and physicochemical conditions ("water quality") jointly regulate the status of aquatic communities (biological elements). This results in a hierarchical structure centered on biological elements and supported by hydrological and physicochemical processes. Accordingly, these three themes are intrinsically coupled and collectively sustain river ecosystem health and ecosystem services. Although ecological keywords may span multiple dimensions, each keyword was assigned to a single primary category based on consistent criteria to ensure analytical clarity and comparability.

The classification criteria were defined as follows. For water quality (physicochemical and compositional dimension), keywords were assigned if they represent chemical elements or compounds (e.g., nitrogen, heavy metals), physicochemical states (e.g., pH, turbidity), anthropogenic pollutants (e.g., wastewater), or environmental indicators derived from chemical or physical analyses. Terms with both biological and chemical attributes (e.g., eutrophication, hypoxia, toxicity) were also included, as their quantification primarily relies on water chemistry parameters. For water flow (hydrological and hydrodynamic dimension), keywords were classified if they relate to the movement, volume, or spatiotemporal dynamics of water within river systems (e.g., discharge, flow velocity, runoff). For aquatic organisms (biological and ecological dimension), keywords were included if they refer to taxonomic groups (e.g., macroinvertebrates, algae, fish), community structure (e.g., food webs, biodiversity), or biological entities (e.g., organisms, biofilms). To address cross-theme overlaps, the three categories were treated as the fundamental analytical units, and studies involving multiple themes were assigned according to their primary research focus or key quantitative indicators, ensuring consistency and operational clarity.



Supplementary Figure S1. Contribution of river ecosystems to SDGs; River ecosystem services were found to directly and indirectly contribute to 68 of the 169 SDGs targets. A small circle represents an SDG target, with grey indicating that the river does not contribute to that SDG target, green indicating a direct contribution of river ecosystems to that target, and yellow indicating an indirect link.

Supplementary Table S1. Keywords related to the theme found in the study of river ecosystems.

Theme	Theme Substitutes
Water quality	heavy metal*; eutrophi*; pollut*; acid*; bases; oxidizer*; organic compound*; copper; cadmium; mercury; arsenic; benzene; dichloroethane; ethylene glycol; nitrogen; phosphoru*; water quality; pathogen*; hypoxia; wastewater; nitrate; ammonia; pH; toxicity; water purification; sewage; water chemistry; water parameter*; water clarity; turbidity; DO; biochemical oxygen demand; BOD; chemical oxygen demand; COD; nutrient*; water contaminant*; water index; WQI; water monitoring; water assessment; microplastic*; pharmaceutical*; DOC; dissolved organic carbon; suspended sediment*; salinit*; temperature;
Water flow	flow*; runoff; discharge; flux; water quantity; hydraulic*; streamflow; water velocity; flow rate; hydrodynamic*; water circulation; water movement; water current*; water exchange; hydrolog*; regime*; flood*; baseflow
Aquatic organisms	biodiversit*; fish*; invertebrate*; phytoplankton*; epiphyte*; algae; microorganism*; vertebrate*; plant*; specie*; animal*; organism*; microbial*; bacterial*; microinvertebrate*; mollusca*; macroinvertebrate*; zooplankton; trout; biota*; life; communit*; benthic invertebrate*; macrophyte*; insect*; amphibian*; crustacean*; aquatic biofilm; periphyton; food web; trophic*; benthos; diatom*; cyanobacteria*; assemblage*

Reference

[1] European Commission. (2000). *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.* Official Journal of the European Communities, L327, 1-73.

Supplementary Table S2. Synergies and trade-offs between river ecosystems and the UN Sustainable Development Goals.

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
Goal 1: End poverty in all its forms everywhere					
1.1	By 2030, **eradicate extreme poverty** for all people everywhere, currently measured as people living on less than $1.25 a day	**Synergy**	**Trade-off**	The river ecosystem provides support for the development of tourism, fishery, hydropower and other industries. 1. Healthy ecosystems can alleviate poverty through tourism, transportation and fishing. 2. Reduced water supply constrains urban development. 3. Declining river water quality affects the economy in a variety of ways. 4. River fisheries boost economic development.	1. Desbureaux S, Damania R, Rodella AS, Russ J, Zaveri E. *The Impact of Water Quality on GDP Growth: Evidence from Around the World*; World Bank: Washington, DC, USA, 2019. 2. Sarkar B, Islam A. Assessing poverty and livelihood vulnerability of the fishing communities in the context of pollution of the Churni River, India. *Environ. Sci. Pollut. Res.* 2022, 29, 26575–26598. 3. Yang SW, Hao HS, Liu B, Wang YM, Yang YA, Liang RF, et al. Influence of socioeconomic development on river water quality: a case study of two river basins in China. *Environ. Sci. Pollut. Res.* 2021, 28, 53857–53871. 4. Cook SE, Fisher MJ, Andersson MS, Rubiano J, Giordano M. Water, food and livelihoods in river basins. *Water Int.* 2009, 34, 13–29.
1.2	By 2030, **reduce** at least by half the proportion of men, women and children of **all ages living in poverty** in all its dimensions according to national definitions	**Synergy**	**Trade-off**	5. Floods caused by rivers can lead to poverty.	
1.3	**Implement** nationally appropriate **social protection systems** and **measures** for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable	**Synergy**	**Trade-off**	1. The poor are more vulnerable to flooding.	1. Ezbakhe F. Addressing water pollution as a means to achieving the sustainable development goals. *J. Water Pollut. Control.* 2018, 1, 2–6.
1.4	By 2030, **ensure** that all men and women, in particular the poor and the vulnerable, have	**Synergy**	**Trade-off**	1. The poor are more vulnerable to floods.2. Protecting river	[1] McElwee P, Nghiem T, Le H, Vu H. Flood vulnerability among rural

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
	equal rights to economic resources, as well as access to **basic services**, **ownership and control over land and other forms of property, inheritance, natural resources**, appropriate new **technology and financial services**, including microfinance			ecosystems helps to increase the disaster resilience of the poor.	households in the Red River Delta of Vietnam: implications for future climate change risk and adaptation. *Nat. Hazards*. 2017, 86, 465–492.
1.5	By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	**Synergy**	**Trade-off**	1. Water management helps reduce poverty in remote rural areas.	[1] McElwee P, Nghiem T, Le H, Vu H. Flood vulnerability among rural households in the Red River Delta of Vietnam: implications for future climate change risk and adaptation. *Nat. Hazards*. 2017, 86, 465–492. [2] Desbureaux S, Damania R, Rodella AS, Russ J, Zaveri E. *The Impact of Water Quality on GDP Growth: Evidence from Around the World*; World Bank: Washington, DC, USA, 2019.
1.a	**Ensure** significant **mobilization of resources** from a variety of sources, including through enhanced development cooperation, in order to provide adequate and predictable means for developing countries, in particular least developed countries, to implement programmes and policies to end poverty in all its dimensions	**Synergy**	**Trade-off**	1. rivers can bring economic benefits to poor areas. 2. River flooding is more harmful to poor areas.	[1] Rentschler J, Salhab M, Jafino BA. Flood exposure and poverty in 188 countries. *Nat. Commun.* 2022, 13, 3527.
1.b	**Create sound policy frameworks** at the national, regional and international levels, based on pro-poor and gender-sensitive development strategies, to support accelerated **investment in poverty eradication actions**	**Synergy**		1. Water management is contribute to reducing remote rural poverty.	[1] Hanjra MA, Gichuki F. Investments in agricultural water management for poverty reduction in Africa: case studies of Limpopo, Nile, and Volta river basins. *Nat. Resour. Forum*. 2008, 32, 185–202.
Goal 2. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture					
2.1	By 2030, **end hunger** and ensure access by all people, in particular the poor and people in	**Synergy**	**Trade-off**	1. Water management is contribute to improve agricultural productivity.	[1] Hanjra MA, Gichuki F. Investments in agricultural water management for poverty reduction in Africa: case studies

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
	vulnerable situations, including infants, to **safe, nutritious and sufficient food** all year round			2. Agricultural development can damage river ecosystems in the basin.	of Limpopo, Nile, and Volta river basins. *Nat. Resour. Forum*. 2008, 32, 185–202.
2.2	By 2030, **end** all forms of **malnutrition**, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons	**Synergy**	**Trade-off**	1. Water resources provided by riverine ecosystems and water and sanitation can alleviate acute malnutrition.2. Drinking unclean river water is more likely to lead to acute malnutrition.3. Mitigation of malnutrition requires increased agricultural cultivation and use of pesticides.	[1] Kinyoki DK, Berkley JA, Moloney GM, Kandala NB, Noor AM. Predictors of the risk of malnutrition among children under the age of 5 years in Somalia. *Public Health Nutr.* 2015, 18, 3125–3133. [2] Ahmed AT, Abas AH, Elmi A, Omer A. Determinants of severe acute malnutrition among children aged 6–36 months in Kalafo district (riverine context) of Ethiopia. *Sci. Rep.* 2022, 12, 5198.
2.3	By 2030, **double the agricultural productivity and incomes of small-scale food producers**, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment		**Trade-off**	1. Increasing the scale of agriculture and animal husbandry will increase the pollution and water stress in the river ecosystem. 2. Greater fishing will destroy the balance of the river ecosystem and harm the biodiversity in the river ecosystem.	[1] Mandal SK, Dutta SK, Pramanik S, Kole RK. Assessment of river water quality for agricultural irrigation. *Int. J. Environ. Sci. Technol.* 2019, 16, 451–462.
2.4	By 2030, **ensure sustainable food production systems** and **implement resilient agricultural practices** that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	**Synergy**		1. Agricultural practices in sustainable food production systems (e.g., balanced fertilizer application) enhance water quality improvements. 2. Sustainable food production systems that use water efficiently contribute to water efficiency in the agricultural sector and reduce water scarcity. 3. Sustainable food production	[1] Kremser U, Schnug E. Impact of fertilizers on aquatic ecosystems and protection of water bodies from mineral nutrients. *Landbauforschung Volkenrode*. 2002, 52, 81–90. [2] Deng X, Shan L, Zhang H, Turner NC. Improving agricultural water use efficiency in arid and semiarid areas of China. *Agric. Water Manage.* 2006, 80, 23–40.

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
			systems can enhance the protection and restoration of water-related ecosystems.	
2.5	By 2020, **maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species**, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed	**Synergy**	1. Preserving the database of plant and biological genetic resources (especially endangered species) is conducive to maintaining the biodiversity of river ecosystems.	[1] Blicharska M, Smithers RJ, Mikusiński G, Rönnbäck P, Harrison PA, Nilsson M, et al. Biodiversity's contributions to sustainable development. *Nat. Sustain.* 2019, 2, 1083–1093.
2.a	**Increase investment**, including through enhanced **international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks** in order to enhance agricultural productive capacity in developing countries, in particular least developed countries	**Synergy**	1. Strengthening rural infrastructure and the application of cleaner production technologies can reduce rural source pollution.	[1] Ranjan R. Restoring natural wetlands through financial incentives based adoption of constructed wetlands on agricultural farms. *J. Clean. Prod.* 2021, 317, 128346 [2] Zhang T, Yang YH, Ni JP, Xie DT. Adoption behavior of cleaner production techniques to control agricultural non-point source pollution: a case study in the Three Gorges Reservoir Area. *J. Clean. Prod.* 2019, 223, 897–906.
2.b	**Correct and prevent trade restrictions and distortions in world agricultural markets**, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round			
2.c	Adopt measures to **ensure the proper functioning of food commodity markets** and			

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
	their **derivatives** and **facilitate** timely **access to market information**, including on food reserves, in order to help limit extreme food price volatility				
Goal 3. Ensure healthy lives and promote wellbeing for all at all ages					
3.1	By 2030, **reduce** the global **maternal mortality ratio** to less than 70 per 100,000 live births				
3.2	By 2030, **end preventable deaths of newborns and children** under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births	**Synergy**	**Trade-off**	1. River ecosystems provide water resources and water and sanitation facilities that can alleviate acute malnutrition. 2. Polluted water resources are more likely to cause harm to newborns and children.	[1] Kinyoki DK, Berkley JA, Moloney GM, Kandala NB, Noor AM. Predictors of the risk of malnutrition among children under the age of 5 years in Somalia. *Public Health Nutr.* 2015, 18, 3125–3133. [2] Ahmed AT, Abas AH, Elmi A, Omer A. Determinants of severe acute malnutrition among children aged 6–36 months in Kalafo district (riverine context) of Ethiopia. *Sci. Rep.* 2022, 12, 5198. [3] Chinwah V, Nyame-Asiamah F, Ekanem I. Risk factors affecting maternal health outcomes in Rivers State of Nigeria: towards the PRISMA model. *Soc. Sci. Med.* 2020, 265, 113520.
3.3	By 2030, **end the epidemics** of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases	**Synergy**	**Trade-off**	1. Improving polluted rivers helps eliminate waterborne diseases.	[1] Griffiths JK. Waterborne diseases. In *International Encyclopedia of Public Health*; Academic Press: Oxford, UK, 2008.
3.4	By 2030, **reduce by one third premature mortality from non-communicable diseases** through prevention and treatment and promote mental health and well-being				

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
3.5	**Strengthen the prevention and treatment of substance abuse**, including narcotic drug abuse and harmful use of alcohol	**Synergy**		1. The use of drugs such as antibiotics threatens the health of rivers and poses a public health risks.	[1] Van Cappellen P, Maavara T. Rivers in the Anthropocene: Global scale modifications of riverine nutrient fluxes by damming. *Ecohydrol. Hydrobiol.* 2016, 16, 106–111
3.6	By 2020, **halve** the number of global **deaths and injuries** from **road traffic accidents**				
3.7	By 2030, **ensure universal access to sexual and reproductive health-care services**, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes				
3.8	**Achieve universal health coverage**, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all	**Synergy**	**Trade-off**	1. The use of drugs such as antibiotics threatens the health of rivers and poses a public health risks.	[1] Van Cappellen P, Maavara T. Rivers in the Anthropocene: Global scale modifications of riverine nutrient fluxes by damming. *Ecohydrol. Hydrobiol.* 2016, 16, 106–111.
3.9	By 2030, substantially **reduce** the number of **deaths and illnesses** from **hazardous chemicals and air, water and soil pollution and contamination**	**Synergy**		1. Protecting river ecosystems from pollution helps reduce the number of deaths caused by water pollution.	[1] Wu J. Challenges for safe and healthy drinking water in China. *Curr. Environ. Health Rep.* 2020, 7, 292–302. [2] Glibert PM. Harmful algal blooms in Asia: an insidious and escalating water pollution phenomenon with effects on ecological and human health. *ASIANetwork Exch.* 2014, 21, 52–68.
3.a	**Strengthen** the implementation of the World Health Organization Framework Convention on **Tobacco Control** in all countries, as appropriate				
3.b	Support the **research and development of vaccines and medicines** for the communicable and non-communicable diseases that primarily affect developing countries, provide access to	**Synergy**	**Trade-off**	1. The use of drugs such as antibiotics threatens the health of rivers and poses a public health risks.	[1] Van Cappellen P, Maavara T. Rivers in the Anthropocene: Global scale modifications of riverine nutrient fluxes

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
	affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all				by damming. *Ecohydrol. Hydrobiol.* 2016, 16, 106–111.
3.c	Substantially **increase health financing and the recruitment, development, training and retention of the health workforce** in developing countries, especially in least developed countries and small island developing States	**Synergy**		1. Improving the work skills and environmental awareness of health system providers is essential to prevent infection and improve environmental health.	[1] Matlow AG, Wray R, Richardson SE. Attitudes and beliefs, not just knowledge, influence the effectiveness of environmental cleaning by environmental service workers. *Am. J. Infect. Control*. 2012, 40, 260–262.
3.d	**Strengthen** the **capacity** of all countries, in particular developing countries, **for early warning, risk reduction and management of** national and global **health risks**	**Synergy**		1. Strengthening the resilience of developing countries to health risks requires the establishment of safe and reliable sanitation facilities and reducing environmental pollution.	[1] O'Gorman M, Penner S. Water infrastructure and well-being among First Nations, Métis and Inuit individuals in Canada: What does the data tell us? *Environ. Sci. Pollut. Res.* 2018, 25, 33038–33055.
Goal 4. Ensure inclusive and equitable quality education and promote life-long learning opportunities for all					
4.1	By 2030, **ensure** that all girls and boys **complete free**, **equitable** and quality **primary and secondary education** leading to relevant and effective learning outcomes	**Synergy**		1. Ensuring that boys and girls complete primary and secondary education contributes to social awareness of environmental protection.2. Awareness of ecological protection is relatively low in communities with low levels of education and employment.	[1] Edsand HE, Broich T. The impact of environmental education on environmental and renewable energy technology awareness: empirical evidence from Colombia. *Int. J. Sci. Math. Educ.* 2020, 18, 611–634. [2] Xiong Y, Hao X, Liao C, Zeng Z. Relationship between water-conservation behavior and water education in Guangzhou, China. *Environ. Earth Sci.* 2016, 75, 1.

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
				[3] Farmer A. *Tackling pollution is essential for meeting SDG poverty objectives*; United Nations Environment Programme / Institute for European Environmental Policy: 2017 [4] Valenzuela-Morales GY, Hernández-Téllez M, Ruiz-Gómez ML, Gómez-Albores MA, Arévalo-Mejía R, Mastachi-Loza CA. Water conservation education in elementary schools: the case of the Nenetzingo River catchment, Mexico. *Sustainability*. 2022, 14, 2402.
4.2	By 2030, **ensure** that all girls and boys have access to **quality early childhood development, care and pre-primary education** so that they are ready for primary education	**Synergy**	1. Ensuring access to quality preschool education for girls and boys helps raise social awareness of environmental protection. 2. Awareness of ecological protection is relatively low in communities with low levels of education and employment.	[1] Edsand HE, Broich T. The impact of environmental education on environmental and renewable energy technology awareness: empirical evidence from Colombia. *Int. J. Sci. Math. Educ.* 2020, 18, 611–634. [2] Xiong Y, Hao X, Liao C, Zeng Z. Relationship between water-conservation behavior and water education in Guangzhou, China. *Environ. Earth Sci.* 2016, 75, 1. [3] Valenzuela-Morales GY, Hernández-Téllez M, Ruiz-Gómez ML, Gómez-Albores MA, Arévalo-Mejía R, Mastachi-Loza CA. Water conservation education in elementary schools: the case of the Nenetzingo River catchment, Mexico. *Sustainability*. 2022, 14, 2402.
4.3	By 2030, **ensure equal access** for all women and men to **affordable and quality technical,**	**Synergy**	1. Access to higher education provides local residents with the opportunity to acquire clean	[1] Pahl-Wostl C, Tàbara D, Bouwen R, Craps M, Dewulf A, Mostert E, et al. The importance of social learning and culture

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
	vocational and tertiary education, including university		technologies and skills. 2. The concept of river management is more sustainable for a highly educated group of people.	for sustainable water management. *Ecol. Econ.* 2008, 64, 484–495. [2] Ladrera R, Rodríguez-Lozano P, Verkaik I, Prat N, Díez JR. What do students know about rivers and their management? Analysis by educational stages and territories. *Sustainability*. 2020, 12, 8719.
4.4	By 2030, substantially **increase the number** of youth and adults **who have relevant skills,** including technical and vocational skills, for employment, decent jobs and entrepreneurship	**Synergy**	1. In communities with low levels of education and employment, awareness of ecological conservation are relatively low.	[1] Valenzuela-Morales GY, Hernández-Téllez M, Ruiz-Gómez ML, Gómez-Albores MA, Arévalo-Mejía R, Mastachi-Loza CA. Water conservation education in elementary schools: the case of the Nenetzingo River catchment, Mexico. *Sustainability*. 2022, 14, 2402.
4.5	By 2030, **eliminate gender disparities in education** and **ensure equal access to** all levels of **education and vocational training** for the **vulnerable**, including persons with disabilities, indigenous peoples and children in vulnerable situations	**Synergy**	1. Access to clean water and energy contributes to education and gender equality and reduces any other form of inequality.	[1] Owusu G. Social effects of poor sanitation and waste management on poor urban communities: a neighborhood-specific study of Sabon Zongo, Accra. *J. Urban.* 2010, 3, 145–160.
4.6	By 2030, **ensure** that all youth and a substantial proportion of adults, both men and women, **achieve literacy and numeracy**	**Synergy**	1. Ensuring that all youth and most adult men and women have literacy and numeracy skills contributes to a greater awareness of social and environmental protection.	[1] Tortajada C. Contributions of recycled wastewater to clean water and sanitation Sustainable Development Goals. *npj Clean Water*. 2020, 3, 22.
4.7	By 2030, **ensure** that all **learners acquire the knowledge and skills needed to promote sustainable development**, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship	**Synergy**	1. Having the knowledge and skills needed for sustainable development contributes to sustainable river development.	[1] Li Y, Zhang W, Ma L, Huang GQ, Oenema O, Zhang F, et al. An analysis of China's fertilizer policies: impacts on the industry, food security, and the environment. *J. Environ. Qual.* 2013, 42, 972–981.

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
	and appreciation of cultural diversity and of culture's contribution to sustainable development			
4.a	**Build and upgrade education facilities** that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all	**Synergy**	1. Building equal educational facilities and a good teaching environment is conducive to improving teaching standards and enhancing awareness and skills to protect the environment.	[1] Nuzir FA, Dewancker BJ. Understanding the role of education facilities in sustainable urban development: a case study of KSRP, Kitakyushu, Japan. *Procedia Environ. Sci.* 2014, 20, 632–641.
4.b	By 2020, substantially **expand** globally the number of **scholarships available to developing countries**, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries	**Synergy**	1. Scholarship assistance helps to stimulate learning, improve knowledge and skills, and promote the conservation of river ecosystems.	[1] Li Y, Zhang W, Ma L, Huang GQ, Oenema O, Zhang F, et al. An analysis of China's fertilizer policies: impacts on the industry, food security, and the environment. *J. Environ. Qual.* 2013, 42, 972–981.
4.c	By 2030, substantially **increase the supply of qualified teachers**, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States	**Synergy**	1. Increasing the number of qualified teachers will help promote education and raise the awareness and skills of society to protect the environment.	[1] Edsand HE, Broich T. The impact of environmental education on environmental and renewable energy technology awareness: empirical evidence from Colombia. *Int. J. Sci. Math. Educ.* 2020, 18, 611–634. [2] Xiong Y, Hao X, Liao C, Zeng Z. Relationship between water-conservation behavior and water education in Guangzhou, China. *Environ. Earth Sci.* 2016, 75, 1.
Goal 5. Achieve gender equality and empower all women and girls				

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
5.1	**End** all forms of **discrimination against all women and girls** everywhere	**Synergy**	1. Eliminating discrimination against women and girls helps women participate in the management of river ecosystems and improve management efficiency.	[1] UN-Water. *Gender, Water and Sanitation: A Policy Brief*; UN-Water: 2006.
5.2	**Eliminate** all forms of **violence against all women and girls** in the public and private spheres, including trafficking and sexual and other types of exploitation	**Synergy**	2. Gender equality contributes to women's access to quality education and environmental awareness.	[2] Benson D, Gain AK, Giupponi C. Moving beyond water centricity? Conceptualizing integrated water resources management for implementing sustainable development goals. *Sustain. Sci.* 2020, 15, 671–681.
5.3	**Eliminate all harmful practices**, such as child, early and forced marriage and female genital mutilation			
5.4	**Recognize and value unpaid care and domestic work** through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate	**Synergy**	1. Reducing female unpaid caregiving chores helps women play an important role in resource management.	[1] Cleaver F, Nyatsambo R. *Gender and integrated water resource management* (Cambridge: Cambridge University Press 2011). [2] Making disaster risk reduction gender sensitive: policy and practical guidelines (United Nations International Strategy for Disaster Reduction 2009)
5.5	**Ensure women's full and effective participation and equal opportunities for leadership** at all levels of decision-making in political, economic and public life	**Synergy**	1. Involving women in water management contributes to gender equality and promotes more effective and sustainable water management.	[1] Cleaver F, Nyatsambo R. *Gender and integrated water resource management*; Cambridge University Press: Cambridge, UK, 2011.
5.6	**Ensure universal access to sexual and reproductive health and reproductive rights** as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing			

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
	Platform for Action and the outcome documents of their review conferences				
5.a	**Undertake reforms to give women equal rights to economic resources**, as well as access to **ownership and control over land and other forms of property, financial services, inheritance and natural resources**, in accordance with national laws	**Synergy**		1. Empowering women facilitates the role of women in water management and promotes more effective and sustainable water management.	[1] Cleaver F, Nyatsambo R. *Gender and integrated water resource management*; Cambridge University Press: Cambridge, UK, 2011.
5.b	**Enhance the use of enabling technology**, in particular information and communications technology, to promote the empowerment of women	**Synergy**		1. Empowering women facilitates the role of women in water management and promotes more effective and sustainable water management.	[1] Cleaver F, Nyatsambo R. *Gender and integrated water resource management*; Cambridge University Press: Cambridge, UK, 2011.
5.c	**Adopt and strengthen sound policies and enforceable legislation** for the **promotion of gender equality** and the **empowerment of all women and girls** at all levels	**Synergy**		1. Empowering women facilitates the role of women in water management and promotes more effective and sustainable water management.	[1] Cleaver F, Nyatsambo R. *Gender and integrated water resource management*; Cambridge University Press: Cambridge, UK, 2011.
Goal 6. Ensure availability and sustainable management of water and sanitation for all					
6.1	By 2030, **achieve** universal and equitable **access to safe and affordable drinking water** for all	**Synergy**	**Trade-off**	1. River runoff transports freshwater resources. 2. Rivers are at the heart of water infrastructure. 3. Some water infrastructure disrupts river continuity.	[1] World Health Organization. *Drinking-water*; World Health Organization: Geneva, Switzerland, 2022. [2] Grill G, Lehner B, Thieme M, Geenen B, Tickner D, Antonelli F, et al. Mapping the world's free-flowing rivers. *Nature*. 2019, 569, 215–221.
6.2	By 2030, **achieve access** to adequate and equitable **sanitation and hygiene** for all and **end open defecation**, paying special attention to the needs of women and girls and those in vulnerable situations	**Synergy**	**Trade-off**	1. River provide freshwater to built infrastructure. 2. River provides water for health care institutions.	[1] Kithuki K, Opanga Y, Watulo E, Marita E. Water, sanitation and hygiene coverage and practices of a semi-arid county in the Eastern region of Kenya. *J. Water Sanit. Hyg. Dev.* 2021, 11, 327–334. [2] Duse AG, Da SM, Zietsman I. Coping

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
					with hygiene in South Africa, a water scarce country. *Int. J. Environ. Health Res.* 2003, 13, S95–S105.
6.3	By 2030, **improve water quality by reducing pollution**, **eliminating dumping and minimizing release of hazardous chemicals and materials, halving** the proportion of **untreated wastewater** and substantially **increasing recycling and safe reuse** globally	**Synergy**		1. Reducing the discharge of sewage helps to protect microorganisms in the river ecosystem, etc. and maintain the health of the river.2. Reducing the discharge helps to improve the water quality of the river.	[1] Macabiog REN, Cruz JCD, Amado T. Water quality analysis: ecological integrity conformance of run-of-river hydropower plants. In *Proceedings of the IEEE*; 2018. [2] Campolo M, Andreussi P, Soldati A. Water quality control in the river Arno. *Water Res.* 2002, 36, 2673–2680. [3] Ma T, Zhao N, Ni Y, Yi JW, Wilson JP, He LH, et al. China's improving inland surface water quality since 2003. *Sci. Adv.* 2020, 6, eabc1960 (u3798).
6.4	By 2030, substantially **increase water-use efficiency** across all sectors and **ensure sustainable withdrawals and supply of freshwater** to address water scarcity and substantially reduce the number of people suffering from water scarcity	**Synergy**		1. Improving water use efficiency and alleviating water shortage means reducing pollution discharge and enhancing the protection of river ecosystems. 2. Improving water use efficiency can reduce river salt intrusion.	[1] Wang Y, Bian Y, Xu H. Water use efficiency and related pollutants' abatement costs of regional industrial systems in China: A slacks-based measure approach. *J. Clean. Prod.* 2015, 101, 301–310. [2] Yao M, Yan D, Kabat P, Huang H, Hutjes RWA, Werners SE. Analysing monthly sectorial water use and its influence on salt intrusion induced water shortage in urbanized deltas. *Sustain. Cities Soc.* 2016, 26, 255–263.
6.5	By 2030, **implement integrated water resources management** at all levels, including through transboundary cooperation as appropriate	**Synergy**		1. Integrated water resources management measures, such as reducing pollution discharges, increasing wastewater treatment rates and safe reuse, and protecting and restoring ecosystems to ensure	[1] Spijkers O. Sustainable Management of Freshwater Resources: linking International Water Law and the Sustainable Development Goals. *GAIA-Ecol. Perspect. Sci. Soc.* 2019, 28, 135–142.

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
			water security and sustainable water supply.	[2] Kherbache N. Water policy in Algeria: limits of supply model and perspectives of water demand management (WDM). *Desalin. Water Treat.* 2020, 180, 141–155.
6.6	By 2020, **protect and restore water-related ecosystems**, including mountains, forests, wetlands, rivers, aquifers and lakes	**Synergy**	1. Integrated water resources management measures, such as reducing pollution discharges, increasing wastewater treatment rates and safe reuse, and protecting and restoring ecosystems to ensure water security and sustainable water supply.	[1] Spijkers O. Sustainable Management of Freshwater Resources: linking International Water Law and the Sustainable Development Goals. *GAIA-Ecol. Perspect. Sci. Soc.* 2019, 28, 135–142. [2] Kherbache N. Water policy in Algeria: limits of supply model and perspectives of water demand management (WDM). *Desalin. Water Treat.* 2020, 180, 141–155.
6.a	By 2030, **expand international cooperation and capacity-building support** to developing countries in **water- and sanitation-related activities and programmes,** including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	**Synergy**	1. Integrated water resources management measures, such as reducing pollution discharges, increasing wastewater treatment rates and safe reuse, and protecting and restoring ecosystems to ensure water security and sustainable water supply.	[1] Spijkers O. Sustainable Management of Freshwater Resources: linking International Water Law and the Sustainable Development Goals. *GAIA-Ecol. Perspect. Sci. Soc.* 2019, 28, 135–142. [2] Kherbache N. Water policy in Algeria: limits of supply model and perspectives of water demand management (WDM). *Desalin. Water Treat.* 2020, 180, 141–155.
6.b	**Support** and strengthen the participation of **local communities in improving water and sanitation management**	**Synergy**	1. Integrated water resources management measures, such as reducing pollution discharges, increasing wastewater treatment rates and safe reuse, and protecting and restoring ecosystems to ensure	[1] Spijkers O. Sustainable Management of Freshwater Resources: linking International Water Law and the Sustainable Development Goals. *GAIA-Ecol. Perspect. Sci. Soc.* 2019, 28, 135–142.

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
				water security and sustainable water supply.	[2] Kherbache N. Water policy in Algeria: limits of supply model and perspectives of water demand management (WDM). *Desalin. Water Treat.* 2020, 180, 141–155.
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all					
7.1	By 2030, **ensure** universal **access** to affordable, reliable and modern **energy services**	**Synergy**	**Trade-off**	1. River hydroelectricity is already widely used worldwide as a clean energy source. 2. Dams can disrupt river continuity and have harmful effects on downstream ecosystems.	[1] Gao X, Kroeze C. The effects of blue energy on future emissions of greenhouse gases and other atmospheric pollutants in China. *J. Integr. Environ. Sci.* 2012, 9, 177–190. [2] Grill G, Lehner B, Thieme M, Geenen B, Tickner D, Antonelli F, et al. Mapping the world's free-flowing rivers. *Nature*. 2019, 569, 215–221.
7.2	By 2030, **increase** substantially the **share of renewable energy** in the global energy mix	**Synergy**	**Trade-off**	1. River hydroelectricity can help increase the share of clean energy. 2. Increasing the share of clean energy can lead to water shortages downstream of the river, dams can disrupt river continuity.	[1] Berga L. The role of hydropower in climate change mitigation and adaptation: a review. *Engineering*. 2016, 2, 313–318. [2] Grill G, Lehner B, Thieme M, Geenen B, Tickner D, Antonelli F, et al. Mapping the world's free-flowing rivers. *Nature*. 2019, 569, 215–221. [3] Yang Y, Zhang M, Zhu L, Liu W, Han J, Yang Y. Influence of large reservoir operation on water-levels and flows in reaches below dam: case study of the three gorges reservoir. *Sci. Rep.* 2017, 7, 15640. [4] Nilsson C, Reidy CA, Dynesius M, Revenga C. Fragmentation and flow regulation of the world's large river systems. *Science*. 2005, 308, 405–408.

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
7.3	By 2030, **double** the global **rate of improvement in energy** efficiency	**Synergy**	1. Improving energy efficiency means reducing pollution.	UNEP. *Water and Energy Efficiency*; United Nations Environment Programme: 2014
7.a	By 2030, **enhance international cooperation to facilitate access to clean energy research and technology**, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	**Synergy**	1. Increased investment in clean energy is conducive to promoting the coordinated development of resource conservation and environmental protection. 2. Promoting international cooperation in clean energy research and technology can reduce nitrogen emissions from energy use, thereby reducing water pollution from atmospheric nitrogen deposition.	[1] Wang P, Wu J. Impact of environmental investment and resource endowment on regional energy efficiency: evidence from the Yangtze River Economic Belt, China. *Environ. Sci. Pollut. Res.* 2022, 29, 5445–5453. [2] Zhang L, Zhu Y, Fan L. Temporal-Spatial structure and influencing factors of urban energy efficiency in china's agglomeration areas. *Sustainability*. 2021, 13, 10961 [3] Ti C, Gao B, Luo Y, Wang S, Chang S, Yan X. Dry deposition of N has a major impact on surface water quality in the Taihu Lake region in southeast China. *Atmos. Environ.* 2018, 190, 1–9. [4] Shi W, Chen Q, Zhang J, Liu D, Yi Q, Chen Y, et al. Nitrous oxide emissions from cascade hydropower reservoirs in the upper Mekong River. *Water Res.* 2020, 173, 115582.
7.b	By 2030, **expand infrastructure and upgrade technology for supplying modern and sustainable energy services** for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	**Synergy**	1. Increased investment in clean energy is conducive to promoting the coordinated development of resource conservation and environmental protection.2. Promoting international cooperation in clean energy research and technology can reduce nitrogen emissions from energy use, thereby	[1] Wang P, Wu J. Impact of environmental investment and resource endowment on regional energy efficiency: evidence from the Yangtze River Economic Belt, China. *Environ. Sci. Pollut. Res.* 2022, 29, 5445–5453. [2] Zhang L, Zhu Y, Fan L. Temporal-Spatial structure and influencing factors of urban energy efficiency in china's

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
				reducing water pollution from atmospheric nitrogen deposition.	agglomeration areas. *Sustainability*. 2021, 13, 10961. [3] Ti C, Gao B, Luo YX, Wang SW, Chang SX, Yan XY. Dry deposition of N has a major impact on surface water quality in the Taihu Lake region in southeast China. *Atmos. Environ.* 2018, 190, 1–9. [4] Shi W, Chen Q, Zhang J, Liu D, Yi Q, Chen Y, et al. Nitrous oxide emissions from cascade hydropower reservoirs in the upper Mekong River. *Water Res.* 2020, 173, 115582.
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all					
8.1	**Sustain per capita economic growth** in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries	**Synergy**	**Trade-off**	1. Economic benefits from river fisheries, hydroelectric power generation, tourism. 2. Economic development means access to treated sewage discharge. 3. River flooding causes economic losses.	[1] Douglas AJ, Taylor J. The economic value of trinity river water. *Water Resour. Dev.* 1999, 15, 309–322. [2] Meng Y, Liu JG, Leduc S, Mesfun S, Kraxner F, Mao GQ, et al. Hydropower production benefits more from 1.5 °C than 2 °C climate scenario. *Water Resour. Res.* 2020, 56, e2019WR025519. [3] Farmer A. *Tackling pollution is essential for meeting SDG poverty objectives*; United Nations Environment Programme / Institute for European Environmental Policy: 2017 [4] Huang X, Tan HZ, Zhou J, Yang TB, Abuaku B, Wen SW, et al. Flood hazard in Hunan province of China: an economic loss analysis. *Nat. Hazards*. 2008, 47, 65–73.

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
8.2	**Achieve higher** levels of **economic productivity** through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors	**Synergy**	1. Hydropower is the focus of green growth policies.	[1] Basheer M, Nechifor V, Calzadilla A, Siddig K, Etichia M, Whittington D, et al. Collaborative management of the Grand Ethiopian Renaissance Dam increases economic benefits and resilience. *Nat. Commun.* 2021, 12, 5622. [2] Vogl AL, Dennedy-Frank PJ, Wolny S, Johnson JA, Hamel P, Narain U, et al. Managing forest ecosystem services for hydropower production. *Environ. Sci. Policy*. 2016, 61, 221–229.
8.3	**Promote development-oriented policies** that **support productive activities, decent job creation, entrepreneurship, creativity and innovation**, and encourage the **formalization and growth of micro-, small- and medium-sized enterprises,** including through access to financial services	**Synergy**	1. River ecosystems create many jobs 2. Encouraging the formalization of enterprises helps protect the environment.	[1] James T, Madly E, Kelly C. *The economic importance of the Colorado River to the basin region*; 2014.
8.4	**Improve** progressively, through 2030, **global resource efficiency in consumption** and production and endeavour to **decouple economic growth from environmental degradation**, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead	**Synergy**	1. Improving resource efficiency means reducing pollution, improving water quality and protecting the environment.2. Economic development and energy efficiency are positively correlated.	[1] Wang J, Wang S, Li SJ, Cai Q, Gao S. Evaluating the energy-environment efficiency and its determinants in Guangdong using a slack-based measure with environmental undesirable outputs and panel data model. *Sci. Total Environ.* 2019, 663, 878–888.
8.5	By 2030, **achieve full and productive employment and decent work** for all women and men, including for young people and persons with disabilities, and **equal pay for work of equal value**	**Synergy**	1. River ecosystems create many jobs.	[1] James T, Madly E, Kelly C. *The economic importance of the Colorado River to the basin region*; 2014

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
8.6	By 2020, substantially **reduce the proportion of youth not in employment, education or training**	**Synergy**		1. River ecosystems create many jobs.	[1] James T, Madly E, Kelly C. *The economic importance of the Colorado River to the basin region*; 2014
8.7	Take immediate and effective **measures to eradicate forced labour, end modern slavery and human trafficking** and **secure the prohibition and elimination of the worst forms of child labour**, including recruitment and use of child soldiers, and by 2025 end child labour in all its forms				
8.8	**Protect labour rights and promote safe and secure working environments** for all workers, including migrant workers, in particular women migrants, and those in precarious employment	**Synergy**	**Trade-off**	1. River ecosystems create many jobs. 2. Working near rivers is risky.	[1] James T, Madly E, Kelly C. *The economic importance of the Colorado River to the basin region*; 2014
8.9	By 2030, devise and **implement policies to promote sustainable tourism** that creates jobs and promotes local culture and products	**Synergy**		1. Sustainable tourism policies promote the development of cultural services in river ecosystems. 2. River ecosystems contain numerous tourist attractions that promote tourism.	[1] Luekveerawattana S. Cultural landscape for sustainable tourism case study of amphawa community. *Procedia Soc. Behav. Sci.* 2012, 65, 387–396.
8.1	**Strengthen the capacity of domestic financial institutions** to encourage and expand access to **banking, insurance and financial services for all**				
8.a	**Increase Aid for Trade support for developing countries**, in particular least developed countries, including through the Enhanced Integrated Framework for Trade-Related Technical Assistance to Least Developed Countries	**Synergy**		1. Aid for Trade to LDCs and developing countries helps improve local infrastructure, human resource cooperation and environmental protection.	[1] Pal P, Sethi G, Nath A, Swami S. Towards cleaner technologies in small and micro enterprises: a process-based case study of foundry industry in India. *J. Clean. Prod.* 2008, 16, 1264–1274.
8.b	By 2020, **develop and operationalize a global strategy for youth employment** and implement				

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
	the Global Jobs Pact of the International Labour Organization				
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation					
9.1	**Develop** quality, reliable, sustainable and resilient **infrastructure,** including regional and transborder infrastructure, **to support economic development and human well-being**, with a focus on **affordable and equitable access for all**	**Synergy**	**Trade-off**	1. Reactive nitrogen emissions from energy use in the industrial sector and transport networks Emissions of reactive nitrogen from energy use in the industrial sector and transport networks may pollute water. 2. River transport can have a negative impact on the alteration of river habitats. 3. Rivers provide a means for transport.	[1] Yang J, Zhang J, Zhang B, Zhuang J, Lin J, Zhang D. Water pollution and sustainable utilization of the Jing Hang grand canal in China. In *Proceedings of the IEEE*; 2010. [2] Blanton P, Marcus WA. Railroads, roads and lateral disconnection in the river landscapes of the continental United States. *Geomorphology*. 2009, 112, 212–227.
9.2	**Promote inclusive and sustainable industrialization** and, by 2030, significantly **raise industry's share of employment and gross domestic product**, in line with national circumstances, and double its share in least developed countries	**Synergy**		1. River dams provide the basis for local industrialization, job creation and potential for development.	[1] Bode MA, Thompson AF, Alese BK, Olurinde L. Predictive model of power generation using Long Short Term Memory on hydrological data. In *Proceedings of the IEEE*; 2019
9.3	**Increase the access of small-scale industrial and other enterprises,** in particular in developing countries, **to financial services,** including affordable credit, and their integration into value chains and markets				
9.4	By 2030, **upgrade infrastructure and retrofit industries to make them sustainable,** with **increased resource-use efficiency** and greater **adoption of clean and environmentally sound technologies and industrial processes**, with all countries taking action in accordance with their respective capabilities	**Synergy**		1. Improving resource efficiency and the adoption of clean technologies by industry and infrastructure.2. technologies and improving water quality are inseparable.	[1] Nhapi I, Hoko Z. A cleaner production approach to urban water management: potential for application in Harare, Zimbabwe. *Phys. Chem. Earth Parts A/B/C*. 2004, 29, 1281–1289

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
9.5	**Enhance scientific research, upgrade the technological capabilities** of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending	**Synergy**	1. Strengthen research that supports technological capabilities that can improve water quality by promoting the development of innovative clean technologies. 2. Strengthen research that supports the technological capacity of the industrial sector to improve water use efficiency and protect river ecosystems by promoting the development of innovative clean technologies.	[1] Nhapi I, Hoko Z. A cleaner production approach to urban water management: potential for application in Harare, Zimbabwe. *Phys. Chem. Earth Parts A/B/C*. 2004, 29, 1281–1289 [2] Oliveira Neto GCD, Cesar Da Silva P, Tucci HNP, Amorim M. Reuse of water and materials as a cleaner production practice in the textile industry contributing to blue economy. *J. Clean. Prod.* 2021, 305, 127075.
9.a	**Facilitate sustainable and resilient infrastructure development** in developing countries through **enhanced financial, technological and technical** support to African countries, least developed countries, landlocked developing countries and small island developing States	**Synergy**	1. Research that provides technical capacity to developing countries can improve water quality, increase water use efficiency, and protect river ecosystems by promoting the development of innovative clean technologies.	[1] Oliveira Neto GCD, Cesar Da Silva P, Tucci HNP, Amorim M. Reuse of water and materials as a cleaner production practice in the textile industry contributing to blue economy. *J. Clean. Prod.* 2021, 305, 127075.
9.b	**Support domestic technology development, research and innovation** in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities	**Synergy**	1. Supporting technology development, research and innovation in developing countries can protect river ecosystems by reducing pollution.	[1] Pal P, Sethi G, Nath A, Swami S. Towards cleaner technologies in small and micro enterprises: a process-based case study of foundry industry in India. *J. Clean. Prod.* 2008, 16, 1264–1274.
9.c	**Significantly increase access to information and communications technology** and strive to provide **universal and affordable access to the Internet** in least developed countries by 2020	**Synergy**	1. Improving access to information and communication can use the technology for water quality testing, watershed risk assessment, etc.	[1] Sato Takeda K, Matsumoto K, Anai H, Yamakage Y. Efforts for disaster prevention/mitigation to protect society from major natural disasters. *Fujitsu Sci. Tech. J.* 2016, 52, 107–113. [2] Park J, Kim KT, Lee WH. Recent advances in information and communications technology (ICT) and

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
					sensor technology for monitoring water quality. *Water*. 2020, 12, 510. [3] Palen L, Liu S. Citizen communications in crisis: anticipating a future of ICT-supported public participation. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*; 2007
Goal 10. Reduce inequality within and among countries					
10.1	By 2030, progressively **achieve and sustain income growth of the bottom 40 per cent of the population** at a rate higher than the national average	**Synergy**	**Trade-off**	1. Increased incomes stimulate increased household water use, agricultural water use. 2. Increased incomes support access to knowledge, technology, infrastructure and services for sustainable water management in more areas and for poor people.	[1] Alcamo J, Floerke M, Maerker M. Future long-term changes in global water resources driven by socio-economic and climatic changes. *Hydrol. Sci. J.* 2007, 52, 247–275. [2] Harding G, Courtney C, Russo V. When geography matters. A location-adjusted blue water footprint of commercial beef in South Africa. *J. Clean. Prod.* 2017, 151, 494–508. [3] Lu Y, Zhang Y, Cao X, Wang C, Wang Y, Zhang M, et al. Forty years of reform and opening up: China's progress toward a sustainable path. *Sci. Adv.* 2019, 5, eaau9413.
10.2	By 2030, **empower and promote the social, economic and political inclusion of all**, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status				
10.3	**Ensure equal opportunity and reduce inequalities of outcome**, including by eliminating discriminatory laws, policies and				

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
	practices and promoting appropriate legislation, policies and action in this regard			
10.4	**Adopt policies, especially fiscal, wage and social protection policies**, and progressively **achieve greater equality**	**Synergy**	1. Controlling pollution of the environment such as water can reduce inequality.	[1] Farmer A. *Tackling pollution is essential for meeting SDG poverty objectives*; United Nations Environment Programme / Institute for European Environmental Policy: 2017
10.5	**Improve the regulation and monitoring of global financial markets and institutions** and strengthen the implementation of such regulations			
10.6	**Ensure enhanced representation and voice for developing countries in decision-making in global international economic and financial institutions** in order to deliver more effective, credible, accountable and legitimate institutions			
10.7	**Facilitate orderly, safe, regular and responsible migration and mobility of people**, including through the implementation of planned and well-managed migration policies			
10.a	**Implement the principle of special and differential treatment for developing countries**, in particular least developed countries, in accordance with World Trade Organization agreements			
10.b	**Encourage official development assistance and financial flows, including foreign direct investment, to States where the need is greatest, in particular least developed countries**, African countries, small island developing States and landlocked developing			

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
	countries, in accordance with their national plans and programmes				
10.c	By 2030, **reduce to less than 3 per cent the transaction costs of migrant remittances and eliminate remittance corridors** with costs higher than 5 per cent				
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable					
11.1	By 2030, **ensure access** for all to **adequate, safe and affordable housing and basic services and upgrade slums**	**Synergy**	**Trade-off**	1. Access to adequate, safe and affordable housing and basic services can offset the conservation and restoration of water-related ecosystems due to loss of land/waters for housing.2. River-induced flooding destroys homes, and for poorer areas more severe.	[1] Han D, Currell MJ, Cao G. Deep challenges for China's war on water pollution. *Environ. Pollut.* 2016, 218, 1222–1233. [2] McElwee P, Nghiem T, Le H, Vu H. Flood vulnerability among rural households in the Red River Delta of Vietnam: implications for future climate change risk and adaptation. *Nat. Hazards*. 2017, 86, 465–492.
11.2	By 2030, **provide access to safe, affordable, accessible and sustainable transport systems for all**, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	**Synergy**	**Trade-off**	1. Reactive nitrogen emissions from energy use in transport networks Emissions of reactive nitrogen from energy use in transport networks may pollute water. 2. River transport can have an impact on the alteration of river habitats. 3. rivers provide a means for transport.	[1] Yang J, Zhang J, Zhang B, Zhuang J, Lin J, Zhang DH. Water pollution and sustainable utilization of the Jing Hang grand canal in China. In *Proceedings of the IEEE*; 2010. [2] Blanton P, Marcus WA. Railroads, roads and lateral disconnection in the river landscapes of the continental United States. *Geomorphology*. 2009, 112, 212–227.
11.3	By 2030, **enhance inclusive and sustainable urbanization and capacity** for participatory, integrated and sustainable human settlement planning and management in all countries	**Synergy**		1. Sustainable urban planning (green infrastructure and blue infrastructure) helps to solve environmental and ecological problems. 2. Sustainable urban construction	[1] Perini K, Sabbion P. *Urban Sustainability and river restoration: green and blue infrastructure*; Wiley: 2017.

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
				and planning can help reduce pollution and improve energy efficiency.	
11.4	Strengthen efforts to **protect and safeguard the world's cultural and natural heritage**	**Synergy**		1. Rivers are part of the natural heritage and natural heritage conservation actions help to improve the condition of rivers.	[1] McDonald G, Weston N, Dorrington B. The potential contribution of the Queensland wet tropics region natural resource plan to river improvement and water quality. *Water Sci. Technol.* 2003, 48, 25–34.
11.5	By 2030, significantly **reduce** the number of **deaths** and the number of **people affected** and substantially **decrease the direct economic losses relative to global gross domestic product caused by disasters**, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	**Synergy**	**Trade-off**	1. River flooding undermines efforts for sustainable development actions. 2. dams built on rivers help mitigate or avoid flood damage.	[1] Jonkman SN. Global perspectives on loss of human life caused by floods. *Nat. Hazards*. 2005, 34, 151–175.
11.6	By 2030, **reduce the adverse per capita environmental impact of cities**, including by paying special attention to air quality and municipal and other waste management	**Synergy**		1. Reducing the adverse environmental impact of cities reinforces the protection of river ecosystems.2. Reducing nutrient pollution in river ecosystems through improved urban waste management.	[1] Tao T, Xin K. Public health: a sustainable plan for China's drinking water. *Nature*. 2014, 511, 527–528. [2] UNEP. *Our Nutrient World: the challenge to produce more food and energy with less pollution*; United Nations Environment Programme: 2013
11.7	By 2030, **provide** universal **access to safe, inclusive and accessible**, **green and public spaces**, in particular for women and children, older persons and persons with disabilities	**Synergy**		1. River ecosystems help provide green and inclusive public spaces.	[1] Durán Vian F, Pons Izquierdo JJ, Serrano Martínez M. River-city recreational interaction: a classification of urban riverfront parks and walks. *Urban For. Urban Green.* 2021, 59, 127042.
11.a	**Support positive economic, social and environmental links between urban, per-urban and rural areas** by strengthening national and regional development planning	**Synergy**		1. Sustainable urban planning contributes to more effective land planning, reduces reduce environmental pollution and protect biodiversity.	[1] Yang C, Zeng W. The Correlation of Geo-Ecological Environment and Mountain Urban planning. *IOP Conf. Ser.: Earth Environ. Sci.* 2018, 108, 32081.

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
11.b	By 2020, substantially **increase** the number of **cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement**, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels	**Synergy**	1. Improving energy efficiency and mitigating climate change in cities helps reduce environmental pollution.	[1] Ma M, Wang Q. Assessment and forecast of green total factor energy efficiency in the yellow river basin—a perspective distinguishing the upper, middle and lower stream. *Sustainability*. 2022, 14, 2506.
11.c	**Support** least developed countries, **including through financial and technical assistance**, in **building sustainable and resilient buildings utilizing local materials**	**Synergy**	1. Financial and technical support can reduce the environmental impact of LDCs in the construction process.	[1] Pal P, Sethi G, Nath A, Swami S. Towards cleaner technologies in small and micro enterprises: a process-based case study of foundry industry in India. *J. Clean. Prod.* 2008, 16, 1264–1274.
Goal 12. Ensure sustainable consumption and production patterns				
12.1	Implement the **10-year framework of programmes on sustainable consumption and production patterns**, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries	**Synergy**	1. Implementing sustainable consumption patterns and production transformation policies can help limit environmental degradation and protect river ecosystems.	[1] Su F, Shang H. Social water cycle and sustainable consumption in the perspective of water footprint – taken the low water consumption patterns of Zhangye city as a case. *Desalin. Water Treat.* 2018, 122, 170–175.
12.2	By 2030, **achieve the sustainable management and efficient use of natural resources**	**Synergy**	1. Efficient use of resources can reduce pollution emissions 2. Sustainable resource management can reduce the production of fertilizers and greenhouse gases.	[1] UNEP. *Our Nutrient World: the challenge to produce more food and energy with less pollution* ;United Nations Environment Programme 2013
12.3	By 2030, **halve per capita global food waste** at the retail and consumer levels and **reduce food losses along production and supply chains**, including post-harvest losses	**Synergy**	1. Reducing food loss in production and supply chain can reduce waste generation, reduce pollution in rivers and help improve water quality.	[1] UNEP. *Our Nutrient World: the challenge to produce more food and energy with less pollution* ;United Nations Environment Programme 2013

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
12.4	By 2020, **achieve the environmentally sound management of chemicals and all wastes throughout their life cycle**, in accordance with agreed international frameworks, and significantly **reduce their release to air, water and soil** in order to minimize their adverse impacts on human health and the environment	**Synergy**	1. Enhancing the sound management of chemicals and wastes and reducing discharges are conducive to improving water quality.	[1] Munthe J, Brorström-Lundén E, Rahmberg M, Posthuma L, Altenburger R, Brack W, et al. An expanded conceptual framework for solution-focused management of chemical pollution in European waters. *Environ. Sci. Eur.* 2017, 29, 13
12.5	By 2030, substantially **reduce waste generation through prevention, reduction, recycling and reuse**	**Synergy**	1. Nutrient contamination in water systems can be reduced through prevention, waste reduction (e.g., food scraps) recycling and reuse.	[1] Ma L, Bai ZH, Ma WQ, Guo MC, Jiang RF, Liu JG, et al. Exploring future food provision scenarios for China. *Environ. Sci. Technol.* 2019, 53, 1385–1393.
12.6	**Encourage companies,** especially large and transnational companies, to **adopt sustainable practices** and **to integrate sustainability information into their reporting cycle**	**Synergy**	1. Businesses can be stimulated to take action to reduce pollution through sustainability practices.	[1] Tseng H, Newton A, Gong G, Lin C. Social–environmental analysis of estuary water quality in a populous urban area. *Elementa*. 2021, 9, 00085.
12.7	**Promote public procurement practices that are sustainable**, in accordance with national policies and priorities	**Synergy**	1. The practice of sustainable public procurement contributes to the protection of the environment.2. Sustainable public procurement can reduce the negative environmental impacts of production and consumption.	[1] Yin Y, Zhang X, Feng Y. Study on modes of the sustainable public procurement. In *Proceedings of ICEEP*; 2015. [2] Grandia J. Finding the missing link: examining the mediating role of sustainable public procurement behaviour. *J. Clean. Prod.* 2016, 124, 183–190.
12.8	By 2030, **ensure that people** everywhere **have** the relevant **information and awareness for sustainable development** and **lifestyles** in **harmony with nature**	**Synergy**	1. Raising people's awareness of sustainable development helps protect the environment and water quality.	[1] Rafika K, Rym K, Souad SB, Youcef L. A public actor awareness for sustainable development. *Procedia Soc. Behav. Sci.* 2016, 216, 151–162.
12.a	**Support** developing countries to **strengthen** their **scientific and technological capacity** to move towards more **sustainable patterns of consumption and production**	**Synergy**	1. Strengthened scientific and technological capacity can better promote sustainable consumption and production patterns, improve	[1] UNEP. *Our Nutrient World: the challenge to produce more food and energy with less pollution* ;United Nations Environment Programme 2013

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
				water use efficiency, and protect river ecosystems.	
12.b	**Develop and implement tools to monitor sustainable development impacts for sustainable tourism** that creates jobs and promotes local culture and products	**Synergy**		1. River ecosystems create jobs and provide an environment for tourism. 2. Sustainable tourism reduces damage to the environment.	[1] Fortuny M, Soler R, Cánovas C, Sánchez A. Technical approach for a sustainable tourism development. Case study in the Balearic Islands. *J. Clean. Prod.* 2008, 16, 860–869.
12.c	**Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption** by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities	**Synergy**		1. Subsidies to reduce wasteful consumption help to reduce environmental pollution. 2. Reducing the use of fossil fuels helps mitigate climate change and has a protective effect on river ecosystems.	[1] Wesseh PK, Lin B, Atsagli P. Environmental and welfare assessment of fossil-fuels subsidies removal: a computable general equilibrium analysis for Ghana. *Energy*. 2016, 116, 1172–1179.
Goal 13. Take urgent action to combat climate change and its impacts					
13.1	**Strengthen resilience and adaptive capacity to climate-related hazards** and **natural disasters** in all countries	**Synergy**	**Trade-off**	1. Hydroelectric power generation reduces the use of fossil fuels and helps mitigate climate change.2. Infrastructure measures for resilience to climate-related hazards can have a negative impact on river runoff3. Climate change exacerbates flooding, and rivers can produce floods.4. Healthy river ecosystems enable support for climate action and build climate resilience5. Aquatic plants contribute to carbon sequestration	[1] Siam M, Eltahir E. Climate change enhances interannual variability of the Nile river flow. *Nat. Clim. Change*. 2017, 7, 350–354. [2] Berga L. The role of hydropower in climate change mitigation and adaptation: a review. *Engineering*. 2016, 2, 313–318 [3] IUCN. *Water and climate change*; International Union for Conservation of Nature: 2015 [4] Kang E, Lu L, Xu Z. Vegetation and carbon sequestration and their relation to water resources in an inland river basin of

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
					Northwest China. *J. Environ. Manage.* 2007, 85, 702–710.
13.2	**Integrate climate change measures** into **national policies, strategies and planning**	**Synergy**	**Trade-off**	1. Climate change mitigation policies can reduce the amount of water available to rivers in some areas.	[1] Giuliani M, Lamontagne JR, Hejazi MI, Reed PM, Castelletti A. Unintended consequences of climate change mitigation for African river basins. *Nat. Clim. Change*. 2022, 12, 187–192
13.3	Improve **education, awareness-raising and human and institutional capacity** on **climate change mitigation, adaptation, impact reduction and early warning**	**Synergy**		1. Increased awareness of climate mitigation can help reduce pollution discharges and protect river ecosystems. 2. Increased education and awareness of climate change climate mitigation, adaptation, impact reduction and early warning can change public awareness and institutional capacity, and in the long term help improve river water quality.	[1] Tung CP. Climate change impacts on water resources of the Tesngwen Creek watershed in Taiwan. *J. Am. Water Resour. Assoc.* 2001, 37, 167–176. [2] Kopprio GA, Freije RH, Arias-Schreiber M, Lara RJ. An ecohydrological adaptive approach to a salt lake in the semiarid grasslands of Argentina: Future management perspectives. *Sustain. Sci.* 2014, 9, 229–238.
13.a	Implement the commitment undertaken by developed-country parties to the **United Nations Framework Convention on Climate Change** to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of **meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization** as soon as possible	**Synergy**		1. Raising funds for mitigation actions can help mitigate extreme conditions (e.g., floods, droughts) in river ecosystems.	[1] Padrón RS, Gudmundsson L, Decharme B, Ducharne A, Lawrence DM, Mao J, et al. Observed changes in dry-season water availability attributed to human-induced climate change. *Nat. Geosci.* 2020, 13, 477–481. [2] Madakumbura GD, Kim H, Utsumi N, Shiogama H, Fischer EM, Seland Ø, et al. Event-to-event intensification of the hydrologic cycle from 1.5 °C to a 2 °C warmer world. *Sci. Rep.* 2019, 9, 3483.
13.b	**Promote mechanisms** for **raising capacity for effective climate change-related planning and management** in least developed countries and	**Synergy**		1. Effective planning and management related to climate change can help mitigate	[1] McClain S, Bruch C, Secchi S. Adaptation in the Tisza: innovation and

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
	small island developing States, including focusing on women, youth and local and marginalized communities		difficulties in water resources management.	tribulation at the sub-basin level. *Water Int.* 2016, 41, 813–834. [2] Atteridge A, Savvidou G. Development aid for energy in Small Island Developing States. *Energy Sustain. Soc.* 2019, 9, 10.
Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development				
14.1	By 2025, prevent and significantly **reduce marine pollution** of all kinds, in particular from land-based activities, including marine debris and nutrient pollution	**Synergy**	1. Protecting the sustainability of marine fisheries can reduce the load on inland fisheries. 2. Rivers are a means of transporting pollutants to the ocean.	[1] Mai L, Sun XF, Xia LL, Bao LJ, Liu LY, Zeng EY, et al. Global riverine plastic outflows. *Environ. Sci. Technol.* 2020, 54, 10049–10056.
14.2	By 2020, sustainably **manage and protect marine and coastal ecosystems to avoid significant adverse impacts**, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans	**Synergy**	1. This can be achieved by strengthening resilience, reducing the impacts of nutrient pollution in water systems (e.g. eutrophication) and taking action to restore marine and coastal ecosystems.	[1] Zhang K. Regime shifts and resilience in China's coastal ecosystems. *Ambio*. 2016, 45, 89–98. [2] Nyström M, Norström AV, Blenckner T, de la Torre-Castro M, Eklöf JS, Folke C, et al. Confronting feedbacks of degraded marine ecosystems. *Ecosystems*. 2012, 15, 695–710. [3] Rech S, Macaya-Caquilpán V, Pantoja JF, Rivadeneira MM, Jofre Madariaga D, Thiel M. Rivers as a source of marine litter – a study from the SE Pacific. *Mar. Pollut. Bull.* 2014, 82, 66–75.
14.3	**Minimize and address the impacts of ocean acidification**, including through enhanced scientific cooperation at all levels	**Synergy**	1. Increasing river alkalinity can slow ocean acidification. 2. Coastal areas are affected by river discharge.	[1] Gomez FA, Wanninkhof R, Barbero L, Lee SK. Increasing river alkalinity slows ocean acidification in the northern gulf of mexico. *Geophys. Res. Lett.* 2021, 48, e2021GL096521. [2] Sridevi B, Sarma VVSS. Role of river discharge and warming on ocean

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
				acidification and pCO2 levels in the Bay of Bengal. *Tellus B*. 2021, 73, 1971924.
14.4	By 2020, effectively **regulate harvesting and end overfishing**, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics	**Synergy**	1. Protecting the sustainability of marine fisheries can reduce the load on inland fisheries. 2. Regulation of river flow and water quality can affect marine fish spawning in estuaries. 3. Scientific fishing helps to protect and maintain biodiversity in river ecosystems.	[1] Broadley A, Stewart-Koster B, Burford MA, Brown CJ. A global review of the critical link between river flows and productivity in marine fisheries. *Rev. Fish Biol. Fish.* 2022, 32, 805–825. [2] Drinkwater KF, Frank KT. Effects of river regulation and diversion on marine fish and invertebrates. *Aquat. Conserv.* 1994, 4, 135–151.
14.5	By 2020, **conserve** at least 10 per cent of **coastal and marine areas,** consistent with national and international law and based on the best available scientific information	**Synergy**	1. Establish more marine protected areas to protect coastal biodiversity.	[1] Davidson L, Dulvy N. Global marine protected areas to prevent extinctions. *Nat. Ecol. Evol.* 2017, 1, 0040.
14.6	By 2020, **prohibit** certain forms of **fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies**, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation	**Synergy**	1. Marine fisheries and river fisheries complement each other.	[1] Xenopoulos MA, Downing JA, Kumar MD, Menden-Deuer S, Voss M. Headwaters to oceans: ecological and biogeochemical contrasts across the aquatic continuum. *Limnol. Oceanogr.* 2017, 62, S3–S14.. [2] Munro G, Sumaila UR. The impact of subsidies upon fisheries management and sustainability: the case of the North Atlantic. *Fish Fish.* 2002, 3, 233–250.
14.7	By 2030, **increase the economic benefits to Small Island developing States** and least developed countries **from the sustainable use of marine resources**, including through sustainable management of fisheries, aquaculture and tourism	**Synergy**	1. Protecting the sustainable development of marine fisheries can reduce the load on inland fisheries. 2. River flow affects marine fisheries.	[1] Broadley A, Stewart-Koster B, Kenyon RA, Burford MA, Brown CJ. Impact of water development on river flows and the catch of a commercial marine fishery. *Ecosphere*. 2020, 11, e03194.

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
14.a	**Increase scientific knowledge, develop research capacity and transfer marine technology,** taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order **to improve ocean health and to enhance the contribution of marine biodiversity** to the development of developing countries, in particular small island developing States and least developed countries	**Synergy**	1. Some of the improvements in marine underwater sampling, monitoring data technology can be equally useful for rivers.	[1] Matzner S, Hull RE, Harker-Klimes G, Cullinan VI. Studying fish near ocean energy devices using underwater video. In *Proceedings of the IEEE International Conference*; 2017.
14.b	**Provide access for small-scale artisanal fishers to marine resources and markets**			
14.c	**Enhance the conservation and sustainable use of oceans and their resources by implementing international law** as reflected in UNCLOS, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of The Future We Want	**Synergy**	1. Rivers and oceans are continuous, and reducing river pollution can effectively protect marine resources.	[1] Rech S, Macaya-Caquilpán V, Pantoja JF, Rivadeneira MM, Jofre Madariaga D, Thiel M. Rivers as a source of marine litter – a study from the SE Pacific. *Mar. Pollut. Bull.* 2014, 82, 66–75.
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss				
15.1	By 2020, **ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services**, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	**Synergy**	1. This can be achieved by protecting terrestrial ecosystems to reduce nutrient pollution of riverine ecosystems.	[1] Gross C, Hagy JD. Attributes of successful actions to restore lakes and estuaries degraded by nutrient pollution. *J. Environ. Manage.* 2017, 187, 122–136.
15.2	By 2020, **promote** the implementation of **sustainable management of** all types of **forests, halt deforestation, restore degraded forests** and substantially **increase afforestation and reforestation** globally	**Synergy**	1. Floodplain forests contribute to the maintenance of riverine fish biomass and biological species.	[1] Capitani L, Angelini R, Keppeler FW, Hallwass G, Silvano RAM. Food web modeling indicates the potential impacts of increasing deforestation and fishing pressure in the Tapajós River, Brazilian

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
				Amazon. *Reg. Environ. Change*. 2021, 21, 42.
15.3	By 2030, **combat desertification, restore degraded land and soil**, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world	**Synergy**	1. Combating land degradation helps to protect the biological habitat of river ecosystems.	[1] Wang L, Lyons J, Kanehl P, Bannerman R. Impacts of urbanization on stream habitat and fish across multiple spatial Scales. *Environ. Manage.* 2001, 28, 255–266.
15.4	By 2030, **ensure the conservation of mountain ecosystems**, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development	**Synergy**	1. Mountain ecosystems play an important role in the protection of water resources in mountain rivers.	[1] Liu Y, Tao Q, Liang C, Wu Y. Research on water resources conservation of mountain river based on the concept of region partition. *J. Mt. Sci.* 2011, 8, 582–591.
15.5	Take urgent and significant action to **reduce the degradation of natural habitats, halt the loss of biodiversity** and, by 2020, protect and **prevent the extinction of threatened species**	**Synergy**	1. Achieving this goal will help protect riverine habitats and biodiversity.	[1] Schneiders A, Van Daele T, Van Landuyt W, Van Reeth W. Biodiversity and ecosystem services: complementary approaches for ecosystem management? *Ecol. Indic.* 2012, 21, 123–133.
15.6	**Promote** fair and equitable sharing of the **benefits arising from** the **utilization of genetic resources** and **promote** appropriate **access to such resources**, as internationally agreed	**Synergy**	1. Fair and equitable distribution of genetic resources is essential for the conservation of rive biodiversity.	[1] Sharma SP, Ghazi MG, Katdare S, Dasgupta N, Mondol S, Gupta SK, et al. Microsatellite analysis reveals low genetic diversity in managed populations of the critically endangered gharial (Gavialis gangeticus) in India. *Sci. Rep.* 2021, 11, 5627.
15.7	Take urgent action to **end poaching** and **trafficking of protected species of flora and fauna** and **address** both **demand and supply of illegal wildlife products**	**Synergy**	1. Ending wildlife trade helps protect river biodiversity and maintain ecosystem services.	[1] Singh A, Ghosh A, Dolker S, Chinnadurai V, Sharma LK, Chandra K, et al. Species identification from seized animal oil: a case study of suspected Gangetic dolphin (Platanista gangetica). *Int. J. Legal Med.* 2021, 135, 1413–1416.
15.8	By 2020, introduce measures to **prevent the introduction** and significantly **reduce the impact of invasive alien species on land and**	**Synergy**	1. Invasive species are one of the main causes of habitat destruction	[1] Dudgeon D, Arthington AH, Gessner MO, Kawabata ZI, Knowler DJ, Lévêque C, et al. Freshwater biodiversity:

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
	water ecosystems and **control or eradicate the priority species**			and loss of native organisms in rivers.	importance, threats, status and conservation challenges. *Biol. Rev.* 2006, 81, 163–182.
15.9	By 2020, **integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts**	**Synergy**		1. The implementation of this target will help to better implement integrated river water resources management and enhance public participation.	[1] Antwi SH, Linnane S, Getty D, Rolston A. River basin management planning in the republic of ireland: past, present and the future. *Water*. 2021, 13, 2074..
15.a	Mobilize and significantly **increase financial resources** from all sources to **conserve and sustainably use biodiversity and ecosystems**	**Synergy**		1. Achieving this target helps to protect river ecosystems through financial support.	[1] Hardy SD. Power to the people: collaborative watershed management in the Cuyahoga River Area of Concern (AOC). *Environ. Sci. Policy*. 2022, 129, 79–86.
15.b	**Mobilize significant resources** from all sources and at all levels to **finance sustainable forest management** and **provide adequate incentives** to developing countries to advance such management, including for conservation and reforestation	**Synergy**		1. Improved forest management helps provide nutrients and protects river ecosystems by improving water quality.	[1] Vannote RL, Minshall GW, Cummins KW, Sedell JR, Cushing CE. The river continuum concept. *Can. J. Fish. Aquat. Sci.* 1980, 37, 130–137. [2] Martínez Moscoso A, Larson R. Forestry management and water law: comparing Ecuador and Arizona. *Water Int.* 2019, 44, 337–353.
15.c	Enhance **global support for efforts to combat poaching and trafficking of protected species**, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities	**Synergy**		1. Increased efforts to combat poaching and trafficking of protected animals will help protect the biological integrity of rivers and reduce species extinction.	[1] Singh A, Ghosh A, Dolker S, Chinnadurai V, Sharma LK, Chandra K, et al. Species identification from seized animal oil: a case study of suspected Gangetic dolphin (Platanista gangetica). *Int. J. Legal Med.* 2021, 135, 1413–1416.
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels					
16.1	Significantly **reduce** all forms of **violence and related death rates** everywhere	**Synergy**	**Trade-off**	1. Water is the source of violence and the victim of violence.	[1] Gleick P. Water, Conflict and Peace. *Open Rivers Rethink. Water Place Community*. 2018, 11, 33–44.

	Goal or target in the 2030 agenda for sustainable development	Interlinkage		Reasoning	References
					[2] Oakland CA. *Water Conflict Chronology*; Pacific Institute: 2022. Available online: https://www.worldwater.org/water-conflict/ (accessed on 25 March 2023).
16.2	**End abuse, exploitation, trafficking and all forms of violence** against and torture of children				
16.3	**Promote** the **rule of law** at the national and international levels and **ensure equal access to justice for all**	**Synergy**		1. Corruption in the water and sanitation sector undermines citizens' equitable access to clean water and sanitation, disproportionately affecting the poor and vulnerable.	[1] Jenkins M. *The impact of corruption on access to safe water and sanitation for people living in poverty*; U4 Anti-Corruption Resource Centre: 2017
16.4	By 2030, significantly **reduce illicit financial and arms flows, strengthen the recovery** and **return of stolen assets** and **combat** all forms of **organized crime**				
16.5	Substantially **reduce corruption and bribery** in all their forms	**Synergy**		1. Laws and regulations for sustainable water management can be implemented by reducing corruption. 2. By reducing corruption, conflicts of interest can be curbed and fair incentives ensured to reduce nutrient pollution in water systems.	[1] Jenkins M. *The impact of corruption on access to safe water and sanitation for people living in poverty*; U4 Anti-Corruption Resource Centre: 2017 [2] Marquis C, Zhang J, Zhou Y. Regulatory uncertainty and corporate responses to environmental protection in China. *Calif. Manage. Rev.* 2011, 54, 39–63.
16.6	**Develop effective, accountable and transparent institutions** at all levels	**Synergy**		1. Reducing pollution of river ecosystems by establishing effective, accountable and transparent institutions helps to strengthen authority over the	[1] Liu J, Yang W. Water sustainability for China and beyond. *Science*. 2012, 337, 649–650.

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
			environment and increases pressure for transparency and monitoring.	
16.7	**Ensure responsive, inclusive, participatory and representative decision-making** at all levels	**Synergy**	1. Achieving this target contributes to the management of river ecosystems.	[1] Strydom WF, Hill L, Eloff E. *The Role of Communication in Governance: the River Health Programme as a Case Study*; Springer: 2007 [2] Roth D, Vink M, Warner J, Winnubst M. Watered-down politics? Inclusive water governance in the Netherlands. *Ocean Coast. Manage.* 2017, 150, 51–61.
16.8	Broaden and strengthen **the participation of developing countries in the institutions of global governance**	**Synergy**	1. The management of river ecosystems requires transboundary cooperation, and strengthening the participation of developing countries in governance institutions contributes to the management of transboundary rivers. 2. Enhancing the participation of developing countries in governance institutions helps developing countries and developed countries to interconnect and discuss together to strengthen environmental protection.	[1] Vinca A, Parkinson S, Riahi K, Byers E, Siddiqi A, Muhammad A, et al. Transboundary cooperation a potential route to sustainable development in the Indus basin. *Nat. Sustain.* 2021, 4, 331–339. [2] UN-Water. *Transboundary waters: sharing benefits, sharing responsibilities*; UN-Water: 2008
16.9	By 2030, **provide legal identity for all**, including birth registration			
16.1	**Ensure public access to information and protect fundamental freedoms**, in accordance with national legislation and international agreements			
16.a	**Strengthen relevant national institutions**, including through international cooperation, **for building capacity** at all levels, in particular in			

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
	developing countries, **to prevent violence** and **combat terrorism and crime**			
16.b	Promote and enforce **non-discriminatory laws and policies for sustainable development**			
Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development				
17.1	**Strengthen domestic resource mobilization**, including through international support to developing countries, to **improve domestic capacity for tax** and **other revenue collection**	**Synergy**	1. Achieving this target helps to create conditions that promote the protection of river ecosystems, for example by mobilizing resources for river infrastructure.	[1] Pal P, Sethi G, Nath A, Swami S. Towards cleaner technologies in small and micro enterprises: a process-based case study of foundry industry in India. *J. Clean. Prod.* 2008, 16, 1264–1274..
17.2	**Developed countries** to implement fully their **official development assistance commitments,** including the commitment by many developed countries to achieve the target of 0.7 per cent of ODA/GNI to developing countries and 0.15 to 0.20 per cent of ODA/GNI to least developed countries; ODA providers are encouraged to consider setting a target to provide at least 0.20 per cent of ODA/GNI to least developed countries			
17.3	**Mobilize additional financial resources for developing countries** from multiple sources			
17.4	**Assist developing countries** in **attaining long-term debt sustainability** through **coordinated policies** aimed at fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries to reduce debt distress			
17.5	Adopt and implement **investment promotion regimes** for least developed countries			
17.6	**Enhance** North-South, South-South and triangular regional and **international cooperation on and access to science,**	**Synergy**	1. International cooperation allows countries to identify common interests and develop strategies and	[1] Amer SED, Arsano Y, El-Battahani A, Hamad OET, Hefny MAE, Tamrat I, et al. Sustainable development and

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
	technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism		actions to improve water quality and provide ecosystem services. 2. Strengthening North-South, South-South, and triangular regional cooperation in the field of science and technology and innovation can help provide useful lessons at the national level.	international cooperation in the Eastern Nile Basin. *Aquat. Sci.* 2005, 67, 3–14. [2] Messerli P, Kim EM, Lutz W, Moatti JP, Richardson K, Saidam M, et al. Expansion of sustainability science needed for the SDGs. *Nat. Sustain.* 2019, 2, 892–894.
17.7	Promote the **development, transfer, dissemination and diffusion of environmentally sound technologies** to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed	**Synergy**	1. Achieving this target helps protect river ecosystems by reducing pollution discharges.	[1] Nhapi I, Hoko Z. A cleaner production approach to urban water management: potential for application in Harare, Zimbabwe. *Phys. Chem. Earth Parts A/B/C*. 2004, 29, 1281–1289.
17.8	**Fully operationalize** the **technology bank and science, technology and innovation capacity-building mechanism** for least developed countries by 2017 and enhance the use of enabling technology, in particular information and communications technology	**Synergy**	1. Improving access to information and communication can use the technology for water quality testing, watershed risk assessment, etc.	[1] Sato H, Takeda K, Matsumoto K, Anai H, Yamakage Y. Efforts for disaster prevention/mitigation to protect society from major natural disasters. *Fujitsu Sci. Tech. J.* 2016, 52, 107–113 [2] Park J, Kim KT, Lee WH. Recent advances in information and communications technology (ICT) and sensor technology for monitoring water quality. *Water*. 2020, 12, 510. [3] Palen L, Liu SB. Citizen communications in crisis: anticipating a future of ICT-supported public participation. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*; 2007. [4] Sachs JD, Schmidt-Traub G, Mazzucato M, Messner D, Nakicenovic N, Rockström J. Six Transformations to

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
				achieve the Sustainable Development Goals. *Nat. Sustain.* 2019, 2, 805–814.
17.9	**Enhance international support** for **implementing effective and targeted capacity-building in developing countries** to support national plans to implement all the sustainable development goals, including through North-South, South-South and triangular cooperation	**Synergy**	1. Strengthening North-South, South-South, and triangular regional cooperation in the field of science and technology and innovation can help provide useful lessons at the national level.	[1] Messerli P, Kim EM, Lutz W, Moatti JP, Richardson K, Saidam M, et al. Expansion of sustainability science needed for the SDGs. *Nat. Sustain.* 2019, 2, 892–894.
17.1	**Promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system** under the World Trade Organization, including through the conclusion of negotiations under its Doha Development Agenda			
7.11	Significantly **increase the exports of developing countries**, in particular with a view to doubling the least developed countries' share of global exports by 2020			
17.1	**Realize timely implementation of duty-free and quota-free market access on a lasting basis** for all least developed countries, consistent with World Trade Organization decisions, including by ensuring that preferential rules of origin applicable to imports from least developed countries are transparent and simple, and contribute to facilitating market access			
17.1	**Enhance global macroeconomic stability**, including through policy coordination and policy coherence			
17.1	**Enhance policy coherence for sustainable development**			

	Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
17.2	**Respect each country's policy space and leadership** to establish and implement policies for poverty eradication and sustainable development			
17.2	**Enhance** the **global partnership for sustainable development**, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries	**Synergy**	1. Strengthening river management and rational use and allocation of water resources through strengthening global partnerships for sustainable development and sharing knowledge on river ecosystem management.	[1] Amer SED, Arsano Y, El-Battahani A, Hamad OET, Hefny MAE, Tamrat I, et al. Sustainable development and international cooperation in the Eastern Nile Basin. *Aquat. Sci.* 2005, 67, 3–14.
17.2	**Encourage and promote effective public, public-private and civil society partnerships,** building on the experience and resourcing strategies of partnerships	**Synergy**	1. Strengthening river management and rational use and allocation of water resources through strengthening global partnerships for sustainable development and sharing knowledge on river ecosystem management.	[1] Amer SED, Arsano Y, El-Battahani A, Hamad OET, Hefny MAE, Tamrat I, et al. Sustainable development and international cooperation in the Eastern Nile Basin. *Aquat. Sci.* 2005, 67, 3–14.
17.2	By 2020, **enhance capacity-building support to developing countries**, including for least developed countries and small island developing States, to **increase** significantly the **availability of high-quality, timely and reliable data** disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts	**Synergy**	1. Achieving this target will help LDCs and SIDS manage riverine ecosystems. Evidence shows that increased capacity building in developing countries can contribute to enhanced management of riverine ecosystems and increased construction of wastewater treatment plants to reduce pollution discharges, particularly through enhanced monitoring and data support.	[1] Hughes DA. Regionalization of models for operational purposes in developing countries: an introduction. *Hydrol. Res.* 2011, 42, 331–337. [2] UNESCO. *The 3rd United Nations World Water Development Report: Water in a Changing World (WWDR-3)*; UNESCO: 2009
17.2	By 2030, **build on existing initiatives to develop measurements of progress on sustainable development** that complement			

Goal or target in the 2030 agenda for sustainable development	Interlinkage	Reasoning	References
gross domestic product, and support statistical capacity-building in developing countries			