

BLUEPRINT OF COASTAL WETLAND CONSERVATION AND MANAGEMENT IN CHINA

FORWARD

Coastal wetlands are the source of abundant biodiversity and valuable ecological services, which support our human livelihoods and contribute to our long-term prosperity—both economic and social. Coastal wetlands in China are critical, life-supporting habitats that sustain irreplaceable biodiversity, including millions of migratory water birds, along with many unique species of plants and other animals.

However, as the recently completed Blueprint of Coastal Wetland Conservation and Management in China indicated, coastal wetlands in China are the most threatened but least protected wetlands of all ecosystems in China. Since the 1950s, China has lost more than 60% of its natural coastal wetlands to economic development, and the speed and scale of coastal wetland reclamation in the past 15 years is especially stunning. Due to this over-reclamation of coastal wetlands, we have already begun to see adverse socioeconomic and ecological consequences.

The Blueprint project was a joint initiative of the Paulson Institute, the Convention on Wetlands Management Office of P. R. China (CWMO), and the Institute of Geographical Science and Natural Resources Research of Chinese Academy of Sciences. Experts from various institutions mapped the biodiversity and threats to China's coastal wetlands and identified 180 priority conservation sites, including 11 most important, but unprotected habitats for migratory birds. Based on scientific analysis, they have produced a set of policy recommendations for the Chinese government.

Given the importance of coastal wetlands to ecological and economic health, the findings of this project are very concerning. To meet the targets of China's "ecological civilization" efforts, and to support sustainable development, the Chinese government at all levels must protect its natural capital through conservation initiatives, including the protection and restoration of coastal wetland ecosystems.

I believe the United States and China, the world's two largest economies, have complementary interests and shared responsibility to protect the ecological wealth of the planet. I am committed to playing an active role to enhance collaboration between our countries on conservation efforts, including the conservation and restoration of China's coastal wetlands through the China Coastal Wetland Conservation Network that the Paulson Institute co-founded with CWMO and other platforms.

I thank all partner institutions and experts who have contributed to the success of these joint projects. My special thanks go to academician Chen Yiyu and to Mr. Ma Guangren of CWMO for their leadership. I am also grateful to my friend Mr. Niu Gengsheng of Lao Niu Foundation and Mr. Cao Dewang of Heren Philanthropic Foundation for their generous financial support. Finally, I offer my congratulations for the success of these important projects. I look forward to continued work between the Paulson Institute and its partners to make meaningful contributions to conservation and restoration of the coastal wetlands in China.



Henry M. Paulson, Jr.

Chairman,
Paulson Institute

A handwritten signature in black ink that reads "Henry M. Paulson, Jr." in a cursive script.



Chen Yiyu
Academician with CAS

As a key member along the East Asian-Australasian Flyway (EAAF), China shares responsibility for protecting migratory waterbirds and their habitats, together with more than 20 countries along EAAF, including the United States, Russia and Australia. Each year, as many as 50 million waterbirds migrate along the EAAF, about 5 million of which fly over the mainland and coastal areas of China. In recent years, however, the populations of waterbirds along the flyway have declined at an average annual rate of five percent.

The coastal wetlands and waterbirds in China are facing many threats: ongoing loss of natural wetland area, deterioration in wetland quality, and reduced population of endangered migratory waterbirds. According to the findings of the Second National Wetland Resources Inventory released by the State Forestry Administration in 2014, the area of natural wetlands in China had fallen by 8.82 percent compared to that in the First National Wetland Resources Inventory, while the area of coastal wetlands in China’s 11 coastal provinces had declined by 21.91 percent during the same period of time.

To help address these pressing issues, the Convention on Wetlands Management Office of P. R. China, the Paulson Institute, and the Institute of Geographic Sciences and Natural Resources Research of Chinese Academy of Sciences jointly launched the Blueprint of Coastal Wetland Conservation and Management in China in February 2014. The findings of the project were released in October 2015 after more than 20 months of hard work by the project team.

As a co-chair of the Project Steering Committee, I have been involved in and have guided the project implementation throughout the process. The project, with migratory waterbirds as the entry point, has assessed the current status of China’s coastal wetlands and their protection, the changes in coastal wetlands and their drivers, as well as the priority areas and gaps in protecting coastal habitats for waterbirds. The best practices of the United States and China in terms of coastal wetlands and waterbirds conservation have been summarized, and potential strategies and priority actions on China’s coastal wetland conservation have also been proposed. To date, many policy recommendations proposed by the project have already been adopted by Chinese government agencies (e.g., the State Forestry Administration), coastal provinces in China, as well as domestic and foreign NGOs.

On behalf of the entire project research team, I wish to thank Lao Niu Foundation and the Paulson Institute for their financial support. My special thanks also go to other organizations, including the Convention on Wetlands Management Office of P. R. China, relevant ministries and commissions, research institutions, national and international NGOs, and coastal wetland-related protected areas, for their assistance and support!

陈宜瑜



Ma Guangren
Director General,
The Convention on Wetlands
Management Office,
People's Republic of China

As the ecotone between marine and terrestrial ecosystems, coastal wetlands are characterized by special hydrology, flora and fauna, and soils. They play a vital role in maintaining biodiversity, regulating climate, controlling pollution, and preventing and controlling natural disasters. The results of the Second National Wetland Resources Inventory in China show that China is home to 5.7959 million hectares of coastal wetlands, accounting for 10.85 percent of total wetland area in the country. These coastal wetlands not only support biodiversity conservation of global importance along the East Asian-Australasian Flyway (EAAF), but serve as life-supporting systems and ecological safety barrier for some of the most populous and economically developed areas in China.

The Chinese central government attaches great importance to wetland conservation. It has developed and implemented a number of programs related to coastal wetland conservation, such as the China National Wetland Conservation Program (2002-2030), as well as its implementation plans in the 11th and 12th Five-Year Plans. Local governments have also contributed a lot to improving the ecological conditions of China’s coastal wetlands by conducting wetland protection and restoration projects, restoring more than 40,000 hectares of coastal wetlands including mangroves, and protecting rare and endangered waterbirds and their habitats.

However, with population growth and fast economic and social development, the coastal wetlands in China are facing many threats, such as reclamation and encroachment by infrastructural construction, pollution, over-fishing and over-collection, and invasive alien species. The Second National Wetland Resources Inventory reveals that the coastal wetland area in China has declined by 1.3612 million hectares from 2003 to 2013, representing the highest loss rate in various types of wetlands across the country. The coastline in East and South China extends for about 18,000 km. Its natural shorelines have been severely damaged, and only 30% of its total shorelines are left to be natural ones.

To help address these issues, the Convention on Wetlands Management Office of P. R. China (CWMO), the Paulson Institute, and the Institute of Geographic Sciences and Natural Resources Research (IGSNRR) of the Chinese Academy of Sciences jointly implemented the project—Blueprint of Coastal Wetland Conservation and Management in China—during 2014 and 2015. The project’s activities ranged from legislation assessment and program planning to scientific support and international cooperation. Policy recommendations were also proposed. The project outcomes proved to be of great significance in helping China address the risks and challenges facing coastal wetlands, and in developing best practices on coastal wetland conservation and management. I am convinced that with the further implementation of ecological civilization system in China, the research outcomes of the project will be gradually translated into practice to help protect the EAAF, maintain the diversity and integrity of China’s coastal wetlands, enhance their ecosystem services, and contribute to human well-being.

Last but not least, I would like to thank Mr. Henry M. Paulson, Jr., the former U.S. treasury secretary, and Mr. Chen Yiyu, academician with the Chinese Academy of Sciences, for their guidance of the project. Special thanks are due to the Paulson Institute and IGSNRR for their close cooperation, and to all the team members for their hard work.

Ma Guangren

INTRODUCTION OF MEMBER INSTITUTIONS



The Paulson Institute is a non-partisan, non-profit “think and do” tank grounded in the principle that today’s most pressing economic and environmental challenges can be solved only if the United States and China work in complementary ways. Our mission is to strengthen U.S.-China relations and to advance sustainable economic growth and environmental protection in both countries. Our programs focus on advancing the transition to more sustainable, low-carbon economic models in China and the United States through industrial transformation, sustainable urbanization programs, and environmental conservation. We also promote bilateral cross-border investment that will help create jobs and strengthen U.S.-China relations. Our Think Tank publishes prescriptive and analytical papers from leading scholars and practitioners on the most important macroeconomic and structural reform issues facing China today. Founded in 2011 by Henry M. Paulson, Jr., the 74th Secretary of the Treasury and former Chief Executive Officer of Goldman Sachs, the Institute is based in Chicago and has offices in Washington, San Francisco, and Beijing. Learn more at www.paulsoninstitute.org



The Convention on Wetlands Management Office, People's Republic of China, founded in August 2005, is mainly responsible for implementing the Convention on Wetlands of International importance especially waterfowl habitat. Its major roles include: organizing the drafting of laws and regulations on wetland conservation; studying how to propose technical standards and specifications on wetland conservation; proposing national and regional wetland conservation programs and organizing the implementation of these programs; organizing the implementation of national wetland resources inventories, dynamic monitoring and statistics; organizing the protection and management of small wetland areas and wetland parks, etc.; representing the People's Republic of China to implement the Ramsar Convention; and implementing international cooperation related to wetland conservation.



Institute of Geographic Sciences and Natural Resources Research (IGSNRR), Chinese Academy of Sciences (CAS) was established in September 1999 through the merger of the former Institute of Geography, CAS (whose predecessor was the Chinese Institute of Geography founded in 1940), and the Commission for Integrated Survey of Natural Resources, CAS, founded in 1956. Focusing on the key scientific and technological issues in resources and environmental areas that are closely associated with China’s national development but constrain its long-term growth, IGSNRR aims to build itself into a leading, multidisciplinary research institution in such core areas as terrestrial surface process, regional sustainable development, resources and environmental safety, ecosystem and GIS; as well as a key think tank and talent pool that can contribute to the national and regional development, resource use, environmental control and ecological civilization development.



Lao Niu Foundation is a private foundation established in late 2004 by Mr. Niu Gensheng and his family, by donating all of the family-held shares and most of the dividends in the Mengniu Dairy Group, which was founded by Mr. Niu. The Foundation focuses on environmental protection, culture and education, and the advocacy for, and development of the philanthropic sector. By the end of 2015, the Foundation has worked with 142 agencies, organizations and individual partners both at home and abroad to implement 171 philanthropic projects in various areas. These projects cover 29 provinces/municipalities/autonomous regions across China, the United States, Canada, France, Nepal and Africa, etc, with a funding of more than RMB 980 million. Lao Niu Foundation ranked the top in “Donation of China’s Private Foundations 2014”, and the first in the “China Foundation Transparency Index 2015”.



Rudong Mudflat, Jiangsu

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OVERVIEW OF THE PROJECT

With financial support from Lao Niu Foundation, the Paulson Institute has cooperated with the Convention on Wetlands Management Office of the People's Republic of China and the Institute of Geographic Sciences and Natural Resources Research of the Chinese Academy of Sciences to develop a national blueprint and strategies for the conservation and management of threatened coastal wetlands in China.

► Tianjin coastal wetlands are the main wintering habitat for Relict Gull.



The Blueprint of Coastal Wetland Conservation and Management in China (the project), funded by Lao Niu Foundation, was organized by the Paulson Institute and the Convention on Wetlands Management Office of the People’s Republic of China (CWMO), and jointly implemented by the Institute of Geographic Sciences and Natural Resources Research (IGSNRR) of Chinese Academy of Sciences (CAS), Beijing Forestry University, Beijing Normal University, Capital Normal University, and Yantai Institute of Coastal Zone Research (YIC) of CAS, among others. On February 26, 2014, the Paulson Institute, CWMO and IGSNRR signed a tri-partite partnership agreement in Beijing, and formally launched the project, which was completed in October 2015.

Major Objectives

To promote the coastal wetland conservation and management in China at both policy and practical levels; to provide scientific support for ecological security and sustainable development in China’s eastern coastal areas; and to make positive contributions to China’s eco-civilization construction and to global biodiversity conservation.

Research Tasks

- Assessing the current status of and main threats to coastal wetland conservation in China;
- Planning and mapping coastal wetland biodiversity in China;
- Analyzing and identifying key habitats for migratory water birds along the East Asian-Australasian Flyway (EAAF) in eastern China coastal areas;
- Conducting vulnerability analysis of coastal wetlands in China to climate change impact, and roles played by coastal wetlands in adapting to climate change;
- Analyzing and summarizing Chinese and overseas models, best practices, and case studies on coastal wetland protection and management;
- Putting forward a strategy, policy framework and action plan for coastal wetland conservation in China.

Members of the Steering Committee



Prof. Chen Yiyu
Academician with CAS
Co-chair of the Steering Committee



Henry M. Paulson, Jr.
Chairman, Paulson Institute
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OVERVIEW OF THE PROJECT OUTCOMES

With 20 months of hard work, the project team assessed the current status of and main threats to coastal wetland conservation in China; analyzed and summarized the main models of coastal wetland conservation in China and the United States; conducted gap analysis of the conservation status of key habitats and identified priority conservation sites for migratory waterbirds; as well as recommended policy framework and action plan for China's coastal wetland conservation strategy.

► Spartina is expanding very fast in Rudong coastal wetland, covering big area of mudflat.

Types and distribution of coastal wetlands in China

Coastal wetlands are the ecotones between terrestrial and marine ecosystems. As defined by the Convention, wetlands include a wide variety of habitats such as marshes, peat lands, floodplains, rivers and lakes, and coastal areas such as saltmarshes, mangroves, and sea grass beds, but also coral reefs and other marine areas no deeper than six meters at low tide, as well as human-made wetlands such as waste-water treatment ponds and reservoirs.

According to the classification system used by China National Wetland Resources Inventory, the coastal wetlands in China include 12 types, i.e., shallow sea area, subtidal aquatic layer, coral reef, lithological seashore, intertidal sand beach, intertidal silty beach, intertidal salt marsh, mangrove swamp, coastal saline lake, coastal freshwater lake, estuarine water area, and delta. The variety of coastal wetland ecosystems makes them a home to rich biodiversity.

Coastal wetlands in China can be generally divided into two groups by Hangzhou Bay. To the north of Hangzhou Bay, the Yellow Sea-Bohai Bay coastal wetlands, Yangtze River estuary wetlands, and Jiangsu coast wetlands have sandy or silty beaches, while some areas in Liaodong Peninsula and Shandong Peninsula have rocky beaches. To the south of Hangzhou Bay, the coastal areas are mainly characterized with rocky beaches, and include Qiantang River-Hangzhou Bay, Jinjiang River estuary-Quanzhou Bay, Wenzhou Bay, the Pearl River Delta and the North (Beibu) Gulf.



Current status and change of coastal wetlands in China

China’s continental coastlines extend for **18000 km**. The coastal areas are home to about **40 percent** of China’s population and more than **50 percent** of its large cities, accounting for about **60 percent** of the whole country’s GDP.

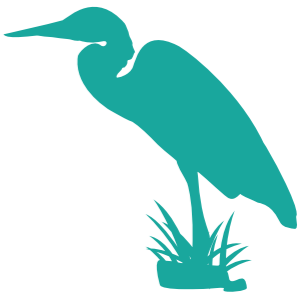
As indicated by the results of the Second National Wetland Resources Inventory, which was released by China’s State Forestry Administration (SFA) in January 2014, the coastal wetlands in China cover an area of **5.7959 million** hectares, accounting for **10.85 percent** of the total wetland area in China. These coastal wetlands are mainly distributed in China’s coastal provinces, including Hong Kong, Macao, and Taiwan.

Ranging from the Yalu River estuary to Hainan Island, there are **40** national coastal wetland nature reserves, **16** Ramsar sites and many wetlands of national importance. Coastal wetlands under protection amount to **1.3904 million** hectares, accounting for **23.99 percent** of the total area of coastal wetlands in China.

However, the monitoring results of SFA, CAS and other institutions show that **53 percent** of temperate coastal wetlands, **73 percent** of mangroves, and **80 percent** of coral reefs have been lost in China over the last half century.



China’s coastal wetlands are home to 16 Ramsar sites and 63 Important Bird Areas, which account for 7.28 and 34.1 percent of the total coastal wetland area in China, respectively.



Ecosystem services of coastal wetlands in China

Ecosystems are life-supporting systems for the survival and development of human beings. Ecosystem services are the benefits people obtain from ecosystems, including provisioning, regulating, cultural and supporting services.

The coastal wetlands in China are mainly distributed in eastern coastal areas with the most dense population and most developed economy, providing ecological barriers for nearly 500 million people and key habitats for a vast array of wild plants and animals. They offer many important ecosystem services.



◀ Clamming in Dandong mudflat, Liaoning, is considered an important source of income for local people



▶ Mangroves in Futian National Nature Reserve, Shenzhen, Guangdong provide a key ecological barrier for Shenzhen to withstand and mitigate typhoon

Provisioning services: In 2011, the yield of aquatic products in China's coastal zones reached 28 million tons (including natural catch and aquaculture), accounting for nearly 20 percent of the global yield.

Regulating services: Coastal wetlands can provide many regulating services such as intercepting and absorbing nutrients, purifying water body, controlling soil erosion and protecting coastline. Coastal wetlands including mangroves can also help withstand and mitigate threats from natural disasters such as typhoon and storm surge, and reduce the negative impacts of global climate change and sea level rise.

Supporting services: Services needed for ecosystems to maintain other services such as provisioning, regulating and cultural services. The coastal wetlands in China maintain biodiversity such as plants, water birds, mollusks, and fish, and provide habitats for over 240 species of migratory water birds (up to several million birds) along the East Asian-Australasian Flyway (EAAF).



◀ Red Beach in Panjin provides an ideal place for people to relax and watch birds.

Cultural services: These are non-physical services that people obtain from the coastal wetlands in order to enrich their spiritual life, expand their horizons, entertain and appreciate the natural beauty. They include sight-seeing, recreation, bird-watching, etc.



▶ Spotted seals take a rest in Panjin Spotted Seal Nature Reserve, Liaoning

Threats facing coastal wetlands in China

The major threats facing coastal wetlands in China are habitat loss due to land reclamation from sea and infrastructural development, invasion of alien species, over-fishing (including aquaculture) and environmental pollution. In terms of the area impacted and the frequency, land reclamation from sea and infrastructural development pose the most serious threats to coastal wetlands in China.



Habitat loss. Land reclamation and infrastructural development are the two key factors leading to the sharp reduction in the area of coastal wetlands in China. Results of the two national wetland resources inventories indicate that over the last decade, the area of coastal wetlands under threat from land reclamation and infrastructural development have increased by ten fold, from 127,600 hectares to 1.2928 million hectares.

◀ A high power pumping station is used in a large-scale project of reclaiming mudflat in Dongtai, Jiangsu Province



Invasion of alien species. *Spartina alterniflora*, which was listed in 2003 as one of the first group of alien invasive species in China, is a major alien invasive species in coastal wetlands. Due to its characteristics of salt resistance, submergence tolerance, strong stress resistance, strong reproductive capacity and fast expansion, *Spartina alterniflora* has been expanded to many mudflats to the south of Bohai Bay, resulting in severe degradation of coastal wetlands.

◀ Many wetlands in Luannan, Hebei have been invaded by *Spartina alterniflora*



Over-fishing and over-aquaculture. According to the statistics of FAO, China is the largest country in terms of fishing, ranking the first in the world for 17 consecutive years. The offshore catch has increased from 4.30 million tons in 1986 to 11.53 million tons in 1996, with an average annual increase rate of 10.4 percent. The catch has tended to stabilize after 1996, but over-fishing for nearly 20 years has resulted in severe degradation of offshore fishery resources.

◀ Over-aquaculture also poses a major threat to coastal wetlands as an important source of pollution



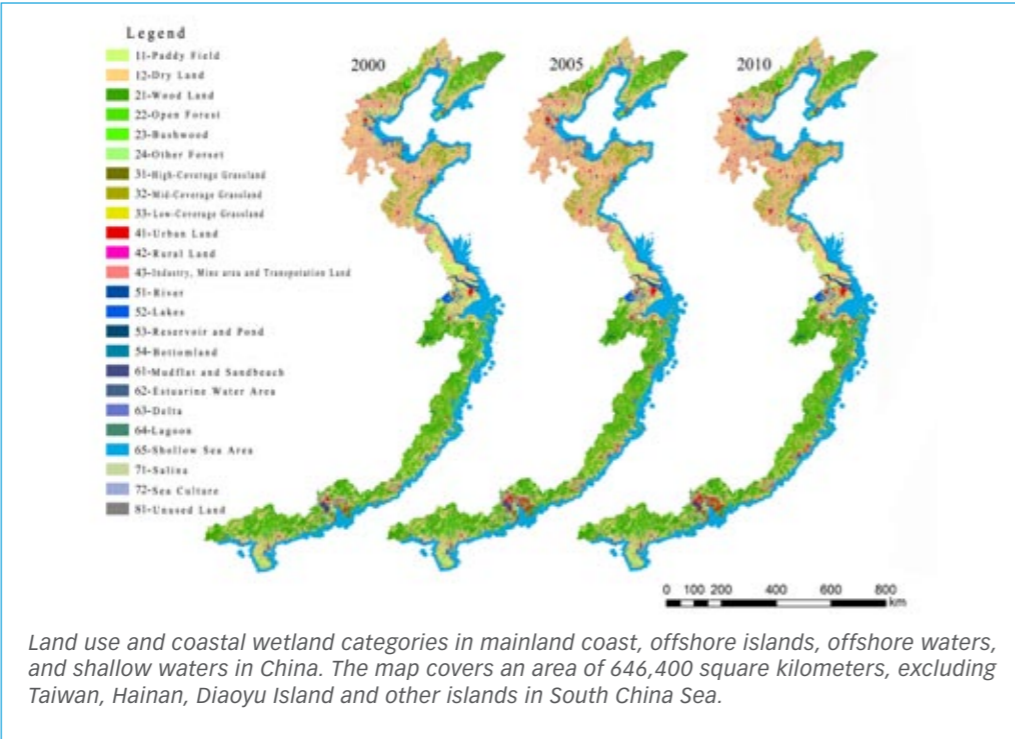
Environmental pollution. The Bulletin of Marine Environmental Quality of China in 2014 indicated that the seawater in coastal areas in China was seriously polluted. The sea areas whose water quality was categorized as Class IV (poor) mainly occurred in the north of Yellow Sea, Liaodong Bay, Bohai Bay, Laizhou Bay, Yancheng in Jiangsu, Yangtze River estuary, Hangzhou Bay, and some coastal areas in Pearl River. The major pollutants include inorganic nitrogen, active phosphate and petroleum.

◀ Serious water pollution leads to the blooms of *Enteromorpha prolifera* in Qingdao coastal area

Analysis of the spatio-temporal dynamic changes in coastal wetlands in China

Land use change is considered a key driver behind the reduced area and degradation of coastal wetlands in China. Using the prefecture-level cities as mapping and statistical units, the project team assessed the characteristics of spatio-temporal dynamic changes in the coastal wetlands in China from 2000 to 2010.

LAND USE CHANGE IN COASTAL AREAS DURING 2000-2010



The area of land used for urban, rural, industrial and mining construction has increased by **13561** km² during 2000-2010, while the area of cropland, forestland, grassland, coastal wetlands and inland water bodies has declined by **9956, 693, 169, 3288** and **378** km², respectively.

The results of our study showed that:

The major types of land use in Eastern coastal areas in China were cropland, forestland and coastal wetlands. In addition to coastal wetlands, the wetland resources in coastal areas also included inland water bodies (i.e., terrestrial freshwater bodies, including rivers and canals, lakes, reservoirs and ponds, and shoals) and artificial wetlands (e.g., salt pans and aquaculture farms).

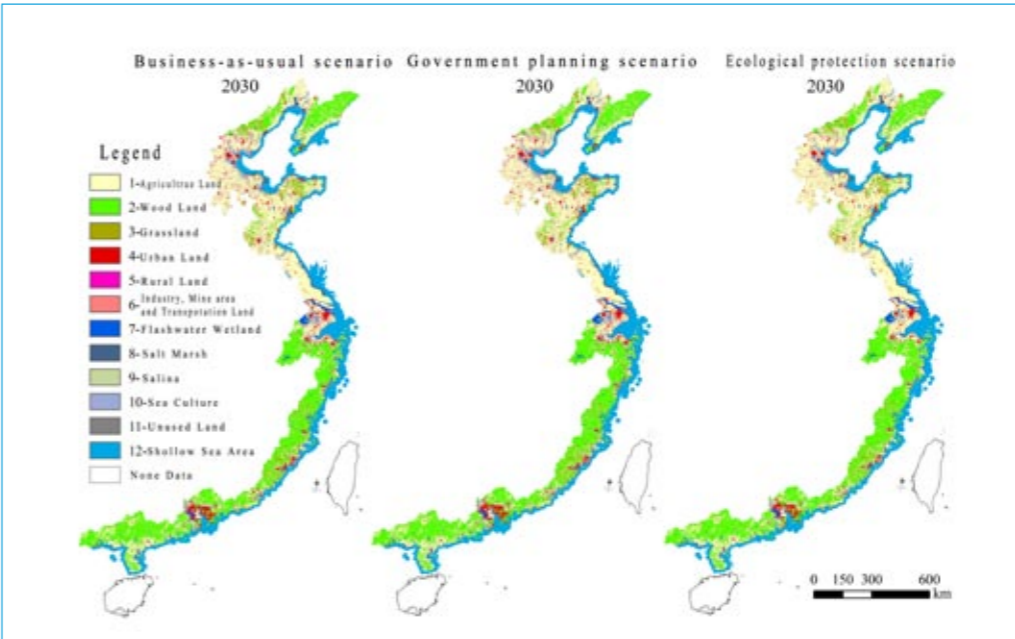
The major changes of coastal areas in China from 2000 to 2010 were characterized by urbanization, industrialization, and reclamation of coastal wetlands. The area of land used for urban, rural, industrial, and mining construction increased by 13561 km² during this decade, while the area of cropland, forestland, grassland, coastal wetlands, and inland water bodies declined by 9956, 693, 169, 3288 and 378 km², respectively. However, the area of artificial wetlands increased by 2592 km².

The land use change in coastal areas exhibited different characteristics at different stages. The changes in the areas of different land use types in the first five years (2000-2005) were more apparent than those in the second five years (2005-2010).

Scenario analysis of future changes in coastal wetlands in China

Based on land use data in 2000 and 2010, the project team developed different scenarios to analyze and simulate the spatial distribution, area and structure of coastal wetlands in China by 2030.

SCENARIO ANALYSIS OF COASTAL LAND USE IN 2030



2030	Business-as-usual scenario	Government planning scenario	Ecological protection scenario:	Climate change scenario:
	A scenario in which the current trends continue, i.e., the current trend of land use change remains the same as before.	A scenario in which the provincial government plannings in coastal areas on land reclamation from sea, approved by the State Council, were used as a basis to simulate and predict land use change along the coastal areas.	A scenario in which the area, structure and spatial distribution of land uses were simulated and predicted on the basis of taking coastal wetland conservation as a priority. This scenario emphasizes on the principle of integrating protection of terrestrial and marine ecosystems with full consideration of the needs for land used for urbanization and economic development.	A scenario in which the InVEST model was used to simulate the vulnerability of coastal provinces in China to climate change (sea level rise) and the role of coastal wetlands in mitigating the risks of disasters. The simulation results indicate that, under the climate change scenario, the areas with high vulnerability include Dandong coastal areas, Liaohe River Delta, Tangshan coastal areas, Yellow River Delta, Laizhou Bay, Rizhao coastal areas, Lianyungang, Yangtze River Delta, coastal areas in southern Zhejiang, and Pearl River Delta. In addition, the coastal wetlands will play a significant role in mitigating the risks of disasters due to sea level rise.
freshwater wetlands	+ 4.42%	+ 4.42%	- 0.46%	
sea water aquaculture	+ 10.12%	- 2.51%	- 8.23%	
saline wetlands	- 0.01%	- 9.93%	- 1.37%	
salt pans	- 0.36%	- 5.96%	- 22.73%	
unused lands	- 1.50%	- 1.50%	- 7.02%	
shallow sea areas	- 0.68%	- 2.51%	- 0.20%	

Coastal wetland management models in China

The biggest challenges facing coastal wetland protection and management in China are how to halt reduction in the area of coastal wetland ecosystems and degradation of their functions, and how to maximize their ecosystem services through enhancing protection, restoration, and wise use of coastal wetland ecosystems.

On the basis of case studies and field visits, the project team selected different sites for investigation into protection, restoration, habitat management, and wise use of coastal wetlands in China, in order to address such issues as coastal wetland reclamation, degradation, habitat loss, and the contradiction between wetland conservation and development. The project team also analyzed and summarized the technical systems and best practices on coastal wetland protection and management in China, i.e., the experiences and practices that have been proven to be relevant, representative, and practical and that can be expanded and replicated.

Successful coastal wetland conservation models in China:

- **Canceling wetland reclamation project and shifting to wetland conservation project:** Minjiang River Estuary Nature Reserve, Fujian
- **Regulating land use in the experimental zone for fine zoning management:** Yellow River Delta Nature Reserve, Shandong
- **Entrusting a local NGO to protect and manage coastal wetland:** Shenzhen Futian Mangrove National Nature Reserve, Guangdong
- **Win-win situation between coastal wetland conservation and local community’s economic development:** Beilun River Estuary National Nature Reserve, Guangxi
- **Resource monitoring-based protection:** Chongming Dongtan Wetland National Nature Reserve, Shanghai

Model Case: cancelling wetland reclamation project and shifting to wetland conservation



Minjiang River Estuary National Nature Reserve, Fujian

In 2002, Chinese president Xi Jinping, who served as governor of Fujian Province at that time, ordered a halt to a proposed wetland reclamation project at Minjiang River estuary in Fujian Province. The Changle Municipal Planning Commission had approved Shanyu (Eel) Floodplain Reclamation Project with an area of 1,000 mu (about 66.67 hectares) in 2001. Xi Jinping then made an important instruction on April 15, 2002: “Wetland conservation is a key component of ecological conservation. To build Fujian into an ecological province, we must pay high attention to wetland conservation.” After that, Changle Municipal Government revoked the reclamation project, and turned to establish Minjiang River Estuary Nature Reserve at County Level in 2003. It was upgraded to a nature reserve at provincial and national levels in 2007 and 2013, respectively. At present, Minjiang River Estuary National Nature Reserve provides key habitats for Chinese crested tern (*Thalasseus bernsteini*), one of the world’s most critically endangered species with an estimated population of only 50 in the world. Joint protection of this endangered species has become a good example of cooperation between mainland China and Taiwan for nature conservation.

Coastal wetland restoration models in China:

- **Restoration based on ecological water replenishment:** Yellow River Delta National Nature Reserve, Shandong
- **Mangrove restoration:** Zhanjiang Mangrove National Nature Reserve, Guangdong
- **Restoring industrial wasteland to mudflat:** Wusong Paotai Bay National Wetland Park, Shanghai

Model Case: Restoration based on ecological water replenishment



Yellow River Delta National Nature Reserve, Shandong

Some wetland areas and bird habitats in Yellow River Delta have become degraded in recent years due to reduced water flow in Yellow River. To restore the degraded wetland ecosystem, ecological water replenishment measures have been taken to implement wetland restoration projects in Yellow River Delta Nature Reserve. Firstly, dykes and diversion canals are built within the nature reserve to collect rainwater during the wet season, divert water from Yellow River during its high flow period, regulate wetland water level and water surface area, build islands for bird breeding, restore wetland vegetation and increase habitat diversity. Secondly, biological and engineering measures such as storage of fresh water on alkali land for leaching are adopted to restore the degraded freshwater wetland ecosystem, expand and restore wetland resources, improve wetland quality, enhance the ecological functions of wetlands within the nature reserve, and conserve biological diversity to provide favorable habitats for water birds. As a result, the population and staging time for the types and endangered species of migratory water birds monitored in the nature reserve have increased significantly in recent years.

Water birds habitat management models in China:

- **Management according to habitat types:** Houhai Bay and Mai Po wetlands, Hong Kong
- **Management focusing on the control of alien species:** Chongming Dongtan National Nature Reserve, Shanghai
- **Management focusing on Saunders’ gull (*Larus saundersi*):** Liaohe River Estuary National Nature Reserve, Liaoning

Model Case: Management according to habitat types



Mai Po wetland nature reserve, Hong Kong

Mai Po Nature Reserve is situated in Shenzhen River estuary to the northwest of Hong Kong, serving as a key staging site or over-wintering site for a large number of water birds. However, it is still under the threats from increased sedimentation, ongoing expansion of terrestrial trees and shrubs, alien invasive species, and urban development. According to the ecological behaviors of black-faced spoonbill and other migratory water birds and the different threats they face, the nature reserve has implemented a management model according to different management zones and habitat types. The Ramsar site in Mai Po comprises four management zones, namely: Core Zone (CZ), Biodiversity Management Zone (BMZ), Wise Use Zone (WUZ) and Private Land Zone (PLZ), with each management zone having its own specific management goal. Twenty-one *gei wai* (intertidal shrimp ponds) within the nature reserve are divided into brackish *gei wai*, brackish habitats for waterbirds, and rainwater-based habitats. As for vegetation management, the weeds and saplings on the embankment are removed to provide better habitats for migratory waterbirds including black-faced spoonbill. Thanks to these efforts, Mai Po and Deep Bay have become the world’s second largest wintering site for black-faced spoonbill. Each year, more than 400 black-faced spoonbills spend their winter here, accounting for about 20 percent of its global population.

Wise use of coastal wetlands models in China:

- **Sustainable shellfish industry:** Panjin Geligang wetland, Liaoning
- **Wetland eco-tourism:** Yellow River Delta National Nature Reserve, Shandong
- **Wetland bird-watching:** Dandong Yalu River Estuary National Nature Reserve, Liaoning - Extensive cultivation of fish at fish farms: Haifeng Wetland Nature Reserve, Guangdong

Model Case: Extensive cultivation of fish at fish farms while providing habitats for waterbirds



Haifeng Wetland in Guangdong Province

Since the 1980s, when the policy on aquaculture was loosened and the right to manage one’s own affairs of aquaculture was recovered, large areas of farmland in Haifeng, Guangdong, have been converted into fishponds for aquaculture. The most important model is extensive cultivation of fish at fish farms. Nature reserves encourage local villagers to continue adopting the existing “extensive” aquaculture practice, and guide local fishermen to lower water levels in their fishponds on a regular basis to harvest fish and shrimps. After the water level is reduced, these fishponds provide open and shallow water areas with little human disturbance and different water depths. Therefore, they can attract thousands of waterbirds including anatidae, egrets (e.g., black-faced spoonbill), waders and Dalmatian pelicans to inhabit and feed in the area. Extensive cultivation of fish at fish farms is a good example of wise use of coastal wetlands. These fish farms not only provide income for local communities, but offer habitats and feeding sites for waterbirds.

Based on case studies, best practices that have proven to be effective on coastal wetland protection, restoration, habitat management, and widely used in the United States, have also been analyzed. These best practices include: legislation on coastal wetland conservation; wetland mitigation banks; transaction of easement; wetland restoration based on monitoring and scientific research; wetland restoration with space reserved for climate resilience; coordination and balance between/among different stakeholders; habitat management targeting various species; and duck stamp system, etc. They are expected to provide valuable reference for the coastal wetland conservation efforts in China.

Model Case: Wetland mitigation banks in the United States

Wetland mitigation banks are very similar to monetary banks in operation, except that mitigation banks are mainly used to quantify savings and loans with wetland area. A mitigation bank traditionally is an open area purchased by sponsors (e.g., public institutions or private entrepreneurs) who have clear intentions to restore, improve, or protect existing wetlands or newly built wetlands. When a land developer has filled a wetland site or affected it by other means, the developer can purchase wetland “credit” savings (wetland area) from a mitigation bank to compensate for any wetland loss caused by the development project. In 2010, 798 public and private wetland mitigation banks were registered in the United States. It is estimated that the funds of wetland mitigation amount to US\$1.3 billion-\$2.2 billion each year.



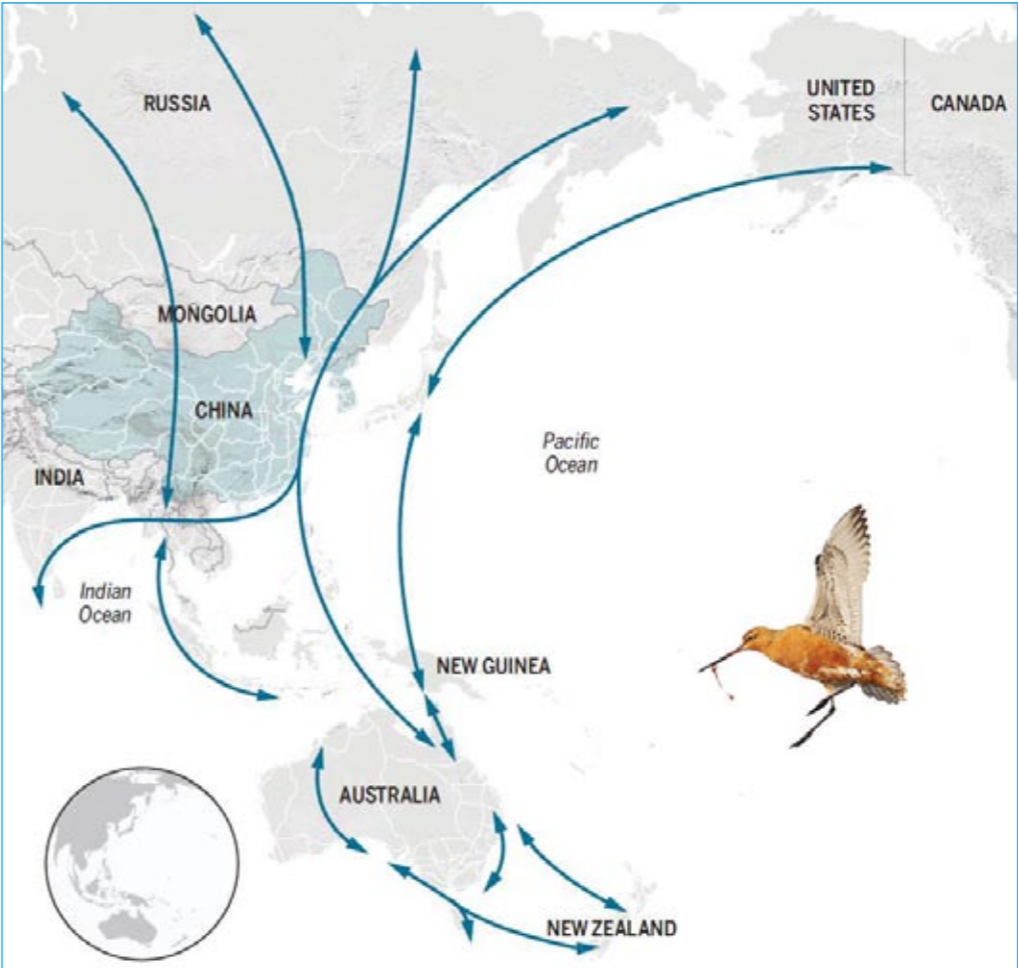
Fish slough in the Puget Bay of the United States

The East Asian-Australasian Flyway (EAAF)

The East Asian - Australasian Flyway (EAAF), one of the nine largest flyways globally, faces the highest level of threats in the world. EAAF extends from Alaska, the United States, and Far East Russia in the North, to Australia and New Zealand in the South, spanning across 22 countries and regions (e.g. the United States, Russia, North Korea, China, Japan, South Korea, Vietnam, Thailand, Malaysia, Indonesia, Australia and New Zealand). More specifically, it covers the “East Line” of flyways in China.



MAP OF EAAF



Each year, about **50 million** migratory waterbirds, including **8 million** shorebirds, migrate along EAAF. In the course of migration, these waders will gather in large numbers and use some key habitats as their staging sites on a long-term basis. However, the populations of migratory birds along EAAF have been significantly reduced due to wetland destruction and human hunting. At present, at least **33** species (including endangered species such as Siberian Crane, Oriental White Stork, Black-faced Spoonbill, Spoon-billed Sandpiper and Chinese Crested Tern) out of the **155** key waterbirds along EAAF are seriously threatened, among which **24** species mainly live in coastal wetlands.

MAIN FINDINGS

Wetland conservation is an integral part of the development of an ecological civilization. The Chinese government has announced a series of important measures to strengthen wetland conservation and restoration. Coastal wetland conservation and biodiversity conservation are inseparable from the development of an ecological civilization.

- More than 60% of natural coastline in China has been built into seawall which is detrimental to biodiversity and ecosystem services.

24 species of waterbirds in China’s coastal wetlands are listed as globally threatened (IUCN’s Red List), accounting for 67 percent of total globally threatened species along EAAF.

From 1950 to 2000, 53 percent of temperate coastal wetlands, 73 percent of mangroves, and 80 percent of coral reefs have been lost in China. Fifty percent of natural coastal wetlands have been lost due to reclamation from sea.

Finding # 1

Coastal wetlands in China are key life-supporting systems. They serve as key ecological barriers to maintain sustainable socio-economic development in the coastal zones, play an important role in ensuring the sustainable fishery development in coastal areas, and provide key habitats for migratory waterbirds along the East Asian-Australasian Flyway.

- The coastal wetlands provide key ecological barriers for the socio-economic sustainable development of the coastal areas in China. They play an important role in purifying water quality, flood control and disaster reduction, mitigating storm tides and typhoons, providing favorable natural conditions, and protecting the safety of facilities and people in coastal zones. Mangroves, for instance, can not only function as forest ecosystems, but can fight against natural disasters, including storm tides and tsunamis, prevent coastal erosion and act as a valuable carbon sink. Therefore, they serve as a multi-functional natural barrier for the coastal zones.
- The coastal zones and offshore waters provide key breeding sites for fish, as well as critical areas to maintain marine fish diversity.
- Coastal wetlands in China are irreplaceable and integral to protecting global biodiversity. Each year, as many as 246 species of migratory waterbirds – up to several million - breed, migrate, stage and/or over-winter in coastal wetlands in China. Twenty-four species of waterbirds in China’s coastal wetlands are listed as globally threatened (IUCN’s Red List), accounting for 67 percent of total globally threatened species along EAAF; there are 99 species of waterbirds using coastal wetlands in China whose population sizes exceed one percent of their global populations or their populations along EAAF; 140 waterbird survey sites meet the criteria of Ramsar sites, international important birdareas or the East Asian-Australasian Flyway Partnership (EAAFP).

Finding # 2

The primary driver for the reduced area of coastal wetlands in China is the large-scale and fast conversion and land reclamation of coastal wetlands. The large-scale conversion projects in the pipeline may threaten the “redline” of conserving about 800 million mu (53.33 million ha) of wetlands in China by 2020. Therefore, effective measures to contain the over-exploitation in coastal zones are urgently needed.

- From 1950 to 2000, China lost 53 percent of temperate coastal wetlands, 73 percent of mangroves and 80 percent of coral reefs. The natural coastal wetlands have been reduced by 50 percent due to reclamation. The length of artificial seawalls reached 11,000 km in 2010, accounting for 61 percent of China’s total coastline.
- Coastal habitats for migratory waterbirds are reclamation hot spots. The study showed that: 22830 hectares of sea were reclaimed in the Phase I project of the Caofeidian Industrial Park in Hebei; 30700 hectares were reclaimed in the last decade in Binhai New Area, Tianjin; 17900 hectares were reclaimed in Laizhou Bay, Shandong, from 2010-2014; 37800 hectares in Dongtai-Rudong, Jiangsu, in the past 10 years; 53800 hectares in Ningbo, Zhejiang, during 2000-2013; and 2500 hectares in Qinzhou Bay, Guangxi, during 2010-2014.

- The scale of sea reclamation in the planning pipeline is even larger. Statistics show that over 578000 hectares of sea are planned to be reclaimed by 2020 – 115000 hectares annually - to support the economic development of coastal areas in China, with the implementation of a new round of coastal development strategies. If this trend continues, the coastal wetland area will be reduced to 5.34 million hectares by the end of 2018, putting the “redline” of 800 million mu at risk.

Finding # 3

The loss of habitats for migratory water birds due to coastal wetlands reclamation has directly threatened the survival of migratory waterbirds including waders. It is one of the primary drivers for the reduced population of waterbirds along the EAAF.

- Among the nine flyways for waterbirds globally, three flyways pass through China. The waterbirds along EAAF suffer from the most severe threat, and their populations are declining fast. At least 27 species are critically endangered (e.g. Siberian Crane, Spoon-billed Sandpiper, Spotted Greenshank, Dalmatian Pelican, Chinese Crested Tern, Oriental White Stork, Black-faced Spoonbill, etc.), among which 24 species mainly live in China’s coastal wetlands. At present, the populations of endangered waterbird species living along the EAAF are almost the sum total of those of endangered waterbird species along other eight flyways.
- Coastal wetlands reclamation has directly converted the natural mudflats and shallow seas used by waterbirds into agricultural and industrial lands, and led to the loss of habitats for waterbirds. Meanwhile, sea reclamation has damaged the substrate of the surrounding mudflats through sand pumping. This has resulted in food shortages for migratory waterbirds, damaged the function of mudflats as habitats for these birds, and threatened the survival of waterbirds that need to stage, for food and energy in coastal wetlands.
- Lots of habitats for waterbirds have been lost due to seawalls constructed during the reclamation projects. Tidal zones would be totally flooded at high tide level, and sea water reaches the seawalls directly. The coastline with artificial seawalls reached 11000 kilometers by 2010, leaving no space at high tide level for migratory birds to stopover and to hunt for food.

Finding # 4

Conservation of coastal wetlands is still a weak component in wetland conservation in China. Some obvious gaps still exist in this field.

- The results of the Second National Wetland Resources Inventory in China show that: 1.3904 million hectares of coastal wetlands are protected within 11 coastal provinces/autonomous regions/municipalities in the country. Only 24 percent of coastal wetlands have been legally designated as protected areas, much lower than the mean wetland protection rate across China (43.5 percent). In this sense, there still exists a significant gap in coastal wetland conservation.
- Some coastal wetlands in China have high conservation values and have reached the criteria of Ramsar sites or the protected areas along the EAAF, including Luannan in Hebei, and Ganyu and Rudong mudflats in Jiangsu. However, they have not yet been included in the conservation system.

Among the nine flyways for waterbirds globally, three flyways pass through China. The waterbirds along EAAF suffer from the most severe threat, and their populations are declining fast. At least 27 species are critically endangered.

About **24%** of coastal wetlands are currently under protection, far below the average wetland protection rate of **43.5%**.

Apart from waterbirds conservation, there still exists a big gap for the conservation of other species and typical coastal wetland ecosystems:

- Of 22 key ecological areas for invertebrates and fish in the Yellow Sea and Bohai Sea area, only six areas have been designated as national nature reserves, while the 16 others have not been put under protection.
- Although about 40 percent of mangroves in China have been protected, the crucial distribution areas for mangroves in Wenzhou Bay, Feiyun River Estuary, and Aojiang River Estuary in southern Zhejiang, the northern coast in Hainan Island, and Beibu Bay in Guangxi, etc., have not been put under protection.
- Similarly, the protection status of sea grass beds is not promising. Of the 35 surveyed seaweed bed distribution zones, 59 percent of the distribution zones have not yet been effectively protected.
- Geographically, Tianjin, Zhejiang, Jiangsu, Hebei, and Shandong, among other coastal provinces, have high ecological value, and are economically developed. However, the protection rate of coastal wetlands in these provinces is rather low. They face heavy pressure in reclamation and arduous tasks in conservation.

Finding # 5

The legal system and effective legal basis remains inadequate to conserve coastal wetlands in China. Coastal wetland conservation efforts in China are still confronted with conflicts of multiple institutions and mechanisms, and are facing many difficulties. No uniform coordination mechanism has been made available. Therefore, the coastal wetland conservation efforts in China still face arduous tasks.

- Lack of specific law and regulation on wetland conservation. Currently, no umbrella law on resources (e.g. the Natural Resources Protection Law) or particular law on wetlands has been promulgated in China. Most of the existing laws and regulations are only related to the protection and management of some wetland components, they thus cannot provide legal basis for protecting the wetland ecosystem as a whole.
- Unclear legal definition of wetlands. In the land use classification system under the Ministry of Land and Resources, wetlands have not been listed as a land-use type. The marshes, mudflats, and reed lands in coastal wetland areas are classified as ‘unused’ lands, and can be converted into cropland, aquaculture ponds or lands for urban and industrial construction. Some of them even become the targets of encroachment by some local governments to ensure “the protection redline of 180 million mu farmlands nationwide” and to balance the cultivated land’s occupation and supplement.
- Weak legal basis for integration of the land and the sea. Under the interaction between land and sea, the area of coastal wetlands is constantly changing; no fixed boundary of coastal wetlands can be determined, making it hard to define the ownership, the right of use, and other rights of coastal wetlands’ natural resources assets. This also makes it difficult to implement the measures to protect coastal wetlands.
- Local legislation on wetland conservation in coastal provinces/autonomous regions/municipalities lags behind other inland provinces. Provincial-level regulations on wetland conservation are local regulations to promote wetland conservation efforts. However, as of August 2015, provincial-level regulations on wetland conservation have not yet been promulgated in Tianjin, Jiangsu, Shanghai,

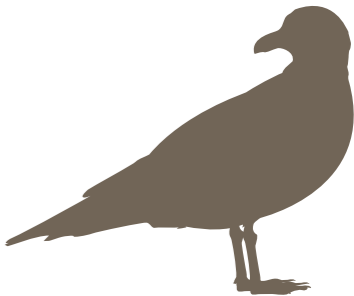
Fujian, or Hainan. In this respect, they lag behind the inland provinces such as Heilongjiang. This does not match the socio-economic development level in economically developed coastal provinces.

- Moreover, conflict surrounding wetland protection and economic development also exists between central and local governments. In furtherance of economic growth, some local governments are unwilling to include coastal wetlands into nature reserves, paying less attention to ecological security and sustainable economic development along the eastern coastal areas.

Finding # 6

Both China and the United States have already conducted many explorations and practices on coastal wetland conservation. Many best practices and tools have been published to provide reference for coastal wetland protection and management efforts. However, as the coastal wetland conservation efforts in China lag behind the United States, there are still many gaps in basic research, applied research and management models demonstration.

- Coastal wetland monitoring capacity in China is still weak, lacking monitoring of coastal wetland ecosystem’s structures, functions and processes on a long-term, site-specific and dynamic basis, which has limited our understanding about the patterns of coastal wetland changes in China. China still lacks the scientific support system for effective conservation and management of coastal wetland.
- Although synchronous survey groups on coastal waterbirds and bird-watching associations in China have conducted such survey work on their own, the domestic data on China’s coastal waterbirds is characterized by short time series, small number of survey sites, non-standard technologies, and lack of platform on waterbirds data sharing compared with other systematic waterbirds data in the United States (e.g. Audubon Society) with a time scale of more than 100 years.
- Although a large number of coastal wetland protection and restoration projects have been implemented in China over the last decade, these projects are short of scientific and technological support, and the basic research, R&D of key technologies, and demonstration of management models remain isolated with no integration or upscaling. In particular, in terms of response and adaption of coastal wetlands to climate change and sea level rise, little research has been conducted and no solutions have yet been proposed.
- Most of the financing and investment channels for wetland protection and restoration efforts depend on government channels, while administrative means are often used in wetland management. This is the result of lacking wetland-related legislation and policies, as well as incentive measures.
- Many local governments have neither acquired appropriate technologies for wetland conservation and restoration, nor have taken reasonable measures to protect coastal wetlands. As for the establishment of coastal wetland national park, a phenomenon of excessively pursuing large size and focusing more on economic benefits than ecological ones can be found in conceptual design, which may pose new risk to the health of local coastal wetland areas. Therefore, right-minded concepts and adequate technologies are in need.



APPENDIX TABLE 1: SIGNIFICANCE OF COASTAL WETLANDS IN THE BIODIVERSITY CONSERVATION
(Note: 243 survey sites in coastal wetlands)

Criteria	No. of Species	Survey sites	Notes
Number of Vulnerable, Endangered or Critically Endangered waterbird species	24	113	Ramsar criteria 2
Habitat regularly supports 1% or more of the individuals in a population of one species or subspecies of waterbirds	99	109	Ramsar criteria 6
Habitat regularly supports 25% or more of the individuals in a population of one species or subspecies of waterbirds	16	28	IUCN criteria of wetland NR
Habitat regularly supports 20000 or more waterbids		20	Ramsar criteria 5
Priority areas for waterbirds		140	Ramsaror EAAF criteria
Site without waterbirds conservation		69	
Key ecoregions for fish and invertebrate		22	
Site without fish and invertebrate conservation		16	

APPENDIX TABLE 2: HABITATS REGULARLY SUPPORTS 20000 OR MORE WATERBIRDS
(Note: A total of 16 sites, descending by the number of waterbirds)

Province	Waterbirds habitat	Date of survey	Number of Waterbirds	Protected Status
Liaoning	Dandong Port Coast (including Helong Reservoir, the East Fairway of Yalu River)	2013/4/14	117,444	No
Liaoning	Liaohe River Estuary NR	2013/4/26	102,549	Yes
Hebei	Luannan Wetland	2013/10/20	80,000	N
Liaoning	Yalu River Estuary NR	2004/4/25	66,169	Y
Jiangsu	Rudong Wetland	2013/10/20	64,444	N
Jiangsu	Lianyungang Coastal Mudflat (incl. Linhongkou and Fuzikou)	2007	63,805	N
Shanghai	Chongmingdongtan Wetland	2012	50,893	Y
Liaoning	Dalian Zhuanghe Coast	2005/5/1	40,308	Y
Shandong	Huanghua Harbor Dongying Yellow River Delta	2013/5/12	39,774	Y
Hebei	Changzhou Haixing Wetland, Huanghua Harbor	2012	39,083	Y
Jiangsu	Dongtai Mudflat	2001/4/28	35,372	N
Shandong	Binhai New Area MudflatLaizhou Bay	2004/5/10	32,639	N
Tianjin	Binhai New Area Mudflat	2000/4/12	30,410	N
Tianjin	Baidagang and surrounding wetlands	2014/3/20	29,316	N
Hongkong Guangdong	Houhai Bay in Shenzhen (incl. Moi Po and Futian NRs)	2003/1/26	27,453	Y
Hebei	Beidaihe coast	2005/4/2	21,532	Y

Note: Protected areas include nature reserves at national, provincial, municipal and county levels, special marine reserves.

APPENDIX TABLE 3: HABITAT REGULARLY SUPPORTS 25% OR MORE OF THE INDIVIDUALS IN A POPULATION OF ONE SPECIES OR SUBSPECIES OF A WATERBIRD
(Note: 14 species of waterbirds observed in 28 survey sites)

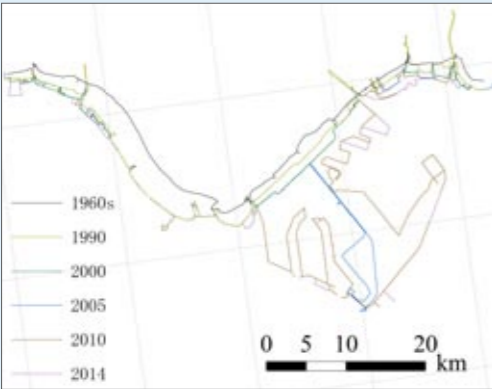
Common name	Scientific name	Number of survey sites	Name of survey sites
Bar-tailed godwit	<i>Limosa lapponica</i>	1	Dandong Yalu River Estuary Reserve
Bean goose	<i>Anser fabalis</i>	1	Changzhou Huanghua Harbor
Chinese egret	<i>Egretta eulophotes</i>	2	Haiwan Town, Hangzhou Bay
Curlew sandpiper	<i>Calidris ferruginea</i>	1	Luannan Wetland
Dalmatian pelican	<i>Pelecanus crispus</i>	9	Minjiang Estuary, Futian Nature Reserve, Mai Po Natural Reserve, Dongtai Jiang Gang Bay, Lianyungang coast, Rudong Mudflat, Yellow River Delta Nature Reserve, Wenzhou Bay
Dunlin	<i>Calidris alpina</i>	1	Dongtai Coast
Little plover	<i>Charadrius dubius</i>	1	Rudong Mudflat
Spotted greenshank	<i>Tringa guttifer</i>	1	Rudong Mudflat
Red knot	<i>Calidris canutus</i>	1	Luannan Wetland
Relict gull	<i>Larus relictus</i>	6	Tianjin Coastal Wetland, Ganyu Coast in Jiangsu
Saunders's gull	<i>Larus saundersi</i>	2	Panjing Nanxiaohe
Spoon-billed sandpiper	<i>Eurynorhynchus pygmeus</i>	2	Rudong Mudflat, Dongtai Tiaozini Mudflat
Spot-billed duck	<i>Anas poecilorhyncha</i>	7	Min Jiang Estuary, Yancheng Reserve, Yellow River Delta Nature Reserve, Chongming Dongtan, Jiuduansha Island, Taizhou Xuanmen Wan



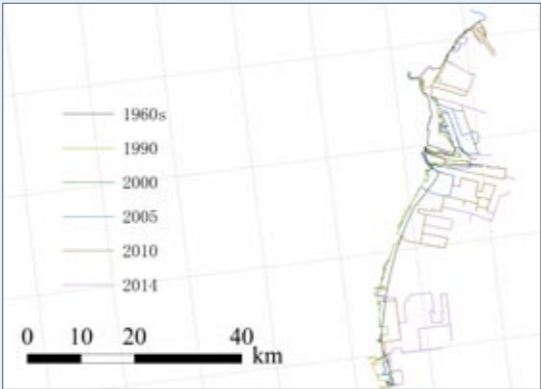
Shelling at Rudong mudflat

APPENDIX FIGURE 1: CASE STUDIES OF WETLAND RECLAMATION IN CHINA

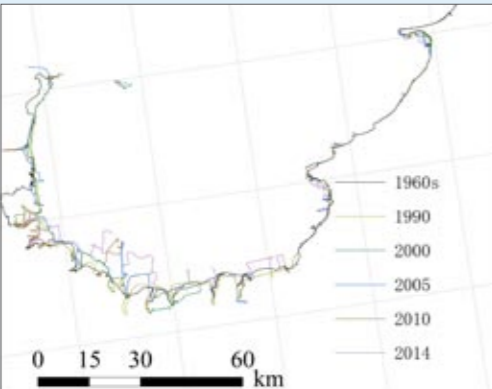
Some key habitats for migratory birds are also hot spots for reclamation projects of large scale and rapid development. For example, **22,830** hectares of sea were reclaimed in the Phase I project of the Caofeidian Industrial Park in Hebei; **30,700** hectares reclaimed in the last decade in Binhai New Area, Tianjin, including **16,100** hectares reclaimed during 20140-2014; 17,919 hectares reclaimed in Jiaozhou Bay, Shandong, from 2010-2014 for constructing salt pans, aquaculture farms and ports; **37,800** hectares reclaimed in Dongtai-Rudong, Jiangsu, in the past 10 years; **2,500** hectares reclaimed in Qinzhou Bay during 2010-2014.



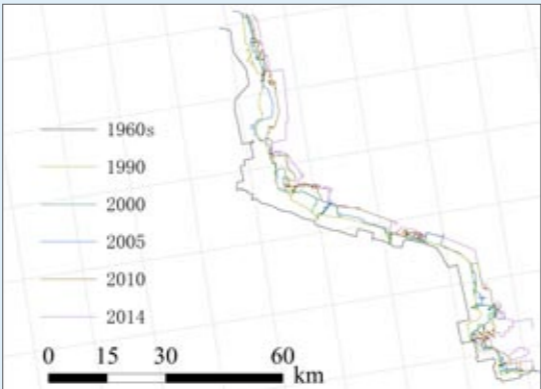
Caofeidian Industrial Park, Hebei



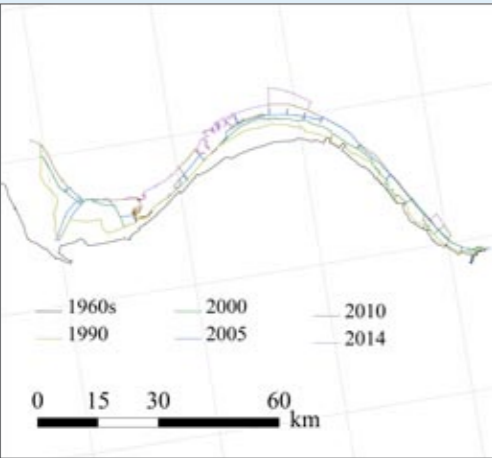
Binhaixinqu coastal wetland, Tianjin



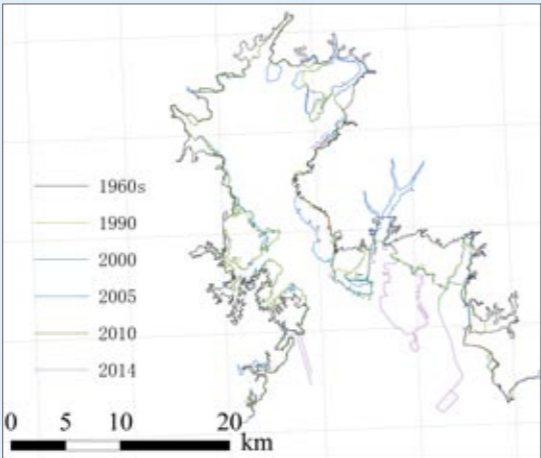
Jiaozhou Bay, Shandong



Dongtai coastal wetland, Jiangsu



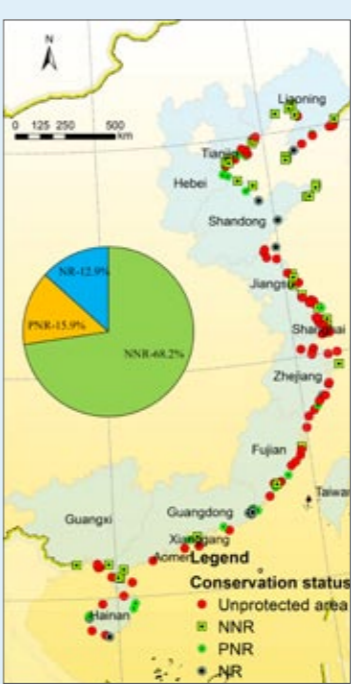
Rudong coastal wetland, Jiangsu



Qinzhou bay, Guangxi

APPENDIX FIGURE 2: CONSERVATION STATUS AND GAP ANALYSIS OF COASTAL WETLAND PROTECTED AREAS IN CHINA

At present, **126** protected areas have been established, including **40** national nature reserves, **52** provincial nature reserves and **34** protected areas of other types. Only **24 percent** of coastal wetlands have been legally designated as protected areas, much lower than the level proposed by the Birdlife International. **49.3 percent** of **140** priority areas identified by this research are not legally designated as protected areas.



APPENDIX FIGURE 3: PRIORITY ANALYSIS OF PROTECTED AREAS OF COASTAL WETLANDS IN CHINA
20 sites important to migratory waterbirds protection

Liaoning (4)

- Dandong Port Coast
- Yalu River Estuary Reserve
- Liaohe River Estuary Nature Reserve
- Nanxiaohe Wetland

Shandong (1)

- Yellow River Delta Nature Reserve

Tianjin (1)

- Beidagang

Hebei (2)

- Luannan Wetland,
- Haixing Wetland-Huanghua Harbor

Jiangsu (5)

- Rudong (including Xiaoyangkou)
- Dongtai Coast
- Yancheng Reserve
- Liangyungang
- Jiang gang

Shanghai (1)

- Chongming Dongtan

Zhejiang (4)

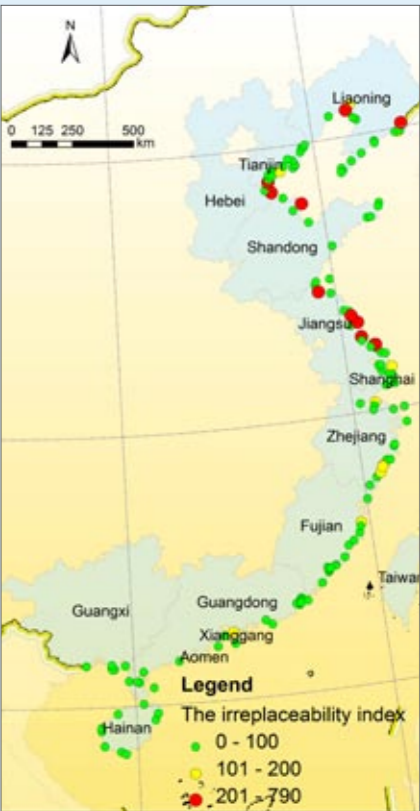
- Hangzhou Bay
- Lingkun Island
- Wenzhou Bay
- Yongqiang Coast

Guangdong (1)

- Houhai Bay
(Futian and Moi Po)

Fujian(1)

- Minjiang Estuary



MAIN RECOMMENDATIONS

Coastal wetland conservation involves 12 government departments/agencies, including forestry, marine, fishery, homeland and environment protection, and 11 coastal provinces/municipals. The central government should develop an integrated conservation strategy for Eastern coastal wetlands, by coordinating various departments/agencies and local governments to ensure a comprehensive and systematic wetland protection and restoration, in order to secure national ecological safety.

► A big flock of Pied Avocet were landing at Tianjin coastal wetland



Recommendation # 1

Strengthen wetland legislation at both the national and local level; revise and improve the provisions of existing laws and regulations related to coastal wetland conservation; enhance law enforcement and accountability; and develop an effective and integrated management system on coastal wetlands.

- Formulate the *Regulations of the People’s Republic of China on Wetland Conservation* to provide the legal basis for enhancing wetland protection and management; incorporate wetland conservation into the provisions of relevant laws in the process of revising existing laws and regulations such as the *Law of the People’s Republic of China on the Protection of Wild Animals*, and the *Fishery Law of the People’s Republic of China*; the five provinces/municipalities of Tianjin, Jiangsu, Shanghai, Fujian and Hainan should promulgate specific provincial-level regulations on wetland conservation.
- Select the municipalities/counties with large area of coastal wetlands to implement pilot projects on the registration of rights for natural resource assets of coastal wetlands.
- Incorporate natural coastal wetlands into local natural resources’ balance sheets; include the natural coastal wetland area and protection rate into the local party and government officials’ performance appraisal system; include the “no net loss” of coastal wetlands into the performance appraisal system of the 11 coastal province governments and governments at municipal/prefectural levels; include coastal wetland damage into the *Measures for Bringing Party and Government Officials to Account for Damage to the Ecological Environment*.
- Establish a wetland integrated law enforcement system, streamline the wetland management system, and establish a coordination mechanism between the protected areas and local governments for key protected areas (e.g. Ramsar sites, wetlands of national importance, wetland national nature reserves, national special marine reserves, national wetland parks and national marine parks).

Recommendation # 2

Incorporate coastal wetland conservation efforts into the overall planning of land spatial development and protection, implement pilot projects on integrated planning at coastal municipal/county levels; reassess and suspend the implementation of coastal wetlands conversion and sea reclamation projects that have previously been approved.

- The competent authorities are requested to adjust the land use classification standards in line with the needs of the deepening of national reform and the development of an ecological civilization to establish a new type of “ecological land use”. On this basis, great efforts should be made to address the “tenure” of wetland in China’s national land classification system. If wetland is still listed as “unused land” in the new national land spatial planning, it will be difficult to change the situation in which the coastal wetlands beyond the nature reserves are reclaimed, occupied, or polluted;

- Review, from a sustainable, long-term perspective at the national level, the coastal wetland reclamation projects that are being implemented or have been incorporated into the reclamation plan, and give top priority to the protection of coastal wetlands that have key ecological functions. The central government agencies should take the lead in developing united land spatial development and protection plan for eastern coastal areas, clearly incorporate the coastal wetlands of national and international importance into the ecological conservation redline in China, and effectively implement such protective measures;
- Promote the integrated planning at the county (municipal) level, and include coastal wetland conservation into the production, living and ecological spatial plan at municipal/county level;
- Conduct post-project evaluation of the sea reclamation projects that have been completed, and assess their pros and cons in economic development and ecological civilization development so as to provide theoretical support for the approval and management of other similar sea reclamation projects in the future;
- Re-assess the coastal wetland reclamation plans that have been previously approved, strictly limit the approval of such new projects; conduct ecological restoration of the coastal wetlands that have been reclaimed but have not yet been developed, and change them into habitats that are suitable for coastal waterbirds and other wildlife;
- Suspend the approval and construction of all coastal wetland reclamation projects before the integrated land spatial development and protection plan has been formulated for eastern coastal areas.

Reclamation in the Yellow Sea and Bohai Bay and its Impact on Red Knot



Reclamation in Binhai New Area, Tianjin, and Caofeidian, Hebei, over the past decade has resulted in the loss of 34% of waterbird habitats in northern Bohai Bay and reduced population of waders that inhabit in the area. Take the Red Knot (*Calidris canutus*) as an example. The bird species breeds in the Arctic, and spends their winter in Australia and New Zealand, with a one-way migration distance of more than 10,000 km. Along the Northern and Western parts of Bohai Bay, China serve as the most important staging site for Red Knots during their northward migration. During the spring migration period, up to 80 percent of Red Knots along the East Asian-Australasian Flyway (EAAF) stage along Luannan coastal wetland in Hebei to replenish their energy. However, the survival of the Red Knot is seriously threatened due to reclamation of the surrounding areas. The population of Red Knots in Luannan coastal wetland has declined from more than 60,000 to over 20,000 individuals in 2015. Therefore, whether the Red Knot can fly to the Arctic and breed there will largely depend on the protection status of this wetland area.

Recommendation # 3

Enhance coastal wetland protection and restoration projects; implement pilot projects on wetland conservation-related investment and financing; and improve the health and ecological services of coastal wetlands.

- Enhance the development and management of coastal wetland protected areas. Efforts should be made to support the development of nature reserves, national wetland parks and other conservation-based infrastructural development projects, as well as the coastal wetland ecological monitoring system, public awareness and training system, and to implement projects related to the restoration of habitats for migratory waterbirds, returning aquatic farms to tidal mudflats, prevent and control invasive alien species, and restoration of mangroves;
- Demonstrate the ecological integrated use of high-efficiency and three-dimensional agriculture, and the wise use of mangrove so as to develop a more rational and sustainable use model for coastal wetlands.
- Introduce an independent third-party appraisal mechanism to assess the conservation projects that have been completed and to summarize best practices and models on coastal wetland protection and management.
- Conduct pilot projects on “mitigation banks” in China’s coastal areas, and adopt such policies as “supplementing after occupying” or “supplementing before occupying” of natural coastal wetlands in order to maintain the area of natural coastal wetlands in the country.
- Conduct pilot projects on “transaction of easement”, through redemptions or leases in China’s coastal areas to regulate the right of wetland use without changing its ownership, to limit the over-exploitation of coastal wetland resources and to promote biodiversity conservation in these areas.

Recommendation # 4

Build new coastal wetland protected areas or expand the scope of existing protected areas, and establish a sound system of coastal wetland conservation.

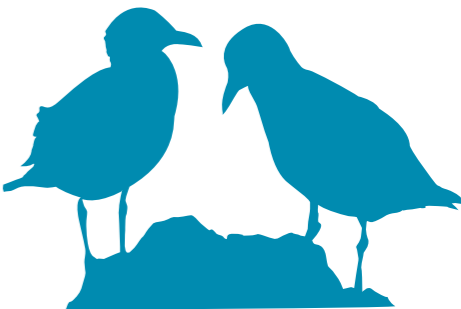
- Implement management system at various levels. Depending on the importance, the coastal wetland areas will be categorized into wetlands of national importance (including Ramsar sites), wetlands of local importance and wetlands of general importance.
- Establish wetland nature reserves, wetland parks and other protected areas, in the areas lacking proper protection, to increase the protection area of coastal wetlands. The project team has selected 11 critical habitats for waterbirds (see appendix for details) in China’s coastal wetland areas for rescue-based conservation.
- SFA and other competent authorities should develop a special programmatic plan for coastal wetland conservation, provide technical guidance and financial support for the protection and restoration of such coastal wetlands, and protect EAAF as a whole.
- A total of 180 important coastal wetlands, including 73 existing coastal wetland reserves (34 national natural reserves and 39 provincial nature reserves), and 107

important sites were identified by the project team (6 mangrove sites, 61 habitats for waterbirds, 12 habitats for mollusks, 28 seaweed/seagrass beds, see details in appendix).

Recommendation # 5

Enhance basic scientific research on coastal wetlands, proactively carry out monitoring and assessment of coastal wetland ecosystem, study and develop technical models for coastal wetland protection and restoration to provide a strong scientific and technological support system for coastal wetland protection and management.

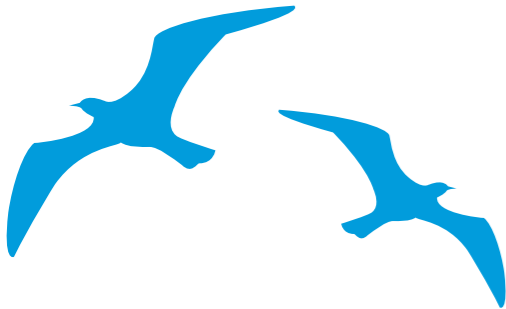
- A monitoring and research network on coastal wetlands should be established to include key coastal wetlands into the planning and operational scope of National Eco-environmental Monitoring Network Program. More specifically, coastal wetland monitoring indicator systems and technical protocols should be developed to build a sound technical platform for basic research on the structures, functions and processes of coastal wetland ecosystem, and to provide scientific data for assessing coastal wetland ecosystem services.
- The relevant authorities should proactively organize and lead domestic and international environmental protection NGOs, and bird-watching lovers, etc., to conduct synchronous surveys on migratory birds on a regular basis, to provide scientific data for the protection and restoration of coastal habitats for water birds;
- Conduct dynamic monitoring and assessment on coastal wetland ecosystems, to provide scientific data for coastal wetland management and accountability.
- Launch a science and technology action plan on the restoration of degraded coastal wetlands at the earliest possible date, integrating basic research on the structures, functions and processes of coastal wetland ecosystem, R&D of key technologies for the restoration of degraded ecosystem, and the demonstration of optimal ecosystem management. At the current stage, focus should be made on solving the technical problem of preventing and controlling the fast spread of *Spartina alterniflora*, an alien pest species doing much damage along coastal areas;
- Assess the mitigation effects of the mangrove, coral reef and oyster reefs on extreme weather events, such as storm tides and sea level rise as a result of the climate change, to develop scientific and systematic plans to direct restoration programs; conduct methodology research on wetland carbon sink, to explore innovative investment and financing channels for wetland conservation and restoration.



Recommendation # 6

Promote the development of a coastal wetland conservation network in China, extensively implement activities to raise public awareness on the importance of conserving coastal wetlands and migratory waterbirds, involve the general public and social forces in conserving coastal wetlands and migratory waterbirds, and actively participate in international cooperation and exchange on coastal wetlands and migratory waterbirds conservation.

- Various organizations (e.g. China Wetland Conservation Association, China Coastal Wetlands Conservation Network, local bird-watching associations, domestic and international environmental protection NGOs) should be fully levered to organize activities that raise public awareness on the importance of conserving coastal wetlands and migratory waterbirds, and to engage them in conservation activities.
- It is also necessary to advocate and promote nationwide bird-watching and eco-tourism activities in coastal wetlands, to compile and publish some brochures and reports online to convey conservation knowledge, such as the Handbook on Bird-Watching in Coastal Wetlands (Series of books), Report on the Status of Coastal Wetlands Protection in China, and Technical Protocols on Synchronous Survey and monitoring of Coastal Waterbirds.
- The relevant government agencies are obliged to conscientiously implement the international conventions and agreements related to wetland conservation; promote China to join the Convention on the Conservation of Migratory Species of Wild Animals (CMS); further improve the mechanism of implementing EAAFP; expand the Flyway Site Network; enhance the bilateral cooperation mechanism on the conservation of migratory waterbirds; and strengthen international cooperation in terms of wetland scientific research, protection and management.
- China should facilitate international cooperation and exchange on wetland conservation with relevant international NGOs, and engage them in coastal wetland protection and management in China.



Priority Actions on Coastal Wetlands Protection in China

- Promulgate the Regulations on Wetland Conservation in China
- Develop an integrated wetland law-enforcement system
- Fully implement the policy of “zero loss” ecological redline for coastal wetlands
- Increase the number and size of protected areas in key coastal wetland areas to fill protection gaps
- Organize the application for Ramsar sites and world natural heritage sites, and implement pilot projects of wetland national parks
- Fully promote the implementation of eco-compensation policy and incentive mechanism on coastal wetland protection
- Innovate market-based and social participation mechanisms on wetland protection and restoration, and carry out infrastructure projects for coastal wetland protection
- Implement capacity building projects on coastal wetland protection to improve the institutional capacity and management effectiveness
- Implement coastal wetland restoration projects
- Implement projects to demonstrate the wise use of coastal wetlands
- Develop monitoring indicator system and technical protocol on coastal wetlands
- Establish a sound monitoring network on coastal wetland ecological conditions, assess the health of coastal wetland ecosystem on a regular basis, and build an information sharing platform on coastal wetlands protection
- Conduct long-term simultaneous survey on coastal waterbirds, and establish a database on them
- Implement publicity and education activities, raise public awareness on and involve them in protecting coastal wetlands
- Improve China Coastal Wetland Conservation Network and build a platform on public participation
- Establish a third-party assessment mechanism
- Effectively implement international conventions related to wetland conservation, and promote China’s accession to Convention on the Conservation of Migratory Species of Wild Animals (CMS, 1979)
- Further improve the mechanism of implementing East Asian-Australasian Flyway Partnership (EAAFP), and expand the network of protected areas under EAAFP
- Strengthen cooperation with international organizations on wetland conservation in China

CHINA COASTAL WETLAND CONSERVATION NETWORK

The network was co-launched by the Convention on Wetlands Management Office of People's Republic of China, the Paulson Institute, and the Institute of Geographic Sciences and Natural Resources Research (IGSNRR), Chinese Academy of Sciences (CAS), to curb the worrisome trends of rapid decreasing of area and degradation of the coastal wetland, and rapid erosion of offshore fishery resources in China. The network aims to promote exchange and cooperation between/ among members; enhance the conservation and management level of coastal wetlands in China; conduct communication and raise public awareness on coastal wetland protection; and to engage private resources in coastal wetland protection.

► Zhanjiang Gaoqiao Mangrove Wetland in Guangdong Province has the largest area of mangrove in China.

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Basic functions

Protected area network. Protected area of coastal wetlands consists of 40 national nature reserves (NNR), 52 provincial nature reserves (PNR), 16 national wetland parks, 16 Ramsar sites and small protected areas at local level.

Partner network. A partner-network serves as a platform to promote dialogue, exchange and cooperation, involving the major stakeholders including wetland-related governmental authorities, wetland nature reserve administrations (offices), research institutes and universities, national and international NGOs focusing on wetland and migratory bird conservation.

Knowledge sharing network. A knowledge sharing network on coastal wetlands and waterbirds will be developed and operated, which will include database, metadata, knowledge base, photo gallery, domestic and foreign best tools and cases on wetland and water bird survey and protection.

Proposed activities

- Annual meetings
- Monitoring and synchronous survey of waterbirds: Organize and coordinate the coastal wetland conservation and management administrations (offices), bird-watching societies, NGOs and bird-watching volunteers to jointly conduct monitoring and synchronous survey of coastal waterbirds.
- Professional/technical training workshops.
- Regular communication, education and publications.

Members

The Convention on Wetlands Management Office of People’s Republic of China will serve as the decision-making and business management agency of China Coastal Wetland Conservation Network. Specifically, it will be responsible for managing the Network, making decisions on key issues, coordinating with relevant ministries and commissions, appointing and recruiting members of the Board of Members and expert panel.

China Wetlands Association is the administrative agency, operating through the secretariat, and responsible for daily management and operations.

The Paulson Institute, IGSNRR and Alashan SEE foundation are main sponsors and supporters, providing technical supports, as well as arranging pilot projects, capacity training, public communication, and fund raising.

Members of the Network consist of wetland competent authorities, NNRS/PNRs, national/provincial wetland parks, wetlands of national/international importance in 11 coastal provinces/autonomous regions/municipalities (i.e., Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi and Hainan), as well as civil groups, universities and research institutions focusing on wetland conservation in China.



The Network held an inaugural meeting and announced Fuzhou Declaration in Changle, Fujian province, in June 2015.


11 COASTAL HABITATS CRITICAL FOR MIGRATORY WATERBIRDS AND IN NEED OF PRIORITY PROTECTION IN CHINA

By assessing the data and existing protection system on waterbirds' population, and according to the three criteria on Ramsar sites defined by the secretariat of the Convention on Wetlands, the project team selected 11 key habitats for waterbirds, which are urgently needed to be protected by building new nature reserves or expanding the existing nature reserves.

The SFA and other competent authorities should develop a special programmatic plan for coastal wetland conservation, provide technical guidance and financial support for the protection and restoration of such coastal wetlands, and protect EAAF as a whole.

► Bar-tailed Godwit in breeding plumage.



Province/ Municipal		Name and Importance
Liaoning		Dandong Port Coast (including Helong Reservoir, the West Fairway of Yalu River) The last and main staging site for many waders to feed before they migrate northward to the breeding site, one of the most important sites for energy supply; supports nine threatened species of water birds, and 20 species of water birds whose population has reached 1% of their global populations according to the Criterion 6 of the Convention on Wetland.
		Panjin Nanxiaohe Wetland The northernmost habitat in China for Saunders’s gull, as well as one of the largest breeding sites of the species. Its highest population in a single survey was recorded to be 6,000, accounting for over 80% of its global population. Home to six threatened species of water birds, and nine species of water birds whose population has reached 1% of global population.
Tianjin		Binhai New Area Coastal Wetland (including Hangu Coast) A key staging site for migratory water birds in North China, and a critical site for relict gull and other migratory water birds. A total of 11,612 relict gulls were recorded, nearly all the popualtion of relict gull. Recorded three threatened species of water birds, and 12 species of water birds whose population has reached 1% of global population.
Hebei		Luannan Coastal Wetland Located in the central part of EAAF, it is an important staging site for some migratory water birds such as red knot, curlew sandpiper, black-tailed godwit and spotted greenshank (EN). Three threatened species of water birds were recorded here, together with other 22 species of water birds whose population has reached 1% of global population.
Jiangsu		Ganyu Mudflat A key staging site for migratory water birds including relict gull (VU), great knot (VU) and Eurasian oystercatcher (LC). It has record of six threatened species of water birds, and four species of water birds whose population has reached 1% of global population.
		Lianyungang Mudflat (including Linhongkou and Liezikou) Home to bedrock coasts and sandy coasts, main staging site for many water birds, including Dalmatian pelican (VU) and Chinese egret (VU). Recorded 10 threatened species of water birds, and 33 species of water birds whose population has reached 1% of global population.

Threats	Conserving species and endangerment categories	Criterion*	Recommendations
Located outside Yalu River Estuary Nature Reserve, the wetland area is suffering from the impacts of wetland development and cultivation, leading to the reduced area, fragmentation and even loss of habitats. It is thus very difficult for many waders to find energy supplies, and their survival has been dversely affected.	Great knot (VU), Bar-tailed godwit (LC)	①	Expand existing Yalu River Estuary Nature Reserve
unprotected	Saunders’s gull (VU)	① ②	Expand existing Liaohe River Estuary Nature Reserve, or establish a new reserve
Many silty mudflats in the area have been lost due to land reclamation from sea. 11,000 hectares have already been reclaimed.	Relict gull (VU), Oriental stork (EN), Red-crowned crane (EN)	① ②	Establish a new reserves as soon as possible
Land reclamation from sea is a major threat to the wetland area. Reclamation of large amount of intertidal mudflats and shallow seas has significantly reduced the habitat area for migratory water birds.Meanwhile, the clamming activity and invasion of alien species of Spartina alterniflora have adversely affected the habitats for migratory water birds.	Spotted greenshank (EN), Relict gull (VU), Curlew sandpiper (LC), Red knot (LC)	②	Establish a new reserves as soon as possible
It faces heavy pressure from land reclamation, and aquatic farms have occupied large amount of mudflats.	Relict gull (VU)	① ②	Establish a new reserves as soon as possible; effectively balance aquaculture with migratory birds protection
Land reclamation from mudflat has resulted in the reduced area and degraded functions of habitats for migratory water birds. As of end 2012, a total of 80,000 hectares of mudflat in Lianyungang have been reclaimed. Pollution is also a serious threat. The coastal water bodies are seriously polluted, mainly by nitrogen and phosphorus.	Dalmatian pelican (VU)	① ② ③	Establish a new reserves as soon as possible

Province/ Municipal		Name and Importance
Jiangsu		Dongtai Mudflat (including Qionggang and Tiaozini) Important staging site for many migratory birds along EAAF, represented by spoon-billed sandpiper (CR) and Dalmatian pelican (VU). Recorded two threatened species of water birds, and four species of water birds whose population has reached 1% of global population.
		Rudong Mudflat (including Xiaoyang Kou) A staging site along the eastern line of EAAF, habitat for spoon-billed sandpiper, a critically endangered species under IUCN. 143 spoon-billed sandpipers were recorded in a survey. Recorded 10 threatened species of water birds, and 32 species of water birds whose population has reached 1% of global population.
Shanghai		Shanghai Coastal Mudflat (Nanhui Dongtan, Hengsha Dongtan) The southernmost staging site in East Asia for many migratory water birds along EAAF. Recorded seven threatened species of water birds, and 12 species of water birds whose population has reached 1% of global population.
Zhejiang		Hangzhou Bay (including Sizaopu reservoir) Transition zone of coastal wetlands in China, siltation-based coasts to the southern bank, and erosion-based coasts to the northern bank. Recorded 10 species of water birds whose population has reached 1% of global population.
		Wenzhou Bay (including Lingkun Island and Yongqiang coast) A key over-wintering and staging site for migratory water birds along EAAF. A total of 66 Dalmatian pelicans were identified, higher than its previously estimated population size (50) along EAAF. Recorded three threatened species of water birds, and four species of water birds whose population has reached 1% of global population.

Threats	Conserving species and endangerment categories	Criterion*	Recommendations
Intensive reclamation in Dongtai has led to the rapid loss of intertidal mudflats, which have been converted into cropland, salt pans and marine aquatic farms. In addition, the invasive alien species - <i>Spartina alterniflora</i> - has occupied the habitats for migratory water birds.	Dalmatian pelican (VU), Dunlin (LC)	① ② ③	Expand existing Yanchen Reserve, or establish a new reserve; eradicate <i>Spartina alterniflora</i>
Significant losses and degradation of natural mudflat caused by reclamation projects, posing threats to habitats for migratory water birds. Meanwhile, wind power development, marine pollution and development of chemical industrial area are also threats.	Spoon-billed sandpiper (CR), Spotted greenshank (EN)	① ② ③	Establish new reserves as soon as possible
Seriously affected by land reclamation and aquaculture. As some areas are planned to be developed, or have even been “leased” to aquatic farms, the habitats for water birds have significantly shrunk. Invasive alien species of <i>Spartina alterniflora</i> has further reduced the area of habitats for these birds.	Chinese egret (VU)	②	Establish new reserves or expand existing reserve as soon as possible; eradicate <i>Spartina alterniflora</i> ; restore native vegetation/ mudflat
The increasing land reclamation and artificial dykes have significantly reduced the area of natural wetlands, and gradually reduced or damaged the living areas of intertidal organisms. In addition, the water bodies are suffering from serious pollution, with inorganic nitrogen, active phosphorus and petroleum as the major pollutants. The eutrophication is prominent.	Chinese egret (VU)	③	Establish new reserves as soon as possible; control and prevent pollution sources.
Reclamation at east tidal flat of Lingkun Island has changed the landscape of the habitats drastically, the habitats and feeding sites of many birds has experienced great changes in a short period of time, causing negative impact on the feeding and other behaviors of many water birds.	Dalmatian pelican (VU)	① ②	Establish new reserves as soon as possible

- ① **Criterion 2** for identifying wetlands of international importance (Ramsar sites): a wetland that supports vulnerable, endangered and critically endangered species or threatened ecological communities according to IUCN;
- ② **Criterion 5** for identifying wetlands of international importance (Ramsar sites): a wetland that regularly supports 20,000 or more waterbirds;
- ③ **Criterion 6** for identifying wetlands of international importance (Ramsar sites): a wetland that regularly supports 1% of the individuals in a population of one species or subspecies of a waterbird.

Annexes 1: CHINA COASTAL WATERBIRDS IN NEED OF URGENT PROTECTION

<div>Dalmatian pelican</div> 	<div>Scientific Name: <i>Pelecanus crispus</i></div> <div>Categories: VU, Class II - National</div> <div>Population: 50</div> <div>Main habitats in China: Yellow River Delta, Yancheng Wetland, Wenzhou Bay Wetland, Minjiang River estuary, Haifeng Wetland</div>	<div>Red-crowned crane</div> 	<div>Scientific Name: <i>Grus japonensis</i></div> <div>Categories: EN, Class I - National</div> <div>Population: 400-500 (over-wintering population in China)</div> <div>Main habitats in China: Liaohe River Estuary Wetland, Yellow River Delta, Yancheng Wetland</div>	<div>Bar-tailed Godwit</div> 	<div>Scientific Name: <i>Limosa lapponica</i></div> <div>Population: 146,000</div> <div>Main habitats in China: Yalu River Estuary Wetland, Nanbao Wetland, Yancheng Wetland, Chongming Dongtan</div>	<div>Curlew sandpiper</div> 	<div>Scientific Name: <i>Calidris ferruginea</i></div> <div>Population: 135,000</div> <div>Main habitats in China: Yalu River Estuary Wetland, Luannan Wetland, Yancheng Wetland, Chongming Dongtan</div>
<div>Chinese egret</div> 	<div>Scientific Name: <i>Egretta eulophotes</i></div> <div>Categories: VU, Class II - National</div> <div>Population: 3,000-4,100</div> <div>Main habitats in China: Dalian Bay Wetland, Changshan Island, Hangzhou Bay Wetland, Shanghai Haiwan Town Beach</div>	<div>White-naped crane</div> 	<div>Scientific Name: <i>Grus vipio</i></div> <div>Categories: VU, Class II - National</div> <div>Population: 1,000-1,500 (over-wintering population in China)</div> <div>Main habitats in China: Beidaihe Wetland, Nanbao Wetland, Beidagang Wetland, Nandagang Wetland, Yellow River Delta,</div>	<div>Far eastern curlew</div> 	<div>Scientific Name: <i>Numenius madagascariensis</i></div> <div>Population: 32,000</div> <div>Main habitats in China: Yalu River Estuary Wetland, Liaohe River Estuary Wetland, Yellow River Delta, Dongsha Islands, Chongming Dongtan</div>	<div>Great knot</div> 	<div>Scientific Name: <i>Calidris tenuirostris</i></div> <div>Population: 290,000</div> <div>Main habitats in China: Yalu River Estuary Wetland, Luannan Wetland, Yancheng Wetland, Chongming Dongtan</div>
<div>Whooper swan</div> 	<div>Scientific Name: <i>Cygnus cygnus</i></div> <div>Population: 60,000</div> <div>Categories: Class II - National</div> <div>Main habitats in China: Yellow River Delta, Rongcheng Coastal Wetland</div>	<div>Oriental white stork</div> 	<div>Scientific Name: <i>Ciconia boyciana</i></div> <div>Population: EN, Class I - National</div> <div>Population: 3,000</div> <div>Main habitats in China: Liaohe River Estuary Wetland, Yancheng Wetland, Beidagang Wetland, Nandagang Wetland, Yellow River Delta, Yancheng Coastal Wetland</div>	<div>Spoon-billed sandpiper</div> 	<div>Scientific Name: <i>Eurynorhynchus pygmeus</i></div> <div>Categories: CR</div> <div>Population: 140-480</div> <div>Main habitats in China: Xiaoyangkou Wetland, Dongtai Wetland, Minjiang River estuary Wetland</div>	<div>Chinese crested tern</div> 	<div>Scientific Name: <i>Sterna bergsteini</i></div> <div>Categories: CR, Class II - National</div> <div>Population: 50</div> <div>Main habitats in China: Minjiang River Estuary Reserve, Jiushan Islands</div>
<div>Black-faced spoonbill</div> 	<div>Scientific Name: <i>Platalea minor</i></div> <div>Categories: EN, Class II - National</div> <div>Population: 2,700</div> <div>Main habitats in China: Yancheng Coastal Wetland, Chongming Dongtan, Dalian Zhuanghe Wetland, Minjiang River estuary, Houhai Bay Wetland</div>	<div>Hooded Crane</div> 	<div>Scientific Name: <i>Grus monacha</i></div> <div>Categories: VU, Class I - National</div> <div>Population: 1,050-1,150 (over-wintering population in China)</div> <div>Main habitats in China: Beidaihe Wetland, Nanbao Wetland, Yellow River Delta, Chongming Dongtan</div>	<div>Spotted greenshank</div> 	<div>Scientific Name: <i>Tringa guttifer</i></div> <div>Categories: EN, Class II - National</div> <div>Population: 400-600</div> <div>Main habitats in China: Luannan Wetland, Xiaoyangkou Wetland, Dongtai Wetland</div>	<div>Relict gull</div> 	<div>Scientific Name: <i>Larus relictus</i></div> <div>Categories: VU, Class I - National</div> <div>Population: 12,000</div> <div>Main habitats in China: Ganyu Wetland, Binhai New Area Wetland</div>
<div>Baer's pochard</div> 	<div>Scientific Name: <i>Aythya baeri</i></div> <div>Categories: CR</div> <div>Population: 250-1,000</div> <div>Main habitats in China: Beidagang Wetland</div>	<div>Eurasian Oystercatcher</div> 	<div>Scientific Name: <i>Haematopus ostralegus</i></div> <div>Population: 5,000-10,000</div> <div>Main habitats in China: Yalu River Estuary Wetland, Liaohe River Estuary Wetland, Yellow River Delta, Yancheng Coastal Wetland</div>	<div>Red knot</div> 	<div>Scientific Name: <i>Calidris canutus</i></div> <div>Population: piersmai:50,500-62,000; rogersi: 48,500-60,000</div> <div>Main habitats in China: Yalu River Estuary Wetland, Luannan Wetland, Yancheng Wetland, Chongming Dongtan</div>	<div>Saunders's gull</div> 	<div>Scientific Name: <i>Larus saundersi</i></div> <div>Categories: VU</div> <div>Population: 7,100-9,600</div> <div>Main habitats in China: Liaohe River Estuary Wetland, Yalu River Estuary Wetland, Yellow River Delta, Yancheng Coastal Wetland</div>

Annexes 2: COASTAL WETLANDS RECOMMENDED BEING INCLUDED IN ECOLOGICAL REDLINE IN CHINA

Note: The international important habitats for waterbirds includes international important wetlands identified by the Ramsar secretariat and important bird areas identified by Birdlife International. All coastal wetlands listed in this table are unprotected areas. 73 existing national and provincial wetland reserves are not listed here

Item	Province / City	Location	Biodiversity Priority PAs	Water Birds Habitants of International Importance	WWF Priority PA	Conserving species or ecosystems
1	Liaoning	Dashan Dao Beach	✓		✓	Mussel
2	Liaoning	Zhangzi Dao and Haiyang Dao	✓			Seagrass
3	Liaoning	Dandong Port Coast	✓	✓	✓	Water Birds
4	Liaoning	Changshan Town	✓	✓		Water Birds
5	Liaoning	Hulu Dao, Juhua Dao	✓		✓	Mussel
6	Liaoning	Jinzhou	✓		✓	Water Birds
7	Liaoning	Ridaoying Estuary	✓		✓	Water Birds
8	Liaoning	Yalu River Scenery Boulevard	✓	✓		Water Birds
9	Liaoning	Zhuanghe Coast	✓	✓	✓	Water Birds
10	Hebei	Beidahe	✓	✓		Water Birds
11	Hebei	Jingtang Gang	✓			Water Birds
12	Hebei	Luannan Wetland	✓		✓	Water Birds
13	Hebei	Qinghuang Dao – Shanhaiguan Offshore			✓	Mussel
14	Hebei	Xinkaihe – Geziwo Mudflat	✓	✓		Water Birds
15	Hebei	Zuidong Fishing Village	✓			Water Birds
16	Tianjin	Beach	✓	✓		Water Birds
17	Tianjin	Tanggudong Gaotou	✓		✓	Mussel
18	Shandong	Dongying Kenli Batou	✓			Seagrass
19	Shandong	Haiyang Dingzi Gang	✓		✓	Mussel
20	Shandong	Laizhou Taiping Wan Haimiao Kou	✓			Seagrass
21	Shandong	Qingdao Huiquan Wan	✓			Seagrass
22	Shandong	Qingdao Wuding Reef	✓		✓	Mussel
23	Shandong	Rizhao Kuishanju Offshore	✓		✓	Mussel
24	Shandong	Rongcheng Lidao Wan	✓			Seagrass
25	Shandong	Rushan Langnuan Kou	✓		✓	Mussel
26	Shandong	Weihai Liugong Dao Offshore	✓		✓	Mussel
27	Shandong	Weihai Shuangdao Wan	✓			Seagrass
28	Shandong	Yantai Danzi Dao Yudaishan	✓			Seagrass
29	Shandong	Yantai Kongtong Dao Offshore	✓		✓	Mussel
30	Shandong	Chang Dao Offshore	✓		✓	Mussel
31	Jiangsu	Dangling Coast	✓			Water Birds
32	Jiangsu	Dongtai Coast	✓			Water Birds
33	Jiangsu	Ganyu Coast	✓		✓	Water Birds
34	Jiangsu	Haitou	✓	✓		Water Birds

Item	Province / City	Location	Biodiversity Priority PAs	Water Birds Habitants of International Importance	WWF Priority PA	Conserving species or ecosystems
35	Jiangsu	Laoba Gang	✓			Water Birds
36	Jiangsu	Lianyun Gang	✓		✓	Mussel
37	Jiangsu	Lianyun Gang (Linhong Kou, Liezi Kou)	✓	✓	✓	Water Birds
38	Jiangsu	Reed Beach	✓			Water Birds
39	Jiangsu	Nantong Coast (Dayang Kou)	✓		✓	Water Birds
40	Jiangsu	Rudong Mudflat (including Xiaoyang Kou)	✓		✓	Water Birds
41	Jiangsu	Rudong Salt Field	✓			Water Birds
42	Jiangsu	Sizhiqu Shellfish Farming Field	✓			Water Birds
43	Jiangsu	Yanwei Gang	✓			Water Birds
44	Shanghai	Northern Chongming Mudflat	✓	✓		Water Birds
45	Shanghai	Haiwan Town Coast	✓			Water Birds
46	Shanghai	Eastern Hengsha Coast	✓			Water Birds
47	Shanghai	Eastern Nanhui Coast	✓	✓	✓	Water Birds
48	Shanghai	Sanjia Gang	✓		✓	Water Birds
49	Shanghai	Wusi Farm	✓			Water Birds
50	Shanghai	Changxing Dao	✓	✓		Water Birds
51	Zhejiang	Feiyun Estuary	✓			Mangrove
52	Zhejiang	Hangzhou Bay	✓	✓	✓	Water Birds
53	Zhejiang	Linshan Haitu Reservoir	✓			Water Birds
54	Zhejiang	Lingkun Island	✓			Water Birds
55	Zhejiang	Longgang Beach	✓	✓		Water Birds
56	Zhejiang	Sanjia – Jinqing Beach	✓	✓		Water Birds
57	Zhejiang	Shangyu Embanked Area	✓			Water Birds
58	Zhejiang	Taizhou Wan	✓	✓		Water Birds
59	Zhejiang	Wenzhou Bay	✓			Mangrove
60	Fujian	Futou Wan	✓			Water Birds
61	Fujian	Funing Wan	✓	✓		Water Birds
62	Fujian	Funing Wan Qiweibi	✓			Mangrove
63	Fujian	Fuqing Wan	✓			Water Birds
64	Fujian	Haicang Coast	✓		✓	Water Birds
65	Fujian	Ju Jiang	✓		✓	Water Birds
66	Fujian	Langqi	✓			Water Birds
67	Fujian	Meizhou Wan	✓		✓	Water Birds
68	Fujian	Qianban Village	✓		✓	Water Birds
69	Fujian	Wenwusha	✓			Water Birds
70	Fujian	Xinghua Wan	✓		✓	Water Birds
71	Guangdong	Chaozhou Raoping Tuolin Wan	✓			Seagrass

Item	Province / City	Location	Biodiversity Priority PAs	Water Birds Habitants of International Importance	WWF Priority PA	Conserving species or ecosystems
72	Guangdong	Huidong Kaozhouyang	✓			Seagrass
73	Guangdong	Leizhou Peninsula Jiulong Shan	✓			Water Birds
74	Guangdong	Leizhou Jijia	✓			Water Birds
75	Guangdong	Leizhou Qishui Wan	✓			Seagrass
76	Guangdong	Sanzhao	✓			Water Birds
77	Guangdong	Shanwei Baisha Lake	✓			Seagrass
78	Guangdong	Shenzhen Daya Bay Chuanbiyan	✓			Seagrass
79	Guangdong	Taishan Shangchuan Dao	✓			Seagrass
80	Guangdong	Taishan Xiaochuan Dao	✓			Seagrass
81	Guangdong	Wai Lingding Dao	✓			Water Birds
82	Guangdong	Xitou	✓		✓	Water Birds
83	Guangdong	Yangjiang Hailing Dao	✓			Seagrass
84	Guangdong	Zhanjiang Donghai Dao	✓			Seagrass
85	Guangdong	Zhuhai Tangjia Wan	✓			Seagrass
86	Hong Kong	Yuan Lang Ha Pak Nai	✓			Seagrass
87	Guangxi	Beihai Fucheng Wudaodun	✓			Seagrass
88	Guangxi	Daguansha	✓	✓		Water Birds
89	Guangxi	Jin Wan	✓	✓	✓	Water Birds
90	Guangxi	Qisha Huangjingjiao	✓			Seagrass
91	Guangxi	Qinzhou Wan Xi’niujiao	✓			Seagrass
92	Guangxi	Qinzhou Wan Yagongjiao	✓			Seagrass
93	Guangxi	Tieshan Gang Gui’erdun	✓			Seagrass
94	Guangxi	Yin Tan	✓			Water Birds
95	Guangxi	Yingluo Wan	✓			Seagrass
96	Guangxi	Yujiang Xiangxi	✓	✓	✓	Water Birds
97	Guangxi	Zhenzhu Gang	✓			Mangrove
98	Hainan	Lin’gaojiao	✓			Mangrove
99	Hainan	Meilisha	✓		✓	Water Birds
100	Hainan	Qionghai Wufuling Beach	✓			Seagrass
101	Hainan	Wenchang Coast	✓			Seagrass
102	Hainan	Wenchang Huiwen Town Baoshi	✓			Seagrass
103	Hainan	Wenchang Yelin Wan	✓			Seagrass
104	Hainan	Xi Dao	✓			Water Birds
105	Hainan	Xinying Houshui Wan	✓	✓	✓	Water Birds
106	Hainan	Ying’ge Sea Salt Field	✓	✓	✓	Water Birds
107	Hainan	Zhanzhou Wan	✓			Mangrove

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PHOTOS

From Cornell Ornithology Lab, CERN Jiaozhou Bay Station, Minjiang River Estuary Nature Reserve, and Futian Nature Reserve; and Ding Lei, Yu Xiubo, Wang Jianmin, Wang Chen, Ma Jingsheng, Guan Xiangyu, Feng Erhui, Liu Yu, Xiao Rong, Tang Zhenghua, Jia Yifei, Chen Shuihua, Cui Lin, Hu Peng, Jiang Luguang, Yuan Xiao, Lei Weipan, Dong Wenxiao, Bo Shunqi

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