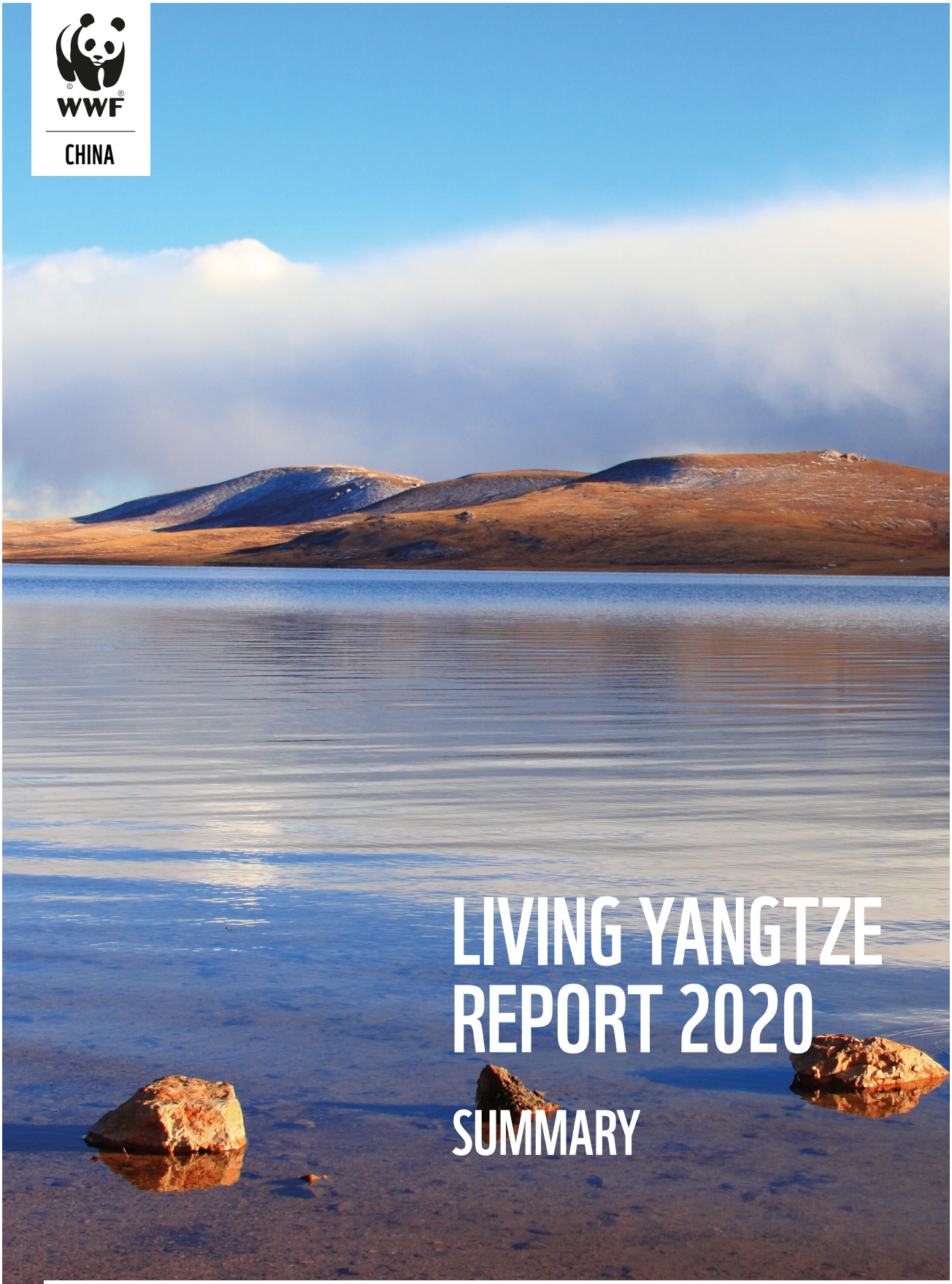
WWF
CHINA



LIVING YANGTZE REPORT 2020

SUMMARY

WWF is working with these partners to protect global environments.

Starting from 1998, the World Wild Fund for Nature (WWF) has regularly released the *Living Planet Report* to track the status of global biodiversity.

Over this same period, WWF has dedicated itself to protecting the Yangtze River freshwater ecosystems through conducting research and implementing evidence-based conservation programs. WWF works to conserve wetlands, protect flagship species and habitats, promote environmental flows, support the green transformation of industry and communities, and enhance the value of ecosystem services in the Yangtze River basin.

Based on 20 years of experience working in the Yangtze basin, WWF developed the conceptual framework of the "Living Yangtze Index" and launched the *Living Yangtze Report* project in 2018. The report aspires to track the health of freshwater ecosystems in the Yangtze River basin and contribute to an "all-out effort to protect the Yangtze River".

2021 is considered a critical year for biodiversity. The international community is reviewing the progress that has been made in global sustainable development and biodiversity protection, and prepare for post-2020 global biodiversity framework. As such, this work is very timely and, in collaboration with the organizations listed below, WWF is proud to release the first *Living Yangtze Report*.

Layout design: Ya Zhuo

cover image: Nianji Lake in the source area of Yangtze River ©WWF Baoyu Wei

Research Group Leader:

Jin Chen

Deputy Leader:

Wenwei Ren

General Coordinator:

Ying Qiu

Technical Leaders (in alphabetical order):

Hongwei Yang
Jijun Xu
Junfeng Gao
Luguang Jiang
Tao Yang
Xin Li
Yanxue Xu
Yushun Chen

Members (in alphabetical order):

Bo Yan
Cheng Yang
Fangyuan Xiong
Jingjing Yang
Lingling Wu
Pengfei Shi
Qi Huang
Senchen Huang
Xijun Lai
Yifeng Liu
Yongqiang Wang
Yue Wang
Yue Zhao

Organizations Involved (in alphabetical order):

- Changjiang River Scientific Research Institute
- Chinese Academy of Environmental Planning
- Institute of Hydrobiology, Chinese Academy of Sciences
- Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences
- Key Laboratory of Yangtze River Water Environment, Ministry of Education (Tongji University)
- Nanjing Institute of Geography & Limnology, Chinese Academy of Sciences
- Research Institute for Environmental Innovation (Suzhou) Tsinghua
- School of Water Resources and Hydropower Engineering, Wuhan University
- World Wide Fund for Nature

Invited Expert Advisors (in alphabetical order):

Angela Ortigara
Daqing Chen
David Tickner
Ding Wang
Gang Lei
Jiakuan Chen
Kathy Hughes
Michele Thieme
Robert Speed
Simon Costanzo

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Finally, a special thanks goes to Executive Editor Yanfei Liu for his work on this report.

FOREWORD

Restoring the health of Yangtze River for the benefit of people and nature

The world's freshwater ecosystems are in crisis. WWF's Living Planet Report 2020 found that freshwater species populations have collapsed by 84 per cent on average since 1970, highlighting the damage we have done to our rivers, lakes and wetlands – ecosystems that are crucial to the ecological balance of the planet, and provide vital services to our society and economy.

A healthy Yangtze River basin is central to China's future. It provides water, food and livelihoods for hundreds of millions of people and sustains much of the Chinese economy. It is also home to incredible biodiversity from giant pandas and snow leopards to over 400 species of fish and the world's only freshwater porpoise. But today, the Yangtze is under immense pressure and its health is failing fast. Preserving biodiversity in the Yangtze, restoring ecosystems to a healthy state, and achieving proper management and sustainable use of resources will be vital to the economic and social development of China.

This new Living Yangtze Report provides an authoritative analysis of the current challenges in the basin, including climate change, alterations to its flow, land-use change and river-bank development, pollution, overfishing and invasive species. These pressures threaten the river's wealth of ecosystem services from water supplies to freshwater fisheries that feed millions, and mitigation of extreme floods and droughts.

At the heart of the report is the Yangtze Living Index, which concludes that the overall health of the Yangtze River basin is declining with its status deteriorating as the river flows from source to sea.

The index is a cutting-edge scientific tool that supports effective management of the river basin by providing a comprehensive set of data to track progress in biodiversity conservation, ecosystem restoration and the sustainability of the river's priceless natural resources.

As the first complete basin-level index in the world, the Living Yangtze Index is also an innovation that will hopefully be replicated across the world. We will not be able to reverse the loss of freshwater ecosystems and the decline in freshwater biodiversity until we better understand the status of the world's major river basins.

Thanks to the Living Yangtze Report, we now have a much more accurate picture of the health of Asia's longest river and how best to improve it for the benefit of the millions of people and the rich biodiversity it supports. I am confident that this report will contribute significantly to the effectiveness of efforts by the government, communities, companies and conservationists like WWF to restore the Yangtze to health – and help drive sustainable development in China.

Marco Lambertini
Director General
World Wide Fund for Nature (WWF) International

FOREWORD

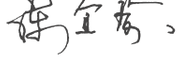
The Yangtze River is often referred to as "the Cradle of Chinese Civilization" – which signals both its role as the lifeline of the nation's sustainable socio-economic development, as well as its prominent role in safeguarding the nation's ecological security. In January 2016, President Xi Jinping presided over a symposium in Chongqing to promote the development of the Yangtze River Economic Belt, and stressed that, "We must proceed from the long-term interests of the Chinese nation to put restoring the ecological environment of the Yangtze River in a dominant position, making an all-out effort to protect it, and forbidding large-scale development of the river". At a similar symposium held in Wuhan in April 2018, Xi Jinping once again reinforced the need for an effective system of environmental protection by calling for a holistic approach in the conservation and restoration of the Yangtze River ecosystem.

The restoration of the Yangtze ecosystem should be carried out with a systematic and holistic perspective — that is, to regard and protect mountains, rivers, forests, farmlands, lakes and grasslands as a whole, rather than as separate sections. Bearing this in mind, we should use evidence-based approaches to trace and analyze the health of the Yangtze ecosystem, identify the weak links and challenges, and comprehensively address the drivers and impacts of degradation to restore the river.

The Living Yangtze Report 2020, initiated and developed by WWF together with a team of multi-disciplinary scientists, is an essential tool for evaluating the health of the Yangtze River . I personally commend this Report, not only because it embodies the close collaboration and great contributions of experts from many different fields involved in the research and conservation of the Yangtze River, but also because the Report is science-based and explores deep questions in simple terms, so that the country's mother river can be better understood by relevant government bodies and across all sectors of the society.

As far as I know, WWF has published the Living Planet Report every two years. By tracking the health of our planet and the impact of human activity, the Living Planet Report has played a unique role in raising public awareness of the health of the Earth, inspiring tangible action from large businesses around the world, as well as building global consensus on combating the decline of biodiversity.

This Living Yangtze Report, which was inspired by the Living Planet Report, is the first time WWF has taken the river basin as the core research subject. Three years ago, when the Living Yangtze Report was still in the pipeline, I was visited and consulted by WWF about the feasibility of this research. At that time, I encouraged them to do it, as I knew that despite the challenges that this project posed, it was one worthy of trying. Today, I am glad to welcome the official release of this Report. Presently, China is at the critical moment of seeking the right solutions to the problems faced by the Yangtze River by "stepping up conservation of the Yangtze River and stopping its over development". The Living Yangtze Report, I believe, will be a valuable resource for the public to better understand the grave threats facing the Yangtze River, and a guiding reference for the related departments, river basin authorities and local governments to make scientific strategies, in a bid to maintain a living Yangtze River now and forever.



Yiyu Chen
Academician
Chinese Academy of Sciences

PROJECT ORIGIN

Protecting the Yangtze River ecosystem is of vital strategic significance to ecological security. However, over-exploitation of the basin resources is putting the health of the ecological system under immense pressure.

The Yangtze River, the "mother river" of China, is the longest in the world to flow entirely within one country. The Yangtze River basin is one of the world's most biologically diverse ecoregions due to its climatic, geographical and geomorphological diversity and complexity of river (lake) relations. Flagship species such as giant pandas, Chinese sturgeons, Baiji dolphins, Yangtze finless porpoises and snow leopards have lived in the region since before the dawn of human civilization. High fish diversity is also an important ecological feature of the Yangtze River basin.

Despite recognition of the value of the Yangtze, over the past 40-plus years of China's rapid economic development, the Yangtze River basin has developed increasingly challenging problems related to overexploitation of natural resources, and ecological and environmental deterioration. The cities and industry stretching along the Yangtze create a great deal of wastewater and sewage that is disposed of without being treated to the relevant standards, while inappropriate development of land, rivers, lakes and waterfronts, construction of reservoirs, and overfishing, have all made the Yangtze River one of the world's most ecologically damaged rivers[1]. Global climate change is also posing a new challenge to biodiversity conservation in the Yangtze River basin, with rising temperatures causing glaciers to melt and an increase in extreme weather and flooding events.

In recognition of this, on January 5, 2016, at the symposium on promoting the development of the Yangtze River Economic Belt in Chongqing, Chinese President Xi Jinping stressed that "we must proceed from the long-term interests of the Chinese nation to put restoring the ecological environment of the Yangtze River at a dominant position, making all-out efforts to protect it, and forbidding large-scale development of the river". In his more recent speech on April 26, 2018 at the symposium on further promoting the development of the Yangtze River Economic Belt in Wuhan, Xi Jinping acknowledged that the health of the Yangtze River is failing fast. He also provided the prescription — to apply the holistic view of Traditional Chinese Medicine (TCM) in a scientific way, to trace the source of the sickness, diagnose the causes, identify the origin, take objective measures and implement systematic treatment.

The Living Yangtze Index reflects the health of the Yangtze River freshwater ecosystems

In 2018, WWF first developed the conceptual framework of Living Yangtze Report and then, in collaboration with strategic partners, the Living Yangtze Report project was launched. The goal of the project is to provide continuous monitoring of the status of the Yangtze River in order to provide evidence-based recommendations for the basin's protection and sustainable development.

WWF would like to thank the following partners who have made this report a reality:

The participating partners are Changjiang (Chinese spelling for Yangtze) River Scientific Research Institute (CRSRI), Chinese Academy of Environmental Planning (CAEP), Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences (IGSNRR), Institute of Hydrobiology, Chinese Academy of Sciences (IHB), Key Laboratory of Yangtze River Water Environment, Ministry of Education (Tongji University) (KLYRWE), Nanjing Institute of Geography & Limnology, Chinese Academy of Sciences (NIGLAS), Research Institute for Environmental Innovation (Suzhou) Tsinghua (RIET), and School of Water Resources and Hydropower Engineering, Wuhan University (SWRHE)

This first *Living Yangtze Report* (hereinafter referred to as the *Report*) was published in September 2020.

The conceptual framework is shown below:

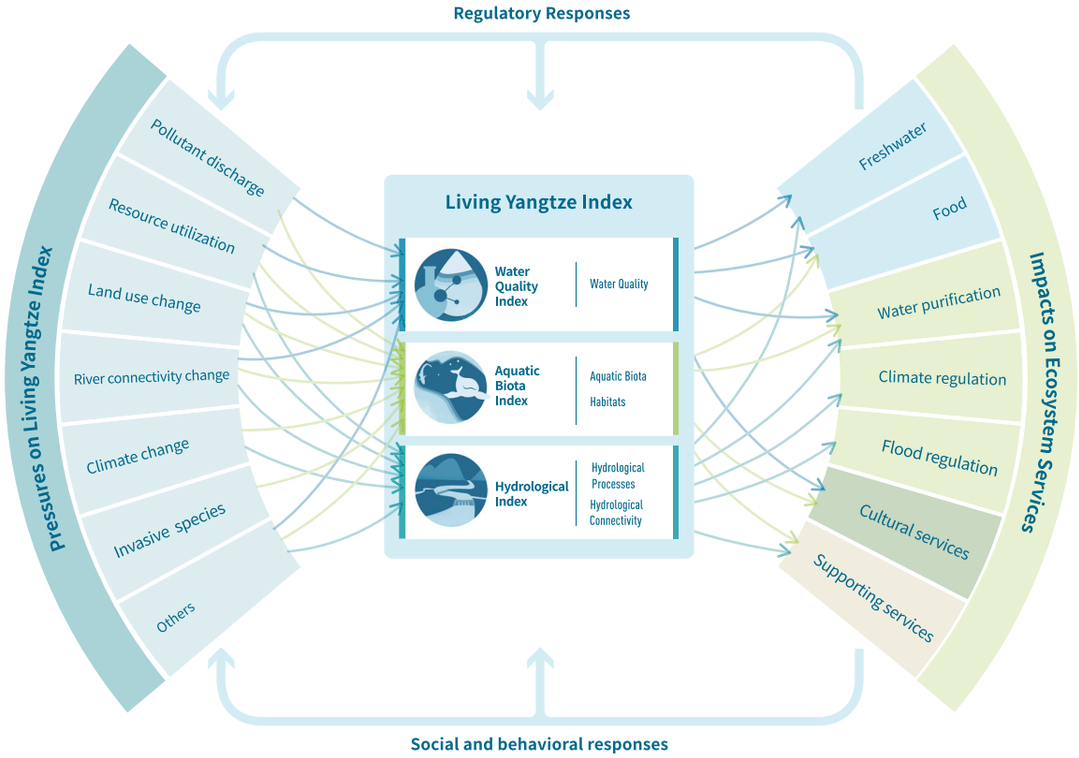
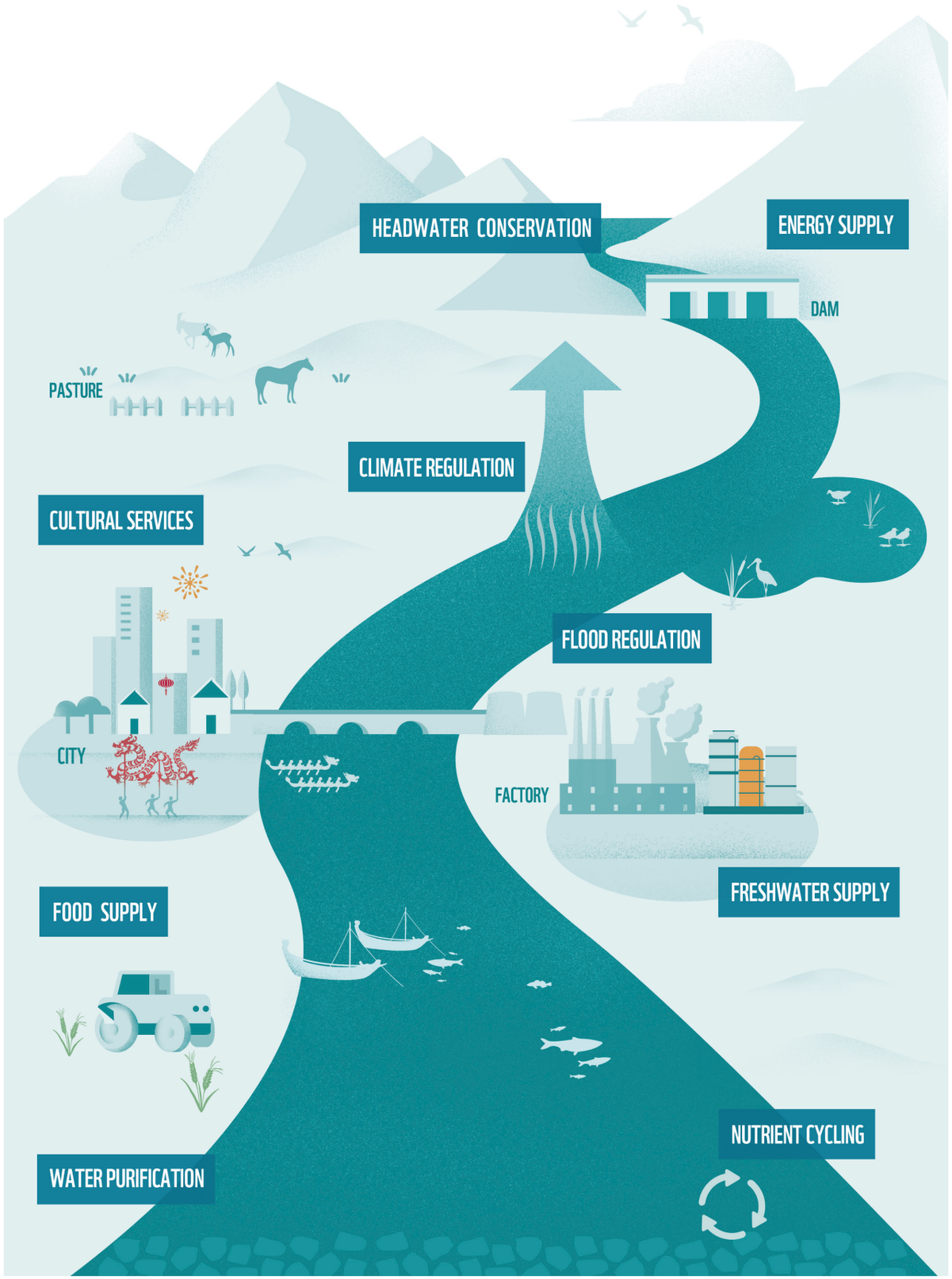


Figure1 Conceptual framework of the *Living Yangtze Report*

Figure 2 Ecosystem services of the Yangtze River Basin



ECOSYSTEM SERVICES OF THE YANGTZE RIVER BASIN

The Yangtze River basin is a huge ecosystem that takes on a lion's share of the task of providing the multiple ecosystem services that support China's social and economic development.

In the *Report*, a range of ecosystem services of the Yangtze River have been evaluated, including headwater conservation, carbon storage and sequestration, soil retention, water purification and habitat quality. The result shows that the ecosystem services of the Yangtze River basin have significant spatial variation and fluctuate over time. Biodiversity- and habitat-related provisioning and supporting services are under great pressure because of the huge demand created by rapid economic and social development. The degradation of natural fishery resources in the Yangtze River freshwater systems is particularly severe.

A stable supply of freshwater resources: the water yield is decreasing upstream and increasing downstream. To fulfill the demand of social and economic development, water supply provided by the basin has increased by 13.4 per cent compared to 1997. In addition, the Yangtze River has also increased water supply to areas outside the basin through a large number of water diversion projects.

Water yield +0.43%
Water supply +13.4%

Protection of the soil on which we live: the total amount of soil erosion in the basin has seen little change. Increases in soil erosion have mainly occurred in the middle and lower reaches.

+0.56%

Carbon sequestration contributing to climate change mitigation: carbon stock has increased by varying degrees in the upper stretches. It has decreased in the middle and lower stretches, except for the Hanjiang river basin.

+0.08%

Generally improved vegetation index: vegetation coverage and quality in the basin have notably improved. The vegetation index has increased by different levels, with the exception of the Taihu Lake basin.

+12.44%

-0.45%

Generally improved vegetation index: vegetation coverage and quality in the basin have notably improved. The vegetation index has increased by different levels, with the exception of the Taihu Lake basin.

-50.82%

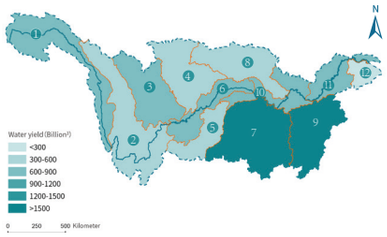
Rapidly declining fishery resources: over the past twenty years, the harvest of natural fish resources in the Yangtze River has fallen by 50.82 per cent, especially in the trunk of the Yangtze River, where the decrease is 63.51 per cent. Figures for the decline in the Poyang Lake and the Dongting Lake fishing resources are 50.46 per cent and 46.70 per cent respectively.

Phosphorous output +2.42%
Phosphorous retention -0.8%

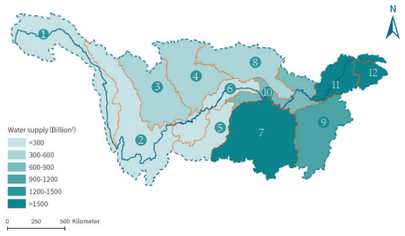
Inadequate nutrient retention capacity and increased pollution delivery: the output of nitrogen and phosphorous in the Yangtze River basin has risen, while the total nutrient retention has slightly dropped. Increased output comes mainly from the Dongting Lake and Poyang Lake basins. The Taihu Lake basin has seen the greatest decline in nitrogen and phosphorous retention capacity.

Figure 3 Changes of some ecosystem services of the Yangtze River basin from 1995 to 2017

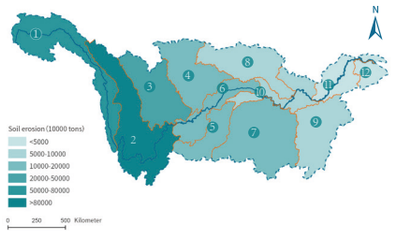
Water yield in different sub-basins of the Yangtze River basin



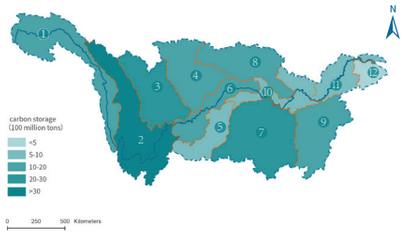
Water supply in different sub-basins of the Yangtze River basin



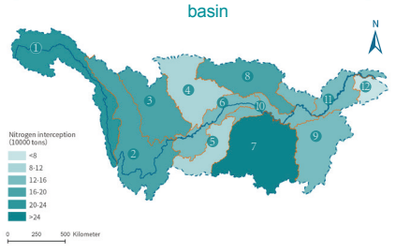
Soil erosion in different sub-basins of the Yangtze River basin



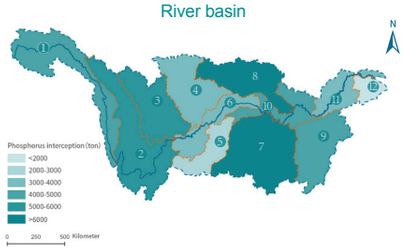
carbon storage in different sub-basins of the Yangtze River basin



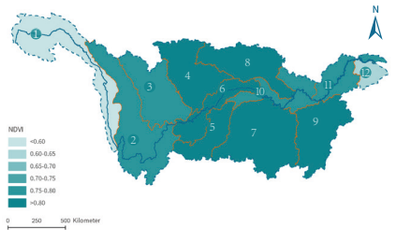
Nitrogen retention in different sub-basins of the Yangtze River basin



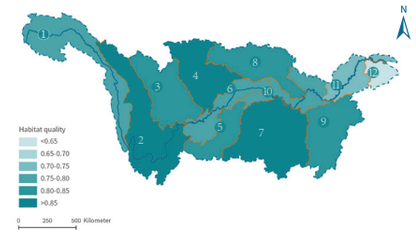
Phosphorus retention in different sub-basins of the Yangtze River basin



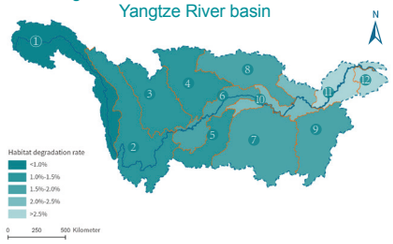
NDVI in different sub-basins of the Yangtze River basin



Habitat quality index in different sub-basins of the Yangtze River basin



Habitat degradation rate in different sub-basins of the Yangtze River basin



Legend

- Yangtze River
- Basin boundary
- WRZ-L2 boundary

Water Resource Zones at level-2（WRZ-L2）

1. Upper Jinsha River basin (upstream of Shigu station)
2. Middle and lower Jinsha River basin (from Shigu station to Yibin station)
3. Minjiang/Tuojiang River basins
4. Jialing River basin
5. Wujiang River basin
6. Upper Yangtze mainstem section from Yibin station to Yichang station
7. Dongting Lake basin
8. Hanjiang River basin
9. Poyang Lake basin
10. Middle Yangtze mainstem section from Yichang station to Hukou station
11. Lower Yangtze mainstem section downstream of Hukou station
12. Taihu Lake basin

Figure 4 Ecosystem services in different sub-basins of the Yangtze River basin in 2017

LIVING YANGTZE INDEX (LYI)

The key factors determining the health of a freshwater ecosystem include water quality, water quantity, connectivity among water systems, aquatic biodiversity, and the condition of the habitats[2,3]

Everything is borne of water. Human settlements follow water. Freshwater ecosystems account for just 4 per cent of the various natural ecosystems in the total Yangtze River basin area, yet they are important sources of food, home to significant biodiversity in the basin, key contributors in climate regulation and flood control, core link to maintain the natural material circulation of the river basin, and symbolic of the culture of the Chinese people. Yangtze River freshwater ecosystems are a bellwether for the health of other natural ecosystems in the basin.

The Living Yangtze Index (LYI), the core of the *Report*, uses three dimensions—— hydrology, water quality, and aquatic biota (living organisms) to assess the overall health status of the Yangtze freshwater ecosystem. The indicators selected meet the principles of being indicative, representative, traceable, measurable and relatively complete over time.

Hydrological regimes (water flows) are important features of freshwater ecosystems and any shifts in these may affect water quality, habitat, and the life cycles of aquatic organisms[2]. Water quality of the ecosystem determines if clean water resources can be ensured to support life, while the trophic status (productivity of an ecosystem) in turn directly impacts the biological composition and communities of aquatic ecosystems[4]. Aquatic biota play an important role in maintaining the structure and function of aquatic ecosystems, and show different responses to environmental and habitat variations[5,6,7,8].

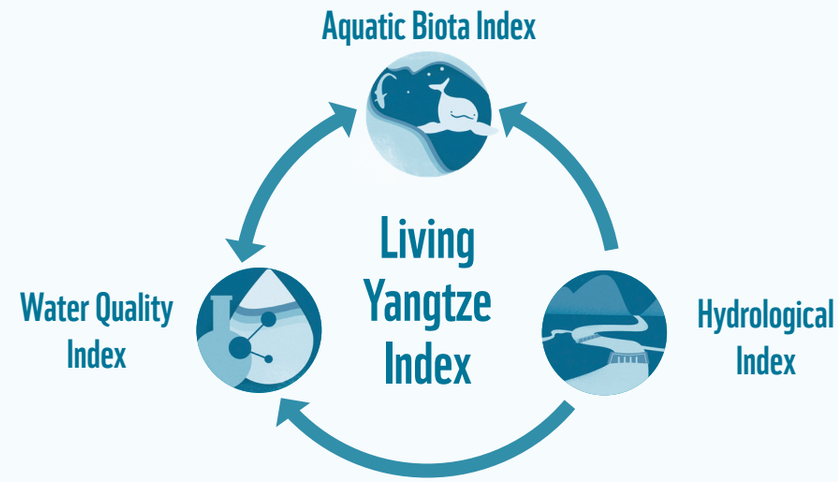


Figure 5 Living Yangtze Index

It should be noted that most of the data in the Report comes from journals, published papers and the research results of the participating organizations. Considering data integrity and availability, the *Report* primarily uses data from 2014 to 2018 for status assessment. The assessment units are the Source of the Yangtze (above the Zhimenda station), the Upper Yangtze (the Jinsha River basin, the Minjiang/ Tuojiang Rivers basin, the Jialing River basin, the Wujiang River basin and the mainstem basin from Yibin station to Yichang station), the Middle Yangtze (the Hanjiang River basin and the mainstem basin from Yichang station to Hukou station, excluding the Dongting Lake and Poyang Lake basins), the Lower Yangtze (the mainstem basin below Hukou station), the Dongting Lake basin, the Poyang Lake basin, the Chaohu Lake basin and the Taihu Lake basin. The assessment of aquatic biota index targets only the mainstem of the Yangtze River and the four lakes.

Figure6 Evaluation scope of the Living Yangtze Index

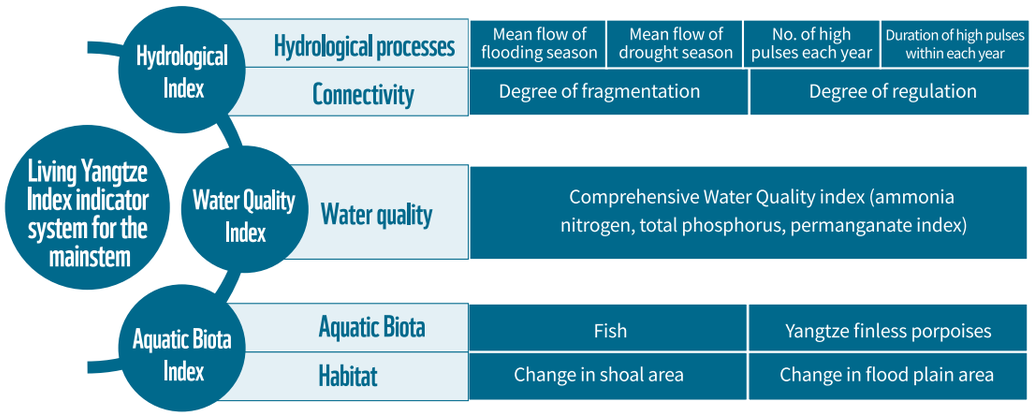


Figure 7 Indicators used for calculating the mainstem LYI
(note: habitat is not included in the index calculation)

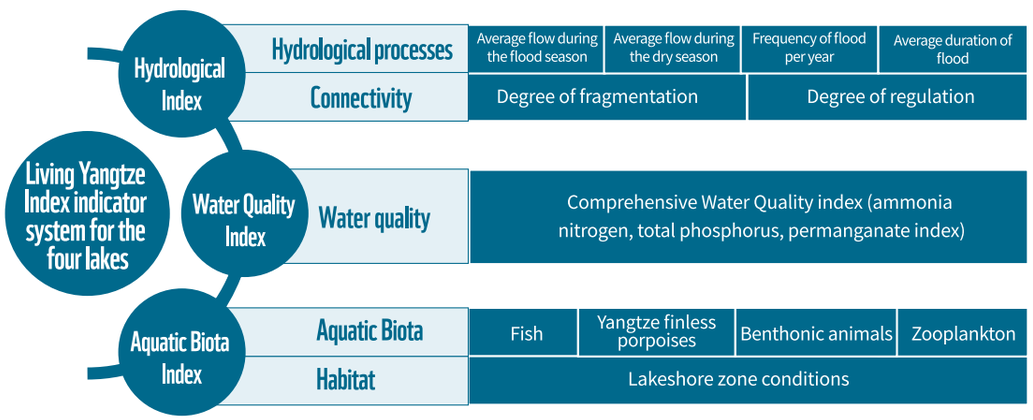


Figure 8 Indicators used for calculating the LYI of four lakes
(note: 1. Habitat was not included in the index calculation. 2. Hydrological indicators of Taihu Lake and Chaohu Lake, which are disconnected from the Yangtze, were not assessed)

The evaluation results of the aquatic biota index of the mainstem Yangtze and four lakes showed that, among the indicators receiving low scores are fish catches and finless porpoise population in the middle and lower reaches and threatened fish species and abundance of fish larvae in the middle reaches. The overall health of aquatic biota in Dongting Lake and Poyang Lake deteriorated less than that of Taihu Lake and Chaoyang Lake. The number of finless porpoises in Poyang Lake increased slightly compared to the number before the 1980s. The status of phytoplankton in Taihu Lake and Chaohu Lake and that of macroinvertebrates in Chaohu Lake were both graded as D or worse.

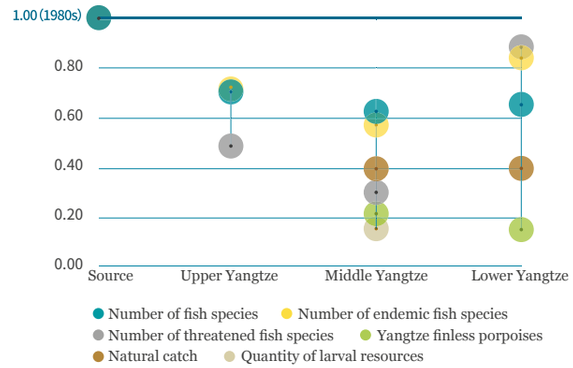


Figure 9 Aquatic biota index assessment results of the mainstem Yangtze River

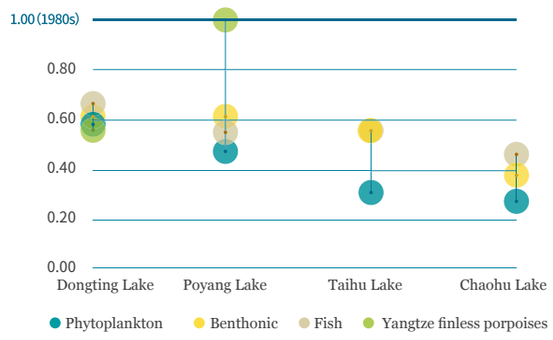


Figure 10 Aquatic biota index assessment results of the four lakes in the Yangtze River basin

The *Report* also conducted evaluations on the hydrological index and water quality index for the main tributaries of the Yangtze River. The result showed that, the indicators of the hydrological process and the connectivity of the Hanjiang River were relatively poor. Among the main tributaries and the four lakes, the water quality indexes of the four lakes are relatively low. In 2018, the water quality of the four lakes was generally from class IV to V, with the main pollutant being total phosphorus.

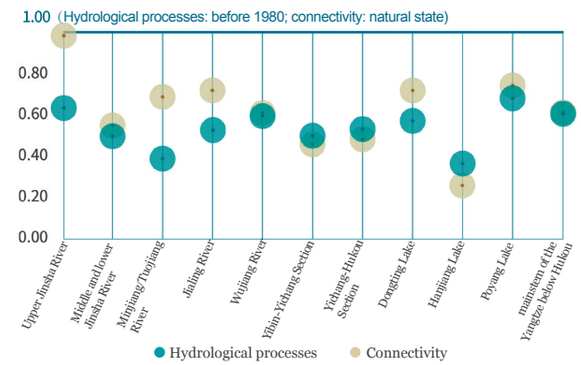


Figure 11 Hydrological index assessment results for the mainstem and tributaries of the Yangtze and lakes connected to the Yangtze River

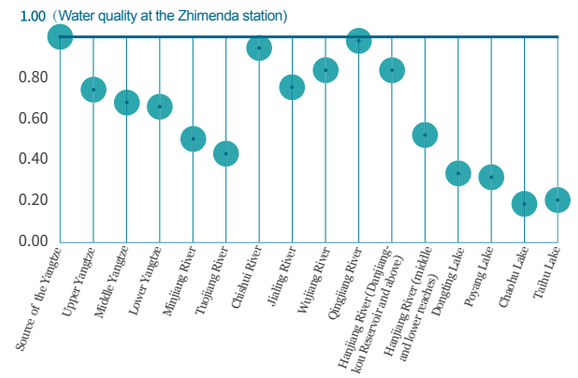
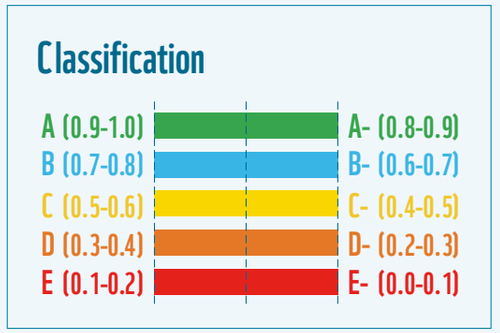


Figure 12 Water quality index assessment results for the mainstem and tributaries of the Yangtze River and the four lakes in the Yangtze River basin

RESULTS OF LIVING YANGTZE INDEX ASSESSMENT

The LYI evaluation grade of the mainstem Yangtze was B-(A being the highest quality). The source region was A, the upper and lower reaches were B-, and the middle reach was C. The evaluation grades of both Dongting Lake and Poyang Lake were C, while the Taihu Lake was D and Chaohu Lake was D- (E being the lowest quality).



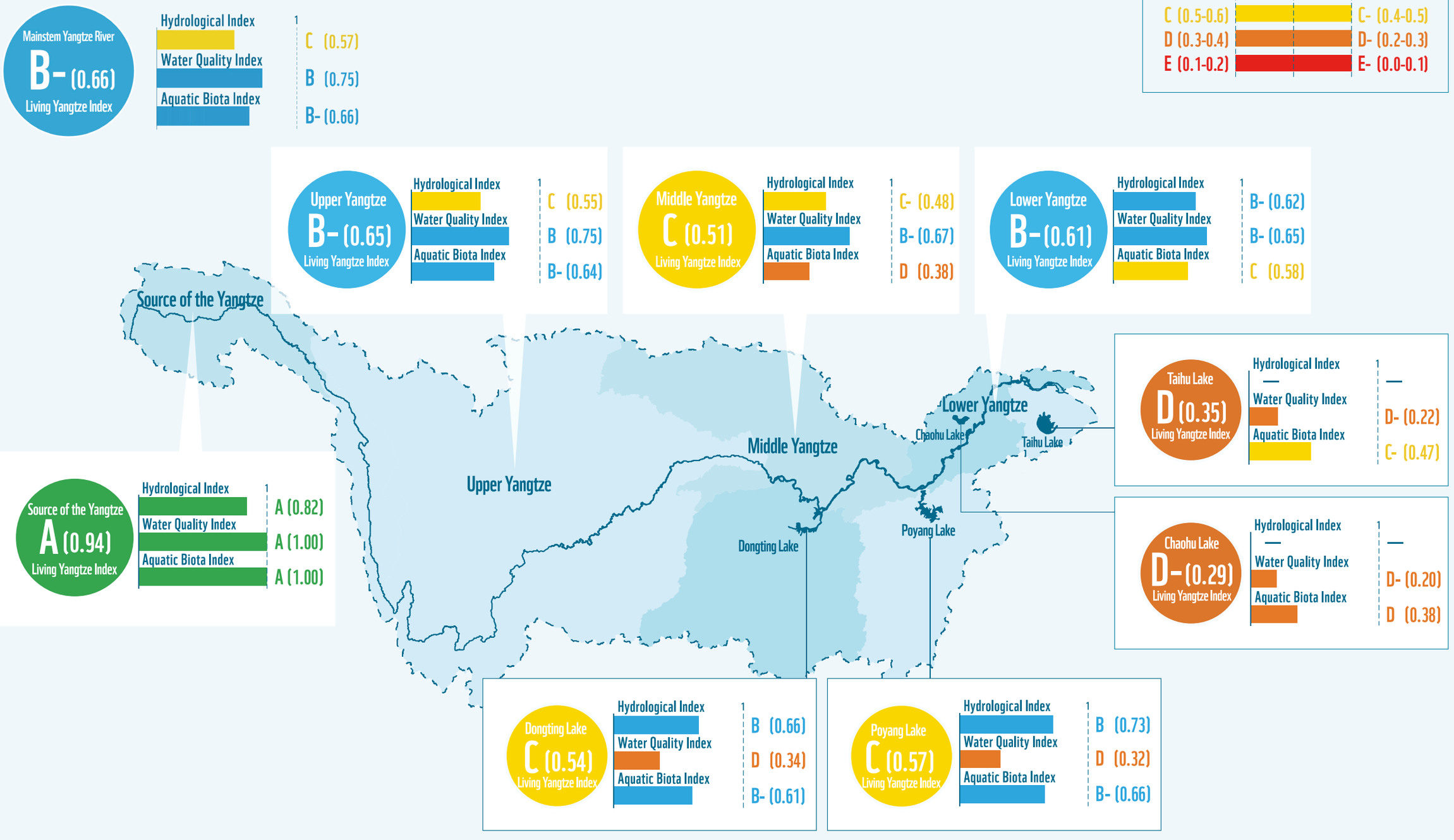
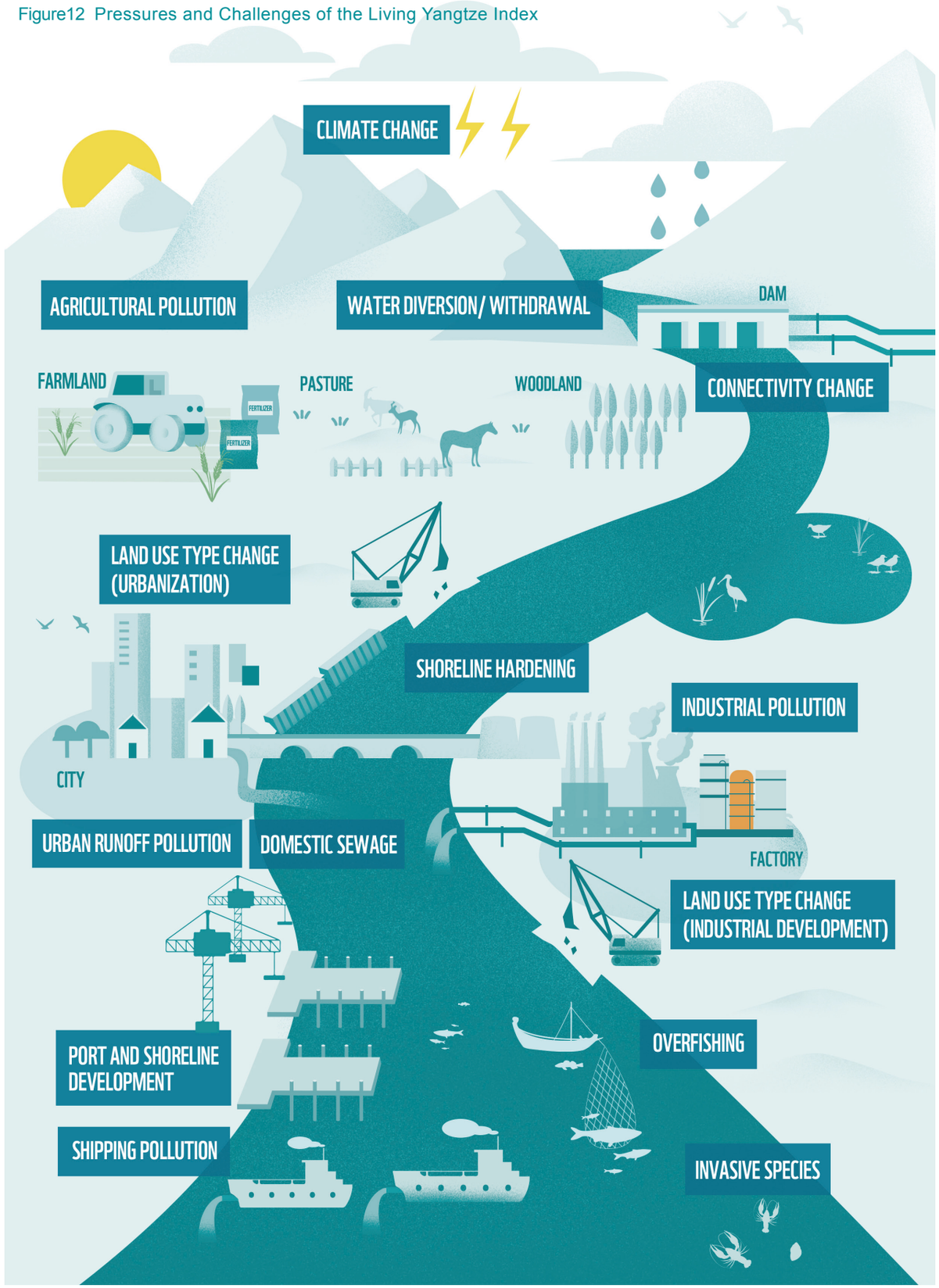


Figure12 Pressures and Challenges of the Living Yangtze Index



PRESSURES AND CHALLENGES OF THE LIVING YANGTZE INDEX

The evaluation results of the LYI reflect the changes in the health status of the freshwater ecosystems of the Yangtze River. In past decades, these ecosystems have provided tremendous benefits to China's rapid economic and social development, at the cost of losing their own productivity. Based on the available data, the key threats to the Yangtze basin have been classified as climate change, land use change and shoreline development, changes in river (lake) connectivity, reservoir regulation, pollution, resource over-utilization and invasive species. The *Report* provides a qualitative analysis of the impacts and spatial differences of the key pressures to the Yangtze, Table 1 shows the main stress types and their significance.

	Changes in river connectivity and reservoir dispatching	Changes in land use types	Resource utilization	Pollution discharge	Climate change
Upper Yangtze	●	●	●	●	●
Middle Yangtze	●	●	●	●	●
Lower Yangtze	●	●	●	●	●
Dongting Lake (aquatic biota index only)	●	●	●	●	●
Poyang Lake (aquatic biota index only)	●	●	●	●	●
Taihu Lake (aquatic biota index only)	●	●	●	●	●
Chaohu Lake (aquatic biota index only)	●	●	●	●	●

Rating

● High significance ● Moderate significance ● Low significance

Table 1 Analysis results of the significance of the pressures on the Living Yangtze Index in Upper, Middle and Lower Yangtze, and the Four Lakes

(Note: The *Report* uses correlation analysis and literature analysis to analyze the differences among the main pressures on the Living Yangtze Index in each evaluated area, but cannot provide an accurate quantitative reflection of the overall cumulative impact of these factors as the results are not fully comparative across the evaluated areas.)

Source of the Yangtze

As there is little direct human disturbance, climate change becomes the greatest challenge. Rising temperatures in the source region have resulted in glacial retreat and permafrost degradation. Alpine meadows, as one of the main terrestrial vegetation types in the source region, face serious ecological stress. The exact effects of climate change on the life cycle of aquatic organisms in the Yangtze source region are not yet fully understood.

Upper Yangtze

Fishery resources and fish diversity of the upper reaches are directly threatened by overfishing and illegal fishing, which is the most significant challenge to the ecosystems. In addition, development of upstream cascade hydropower stations has blocked the passage of migratory fish and land development has changed habitats, which is also a major challenge to aquatic biota. Climate change is the biggest influence on hydrological indicators, with reservoir regulation and change of land use following. The most severe pressure on water quality is non-point source pollution.

Middle Yangtze

Resource over-utilization, particularly fishing, and changes in river connectivity have had the most significant impacts on aquatic biota index, while land development is also increasingly causing problems for habitats. The pressures on water quality mainly come from pollution discharge (industrial, agricultural, and domestic sewage) and total water consumption. However, recent improvements to pollution treatment capacity have partly alleviated the pressure brought by industrial and domestic wastewater discharge. Reservoir regulation and climate change have significant impacts on the hydrological index. Global warming is found to be correlated to fluctuations in average flow of the river sections of the middle reaches during the flood season and dry season, while there is a significant correlation between reservoir regulation and the number of high pulses each year as well as mean flow during the flood season at Hankou station and Yichang station.

Lower Yangtze

Overfishing has the most significant impact on the aquatic biota index in the mainstem Lower Yangtze. Accidental capture has been a long-term issue for finless porpoises, additional pressures from food shortages that result from over-fishing have also caused a sharp fall in numbers recently. Land use change from urbanization in the Yangtze River Delta is also causing a loss of aquatic habitats and reduction in living space in the Lower Yangtze. Chemical industries and agricultural development discharging waste along the Yangtze River increase the risks of chemical contamination, threatening the natural habitats of the basin. Climate change is the biggest single factor affecting the hydrological index, particularly ENSO (El Niño-Southern Oscillation) events. Climate change is also expected to lead to runoff changes and sea level rise in the Yangtze River estuary area[9]. A large number of water diversion projects along the mainstem Lower Yangtze divert and withdraw large amounts of water each year, exacerbating pressures in dry years. With a high volume of water flow and decent hydrodynamic conditions, the lower reaches of the mainstem Yangtze River have relatively good self-purification capacity and results in the water quality index graded as B-. However, pollution stemming from a large population and intensive industry still put severe pressure on water quality. In the recent decade, the GDP of the lower basin increased by 144 per cent, while the total investment in environmental pollution control increased by only 17 per cent.

Four Lakes

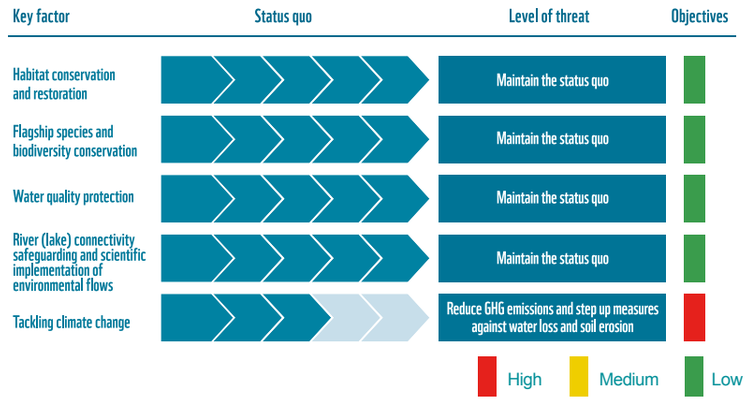
For Dongting Lake and Poyang Lake, overfishing has the most significant impact on the aquatic biota index. Excessive sand dredging and land reclamation have all severely undermined the natural habitat and ecological cycles of the two lakes. Climate change and reservoir regulation (including the reservoirs in Dongting Lake and Poyang Lake basins, the water level of the mainstem of the Yangtze River, and the regulation of the Three Gorges Reservoir) have impacted hydrological processes. Pollution and water resource over-utilization are important factors influencing water quality in the two lake basins. Pollution is the most significant problem in Chaohu Lake and Taihu Lake, followed by resource over- utilization and habitat degradation.

RESEARCH TO FACILITATE A LIVING YANGTZE RIVER

Preserving biodiversity in the Yangtze River, restoring ecosystems to a healthy state and achieving proper management and sustainable use of resources are vital to the economic and social development of China. The Living Yangtze Index provides a critical tool to support effective management by providing a comprehensive set of data to help us track changes over time, gain a better understanding of the status of, and progress on, biodiversity conservation, ecosystem restoration and the sustainability of the resources of the Yangtze River. This will enable us to find the roots of the problems and the right solutions.

There are a number of crucial measures that should be implemented to improve the Living Yangtze Index. These include conserving and restoring habitats, protecting flagship species and biodiversity, water quality protection, safeguarding river (lake) connectivity, implementing environmental flows and tackling climate change.

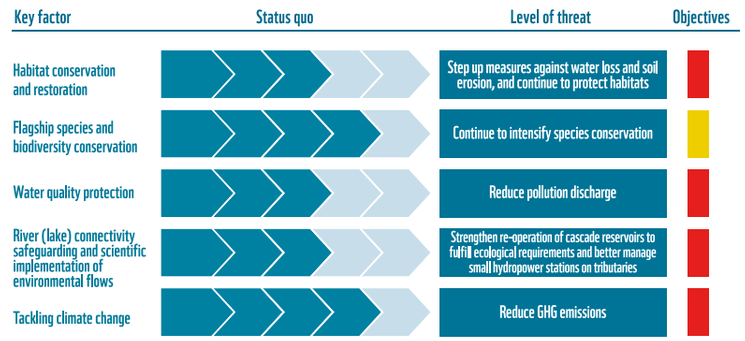
Targeted policy recommendations to protect the Yangtze



Objectives of key factors in the source region of the Yangtze River

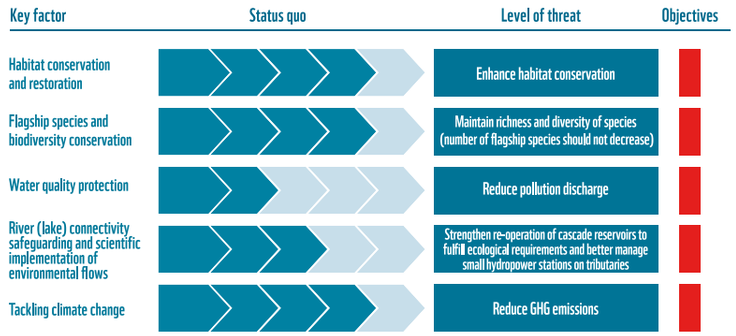
Note: The level of threat is graded as High, Medium and Low. The followings are equally graded.

The LYI results indicate the source region should prioritize water and soil conservation and tackling climate change, put more effort to mitigate soil erosion, enhance the protection of natural reserves and continue to protect rare and endemic fish species.



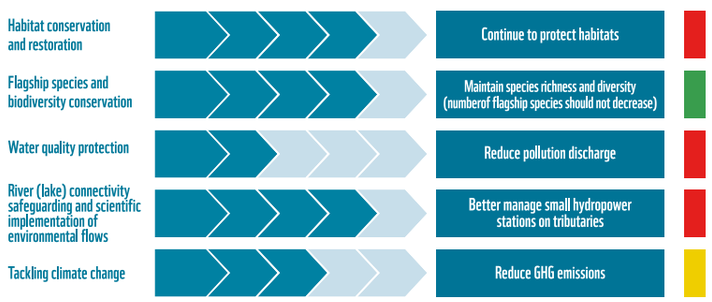
Objectives of key factors in the upstream of the Upper Yangtze

Regarding the upstream region, the LYI suggests that the hydrological rhythm and connectivity of the rivers should be maintained by re-operating the reservoirs to better fulfill ecological needs, and strictly managing the development of hydropower projects. LYI results also indicate pollution control should be improved, especially for the non-point source pollution from agriculture. Constructing standardized intensive livestock farms and enhancing the recycling and treatment of domestic sewage are recommended, as are soil erosion control and improving the management of phosphorite mining.



Objectives of key factors in the Middle Yangtze

According to multiple recommendations from the LYI results, the management of livestock and poultry breeding industries in Hunan and Hubei Province should be strengthened and green development of fisheries should be promoted. The natural shorelines and wetlands of the mainstem Yangtze should be restored and protected, and Poyang Lake and Dongting Lake should remain connected with the Yangtze River, while sand mining should be limited. Safe construction and land use management in the flood storage and retention areas should be strengthened, and flood management in the urban areas should be improved. In the Dongting Lake and Poyang Lake, more focus should be given on biodiversity conservation, habitat preservation and management and oversight of the nature reserves, to facilitate the restoration of the ecosystems.



Objectives of key measures in the lower reaches of the Lower Yangtze

The LYI results recommend that the lower reaches, with a focus on Anhui and Jiangsu Provinces, should improve sewage management, specifically the construction of urban sewage collection and treatment facilities, the renovation and repair of old sewage networks and building more capacity, and supervision and inspection of industrial discharge should be improved. Land-use change affecting the shoreline of rivers and lakes and reclamation of lakes should be restricted, buffer zones for lakes and rivers should be developed, and great efforts need to be made to protect and restore the wetland ecosystems along the rivers and the lakes. Endemic species such as finless porpoise and rare fish and their habitats should be protected. The control of discharge of pollutants into Taihu Lake and Chaohu Lake should be tightened. Additional efforts should also be made on cyanobacterial bloom control and the rational regulation of water volume of Taihu Lake.

Establishing a set of institutions and mechanisms

Implementing policies and improving regulations. The *Report* recommends that local governments should take on the responsibilities for protecting the Yangtze ecosystems and strengthen organizational leadership, implement necessary water quality protection activities, habitat conservation and water resources management measures, while actively responding to the promulgation and implementation of the *Yangtze River Protection Law of the People's Republic of China*.

Sharing data and improving scientific research input. The integrated monitoring system of the Yangtze with regards to ecological protection and restoration should be improved, particularly the interdepartmental data sharing mechanism. The development of an open database system and information sharing platform needs to be explored. Local governments also have a role in providing more support for basic research on the aquatic ecology of the Yangtze River basin. A systematic integration of technology and management innovation would be of great benefit to manage regional sources of pollution, habitat protection, hydrological connectivity, the restoration of aquatic biological resources, rational deployment of water resources, natural capital evaluation, as well as nature-based solutions. Referring to the results of WWF's systematic protection plan, endangered species should be prioritized for protection.

Preventing risks and enhancing law enforcement. The preparation and training of risk contingency plans should be made and the layout of enterprises and docks along the river should be standardized. Local governments need to enhance safety supervision of the transportation of hazardous chemicals by water, prevent oil spills from ships, and encourage the use of standardized and eco-friendly ships. Local governments are required to enhance the enforcement of environmental protection laws basin-wide.

Raising awareness and encouraging collaboration. Local governments should make full use of social media to promote public awareness, increase the channels for public participation and to step up efforts in promoting Yangtze River protection and restoration. They should also facilitate social collaboration, strengthen the guiding and overseeing responsibility of media, and motivate NGOs to engage in environmental protection.

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Nianji Lake in the source area of Yangtze River ©WWF Baoyu Wei

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