



WWF

REPORT

CHINA

2015

THIS REPORT
HAS BEEN
PRODUCED IN
PARTNERSHIP
WITH:



Global Footprint Network
Advancing the Science of Sustainability



Living Planet Report • China 2015

Development, Species and Ecological Civilization

World Wide Fund for Nature

World Wide Fund for Nature (WWF) is one of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global Network active in more than 100 countries. WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

China Council for International Cooperation on Environment and Development

Established in 1992 with the approval of the Chinese Government, China Council for International Cooperation on Environment and Development (CCICED) is a high level non-for-profit international advisory body composed of high level Chinese and international figures and well-known experts in the field of environment and development. The main tasks of CCICED are exchanging and disseminating international successful experience in the field of environment and development; studying key environment and development issues of China; providing forward-looking, strategic and early warning policy recommendations to State leaders and decision makers of all levels in China, facilitating the implementation of sustainable development strategy and the development of resource-saving and environment-friendly society in China.

Institute of Geographic Sciences and Natural Resources Research

The Institute of Geographic Sciences and Natural Resources Research (IGSNRR), established within the Chinese Academy of Sciences (CAS), is a national platform for knowledge and innovation. IGSNRR currently gives high priority to research on physical geography and global change, human geography and regional development, natural resources and environmental security, geo-information mechanisms and system simulation, water cycle and related land surface processes, ecosystem network observation and modeling, and agricultural policies.

Global Footprint Network

Global Footprint Network promotes the science of sustainability by advancing the Ecological Footprint, a resource accounting tool that makes sustainability measurable. Together with its partners, the Network works to further improve and implement this science by coordinating research, developing methodological standards, and providing decision-makers with robust resource accounts to help the human economy operate within the Earth's ecological limits.

Institute of Zoology

Institute of Zoology (IOZ), Chinese Academy of Sciences (CAS), is a government-funded research institution in zoological sciences. With its efforts to both address basic scientific questions and meet national and public demands in the fields of biodiversity, ecology, agricultural biology, human health and reproductive biology, IOZ places great emphasis on integrative biology, evolutionary biology and reproductive biology. Other high priorities include invasive biology and technological innovations for sustained control of agricultural pests.

Advisers:

Li Ganjie, Marco Lambertini, Lo Sze Ping,
Li Lin, Li Zuojun

Authors:

Xie Gaodi, Cao Shuyan, Yang Qisen, Xia
Lin, Fan Zhiyong, Gao Ying, David Lin,
Ronna Kelly, Ge Liqiang, Sarah Humphrey

WWF Beijing Office

Wen Hua Gong
Working People's Culture Palace
100006 Beijing, P.R. China
www.wwfchina.org

CCICED

No. 5 Houyingfang Hutong,
Xicheng District, Beijing, China 100035
<http://www.cciced.net/encciced/>

Institute of Geographic Sciences and Natural Resources Research

A11, Datun Road, Chaoyang District,
100101 Beijing, P.R. China
<http://www.igsnrr.ac.cn>

Global Footprint Network

312 Clay Street, Suite 300
Oakland, California 94607, USA
www.footprintnetwork.org

Institute of Zoology

1 Beichen West Road, Chaoyang
District, Beijing 100101, P.R.China
www.loz.ac.cn

CONTENTS

Foreword	1
Executive Summary	3
Chapter One: The Current Situation	5
Variation Trend Index of Chinese Vertebrates	7
Global Context	7
China's Current Situation and Analysis	9
Ecological Footprint	14
Global Context	15
Ecological Footprint in China	19
The Biocapacity and Ecological Footprint of Each Province	21
Water Footprint	26
Water Footprint of Production	27
Water Footprint of Consumption	29
Water Stress in China	30
Chapter Two: Key Drivers Analysis	31
Development and Ecological Footprint	33
Urbanization and Ecological Footprint	37
Global Impact of the Ecological Footprint	41
Chapter Three: Call for Action - China: Ecological Civilization Construction	49
Chapter Four: WWF One Planet Solutions	53
APPENDIX A TECHNICAL QUESTIONS	65
APPENDIX B GLOSSARY OF TERMS	67
APPENDIX C ADDITIONAL INFORMATION	68
APPENDIX D REFERENCES	76

FOREWORD

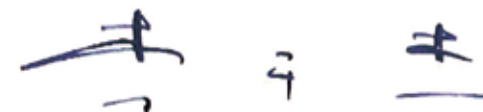
The sustainable development of humankind depends upon a stable natural and ecological environment. Over the past four decades, the human demands for the nature have gone beyond the service capacity of the Earth, leading to a drastic decline in biodiversity and gradual depletion of natural resources. The need to better coordinate development of the economy, society and environment has become a hot topic across the world as reflected in the post-2015 targets for sustainable development.

The construction of an ecological civilization is now a national strategy for China, and as China's economic development enters into the new normal, it will be particularly important to coordinate ecological construction and economic growth pattern. The top priority and major challenge for China in advancing ecological civilization construction lies in its efforts to cope with the ever-growing pressure on resources and the environment, and "develop green hills and clear waters into golden and silver mountains" in a context of continuous economic development, rapid industrialization and urbanization.

This report explores the health of the basic components of the ecological environment and natural resources which underpin human survival and development from three perspectives- the Species Trend Index, Ecological Footprint and Water Footprint- which serve as indicators of overall status of China's ecological system.

The China Council for International Cooperation on Environment and Development has partnered with the World Wide Fund for Nature for the third time since 2008, as both sides work to jointly publish the Living Planet Report• China 2015. The report updates our understanding of the relationship between Chinas' Ecological Footprint and biocapacity, analyzes the driving forces that affect Ecological Footprint, and establishes and enriches the database and relevant studies of terrestrial ecosystem vertebrates. It includes case studies of the "One Planet" concept for the first time, and explores solutions for the sustainable management of natural resources within the boundaries of the Earth.

It's hoped that this report can provide a reference point for China's endeavour to advance ecological civilization and realize the green and beautiful China Dream.



Li Ganjie
Secretary General
CCICED

Our societies and economies depend on a healthy planet. We all need safe food, fresh water and clean air from it. However, humanity's ever-growing demand for resources is putting tremendous pressures on it. At our current rate of consumption, the Earth needs 1.5 years to produce and replenish the natural resources that we consume in a single year. This means we are eating into our natural capital, making it more difficult to sustain the needs of future generations.

Indicators presented in this report, the Variation Trend Index of Chinese Vertebrates, Ecological Footprint and Water Footprint help us to better understand the health of the environment and ecosystem of China, our impacts upon it, and possible implications.

This iteration of the China report introduces for the first time the "One Planet Solutions", which demonstrate the WWF "One Planet Perspective" in practice – with significant environmental, social and economic benefits. With this new chapter, we hope to provide better choices for managing, using and sharing natural resources within the biocapacity.

The Ecological Civilization is now positioned as the national strategy and mainstreamed in major national development plans of the Chinese government, which shows great determination and commitment from the government to balance the economic development and environment protection and will also fit well into the global Sustainable Development Agenda. With this report, we call for joint efforts from us all to build a future where people can live and prosper in harmony with nature.



Marco Lambertini
Director General
WWF International

Executive Summary

Nature is the fundamental provider of goods and services for humans. In an era featuring rapid social and economic growth, as the demands for resources continue to grow, it is of ever greater importance to understand whether humans are living within the Earth's ecological capacity. Over the past few decades, China has become one of the world's largest economies in terms of both financial and material flows. This has significantly improved many people's livelihoods. However, these achievements have increased people's demand on resources to level that exceeds the regenerative capacity – or biocapacity – of China's ecosystem. This is putting unprecedented pressure on China's environment and ecosystems.

As the environmental challenges and natural resource pressure continue to grow, China has shifted the focus of resource and environmental protection and sustainable growth to the more integrated approach of Ecological Civilization which aims to achieve the benefits of development in harmonious coexistence with nature. The approach is reflected in numerous policy documents and practical actions.

This report serves as an update to three earlier reports on China's Ecological Footprint produced in 2008, 2010 and 2012. It presents China's Ecological Footprint, Water Footprint, and the Living Planet Index, as a basis to determine whether the consumption of resources falls within the carrying capacity of the ecological system. Based on the latest data and improvements of earlier calculation methods, this update has the following findings:

(1) In the 1970s, the humankind entered a state of global ecological overshoot where our global Ecological Footprint surpassed the biocapacity of the Earth. The overshoot has continued to grow and by 2010 the global per capita Ecological Footprint reached 2.6 gha, while per capita biocapacity was just 1.7 gha. The level of ecological overshoot has reached a point at where 1.5 Earths are needed to provide the biocapacity that humans demand. Many natural systems are able to tolerate or recover from short term exposure to the effects of ecological overload. However, ecological deficit is increasingly leading to the degradation of ecological assets, exhaustion of natural reserves, loss of biodiversity, and collapse of ecosystems, among other major impacts on the environment.

(2) In 2010, China's per capita Ecological Footprint was 2.2 gha, which is

below the average global per capita Footprint of 2.6 gha, and but still higher than the global average biocapacity of 1.7 gha. If everyone on this planet had the same Ecological Footprint as the average Chinese resident, we would need approximately 1.3 Earths to support our demands from nature. Despite being lower than the world average, China's per capita Ecological Footprint was more than twice the per capita biocapacity available in 2010, meaning that China's biologically productive area was unable to provide sufficient renewable resources and services for the Chinese population. China's options to balance the supply and demand of biocapacity are to increase its domestic biocapacity, supply control the growth of its Ecological Footprint, and meet the deficit through imports of biocapacity from other countries.

(3) The spatial distribution of China's biocapacity is uneven. In 2010, half of the country's biocapacity was concentrated in nine provinces, namely Shandong Province, Henan Province, Inner Mongolia Autonomous Region, Sichuan Province, Heilongjiang Province, Yunnan Province, Hebei Province, Jiangsu Province, and Hunan Province. The good news is that the total biocapacity in most Chinese regions increased during the period 2010-2012. The Ecological Footprints of different regions also exhibit significant variation. In general, the per capita Ecological Footprint of provinces in East China is relatively high, while that of provinces in West China is low. From 2010 - 2012, two mega-cities, Beijing and Shanghai managed to decrease their per capita Ecological Footprint as a result of greater energy efficiency. The increase in per capita Ecological Footprint in other provinces was about 0.2-0.3 gha.

(4) With regard to the international trade in biomass commodities, an analysis of the biomass Footprint of 455 trade product types found that in 2012, China was a net importer of biocapacity. The net imported biocapacity accounted for approximately 1.3% of the Earth's total biocapacity. While the net imported per capita biocapacity has increased significantly, the local ecosystem remains the main source of biocapacity used to meet the demand of Chinese residents. About two-thirds of China's import and export of biocapacity is accounted for by trade of biomass products with 26 countries. Countries with rich per capita ecological resources, such as Australia, Brazil, Canada, Russia, New Zealand and Indonesia, are the main exporters of biocapacity to China. The types of imported biocapacity have strong regional characteristics. For instance, biocapacity imported from

Australia and New Zealand is mainly grazing land, biocapacity imported from Canada and Russia is mainly forest land, and biocapacity imported from Brazil is mainly cropland. China's biocapacity is mainly exported to the Asia-Pacific region and North America.

(5) Water is a crucial natural resource for the development of human society. As a supplement to the Ecological Footprint, the analysis on the Water Footprint shows that in 2012, China's Water Footprint was 1.17 trillion cubic meters, of which 46% is green Water Footprint, 28% is blue Water Footprint, and 26% is grey Water Footprint. Compared to 2010, the Water Footprint of provinces has increased in 2012 reflecting the rising demand of social and productive activities on water resources.

(6) China's ecological deficit is associated with reduction in biodiversity as a result of direct human intervention and environmental change. Based on an times series data for 10,380 animal populations spanning 3,038 vertebrate species, the 2014 global Living Planet Index (LPI) indicates that the populations of vertebrates around the globe dropped by 52% from 1970 to 2010. China is amongst the countries with the world's richest biodiversity, yet it is also one of the countries that has experienced the greatest biodiversity loss.

The LPI of China's terrestrial ecosystem is based on times series data for 1,385 animal populations representing 405 birds, mammals, amphibians and reptiles. The index indicates that the populations of China's terrestrial vertebrates decreased by 49.7% from 1970 to 2010. The closer the genetic relationship of the species, the more intensive the competition for resources and space among them is. As the most prosperous and powerful of the primate species, humans have out-competed our "closest relatives". Human created habitats such as towns and farmlands have occupied or altered the space other primates need for survival. The LPI based on 19 Chinese primate species shows that the population size decreased by 83.8% from 1955 to 2010, with most of this change occurring between 1970 and 2010.

(7) China's growing ecological deficit and ecological debt is a reality that it is facing now as well as a threat to its development. In order to achieve further development, China needs to focus on maintaining a harmonious and win-win relationship with nature. In 2012, China signaled that equal priority should be

given to the construction of ecological civilization and the construction of economy, politics, culture and society, and explicitly set out a future development path focusing on ecological civilization. The main challenge for China in constructing an ecological civilization is to address tightening resource constraints and serious environmental pollution and ecosystem degradation. This is consistent with the concept underpinning the analytical framework of the Ecological Footprint of protecting and developing biocapacity and reducing the Ecological Footprint.

The following suggestions for construction of an ecological civilization are based on the analytical contents in this report:

- Ecological capital should be reasonably allocated, and various regions should build a mutually beneficial partnership for exchanging materials and services.
- Rural residents' welfare should be improved, and the rural Ecological Footprint should be allowed to grow in a rational manner under appropriate guidance.
- Particular attention should be given to rational urban layout and the urban Ecological Footprint should develop rationally under guidance.
- The resource utilization efficiency of production should be improved and options for green products and services should be further developed.
- Total energy consumption should be strictly controlled, low-carbon energy structures should be promoted, and the carbon intensity of energy production should be reduced.
- Ecological lands should be strictly protected, and natural productivity should be conserved and developed.
- Ecological compensation should be implemented comprehensively, the vitality and resilience of ecosystems should be strengthened, and the service providing ability of ecosystems should be enhanced.

Chapter One

The Current Situation



Variation Trend Index of Chinese Vertebrates

Global Context

Living Planet Index

The Living Planet Index (LPI) tracks the trends in global vertebrate species populations, and serves as an indicator for the status of biodiversity at multiple levels. It has been adopted by the Convention on Biological Diversity as one of the major indices to measure the health status of the global ecosystem. The LPI has been updated every two years since 1998 and is reported in The Living Planet Report published by the World Wide Fund for Nature.

Calculated using trends in 10,380 populations of 3,038 vertebrate species, the global LPI of 2014 indicates that the global vertebrate population decreased by 52% from 1970 to 2010. Specifically, the tropical species population decreased by 56%, and the temperate species population decreased by 36% over this period. Subdivision of the LPI by biomes shows that the LPI of the fresh water ecosystem decreased by 76% from 1970 to 2010, a significantly higher decline than that of the marine ecosystem, which is 39%. The main causes of reduction in global biodiversity of vertebrates are development, habitat fragmentation, habitat loss, climate change, invasion of alien species, pollution and diseases.

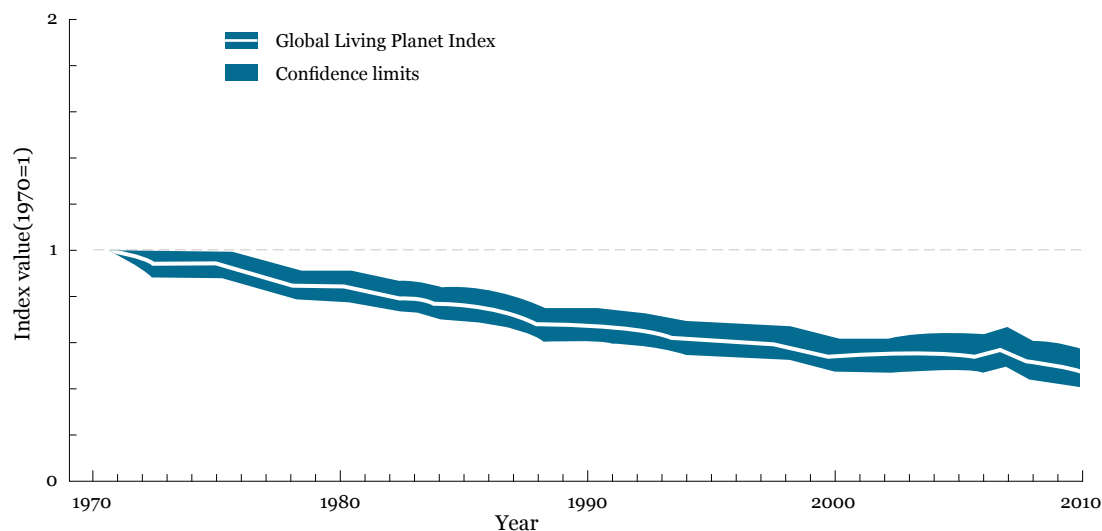


Figure 1.1 Global Living Planet Index of 2014

Data source: WWF, Zoological Society of London, 2014

The global LPI provides a quantitative reference for drafting the principles, strategies and policy framework for the protection of global biodiversity. The Index reflects the responses of biodiversity in different ecosystems to human interference and environmental variation. The information on population trends in the LPI database provides a rich reference source for evaluating the status of species, and identifying where management actions need to be taken.

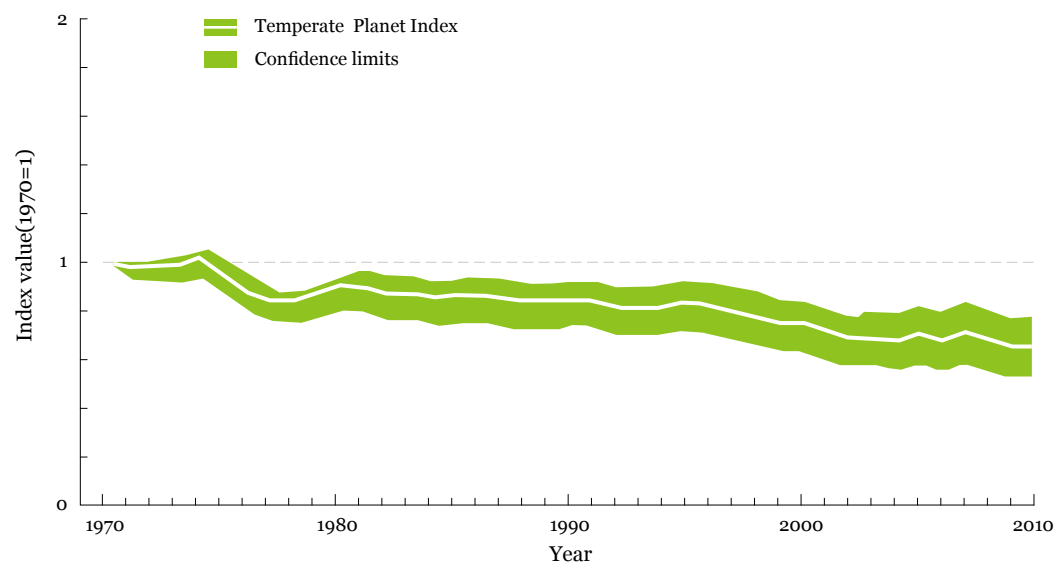


Figure 1.2 The Temperate Living Planet Index of 2014

Data source: WWF, Zoological Society of London, 2014

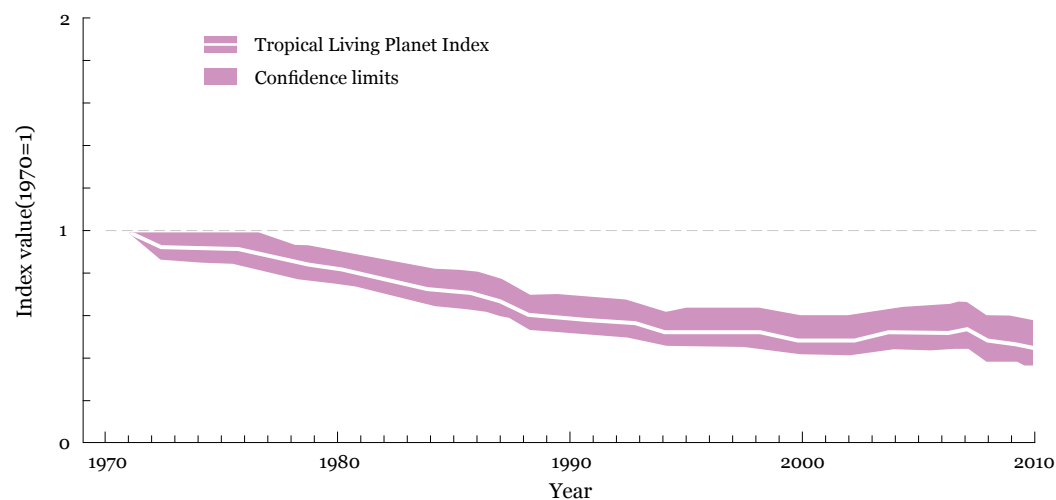


Figure 1.3 The Tropical Living Planet Index of 2014

Data source: WWF, Zoological Society of London, 2014

China's Current Situation and Analysis

The Index of Population Trends of Chinese Terrestrial Vertebrates

China ranks the eighth among the twelve globally recognized "mega-diversity" countries, having more than 30,000 higher plant species (of which 50% are endemic to China), and 6,347 vertebrate species. These figures account respectively for 10% and 14% of the total number of recorded global species. With few parts of the country affected by the last Ice Age, China has abundant relict and endemic species and the most unique fauna in Southeast Asia. The Hengduan Mountainous Region in Southwest China is one of the 25 biodiversity hot spots around the globe. However, China is also one of the countries that has suffered from the highest biodiversity losses. While China has recognized the severity of the loss of biodiversity, and has made important efforts to reverse this trend, there is still no quantitative description of the state-level biodiversity losses, the reasons and processes for the losses in various historical periods, or the effectiveness of protection policies and actions in each period.

Launched in 2012, "Library of Chinese Vertebrate Population Trends", has built on and adapted recognized biodiversity monitoring and evaluation methods, such as the LPI, to track population trends in China's vertebrate species. The Library provides a database on the status of China's ecosystem biodiversity and enables the extent of China's biodiversity loss since 1970 to be quantified. Information on vertebrate population sizes in the database is collected from domestic and foreign published academic papers, monographs, government reports, investigation reports of various conservation areas, as well as databases and species distribution and population records officially

published or released by authorities and organizations. By 2014, the Library of Chinese Vertebrate Population Trends' had recorded information on trends in 2,419 populations of 682 vertebrate species, of which 170 are mammals, 280 are birds, 62 are amphibians and reptiles, and 170 are fish. Together these account for 11.11% of the total number of Chinese vertebrate species. The population information in the database covers all administrative areas in China, except for Taiwan, Macau and Hong Kong (Figure 1.4).

The calculation of the Chinese vertebrate population index is based on the global LPI and the published state and regional LPI calculation method (Martin and Collen, 2010; McRae et al., 2010). China's geographical faunas and their complexity have been taken into consideration for species selection and in conducting stratified analyses and the index has been adapted based on the distribution of Chinese species and on their biological and ecological characteristics.



Figure 1.4 The geographical distribution of animal populations in the Chinese terrestrial vertebrate population time series database

Data source: Institute of Zoology, Chinese Academy of Sciences, 2015

Based on trends in 1,385 populations of 405 fish, mammal, amphibian and reptile species, the index of population trends of China terrestrial vertebrates indicates that the size of Chinese terrestrial vertebrate populations decreased by 50% from 1970 to 2010.

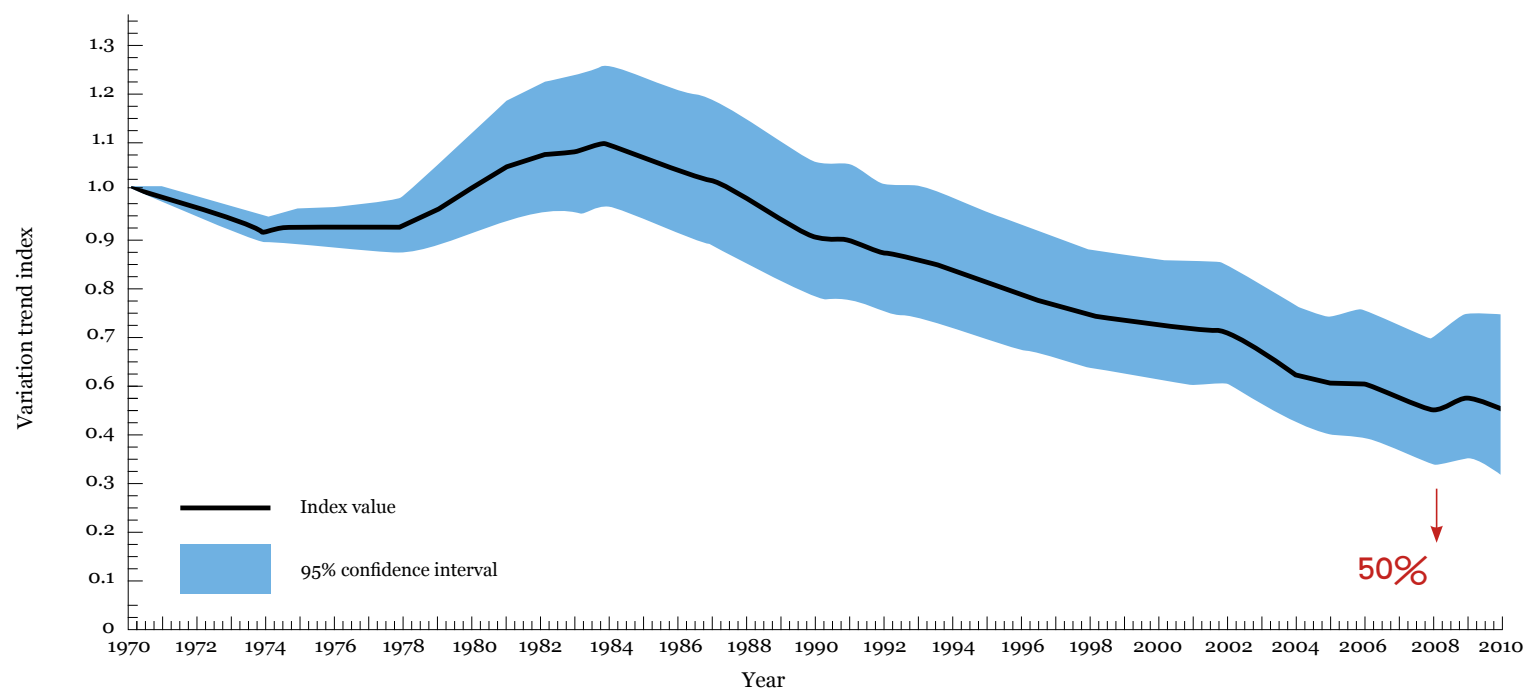


Figure 1.5 Index of population trends of Chinese terrestrial vertebrates (1970~2010)

Data source: Institute of Zoology, Chinese Academy of Sciences, 2015

(1) Index of population trends of Chinese amphibians and reptiles

Based on trends in 98 populations of 60 amphibian and reptile species, the index indicates that China's amphibian and reptile populations declined continuously from 1970 to 2010. The decline slowed down at the turn of this century, but by 2010, the index had decreased by 97%.

Reasons for the extreme downward trend in Chinese amphibian and reptile populations include: excessive hunting for traditional Chinese medicines; habitat loss and fragmentation; population isolation and traffic deaths caused by the development of highway networks and climate change.

(2) Index of population trends of Chinese resident birds

Based on trends in 312 bird populations of 184 resident breeding birds in China, the index suggests that the bird population remained relatively stable from 1970 to 2000, and increased notably in the early part of this century, though with strong fluctuations. Overall, from 1970 to 2010, the population size increased by 43%.

The reasons the bird population remained stable and even climbed, while the populations of other vertebrates have declined include: the shelter effect of reserves; increased number of reserves and the protection effect of laws and regulations. The number of birds in China had significantly dropped before 1970.

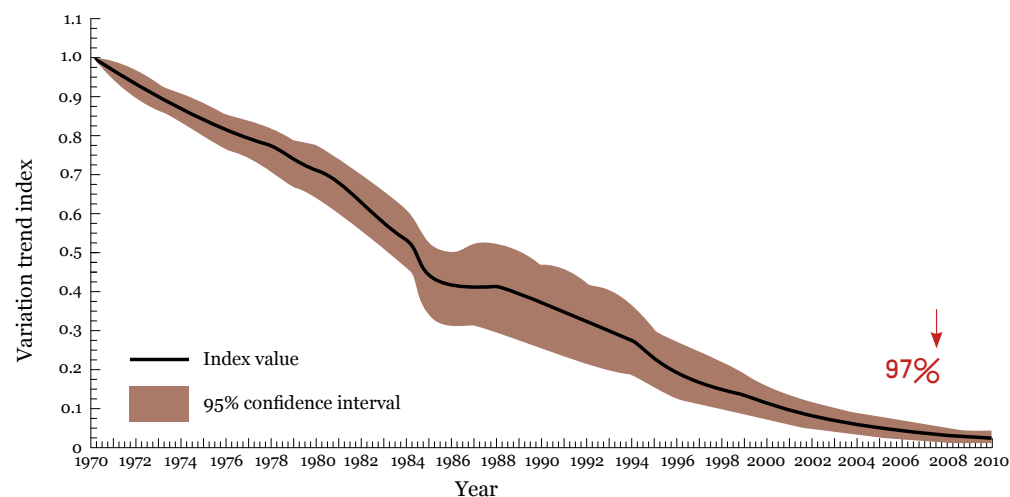


Figure 1.6 Index of population trends of Chinese amphibians and reptiles (1970-2010)

Data source: Institute of Zoology, Chinese Academy of Sciences, 2015

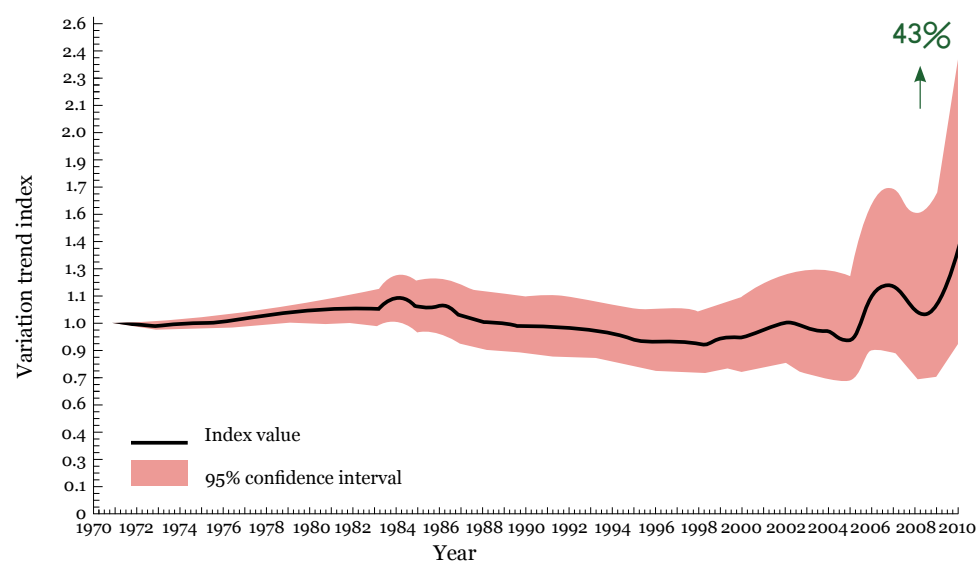


Figure 1.7 Index of population trends of Chinese birds (1970-2010)

Data source: Institute of Zoology, Chinese Academy of Sciences, 2015

(3) Index of population trends of Chinese mammals

Obtained from trends in 977 populations of 161 mammal species, the index indicates that China's mammal population dropped by 50% from 1970 to 2010.

Subdivision of the trend in terrestrial mammal populations by biome

Animals with limited ranges that are highly dependent on specific environments are particularly influenced by the health of their host ecosystems. Trends in mammal populations tracked by the Library of Chinese Vertebrate Population Trends reflect ecosystem health and species composition in different areas and over time. Data on mammal populations are the most abundant in the Library and best suited to further interpretation and analysis through subdivision by biome.

● **Index of population trends of forest ecosystem mammals**

Obtained from trends in 268 populations of 90 forest mammal species, the index has decreased by 78% from 1970 to 2010. The reasons for the drastic decline in populations of forest mammals include: excessive hunting; shrinkage in natural forests; dense population and rapid development as well as drought and desert expansion in the northern hemisphere.

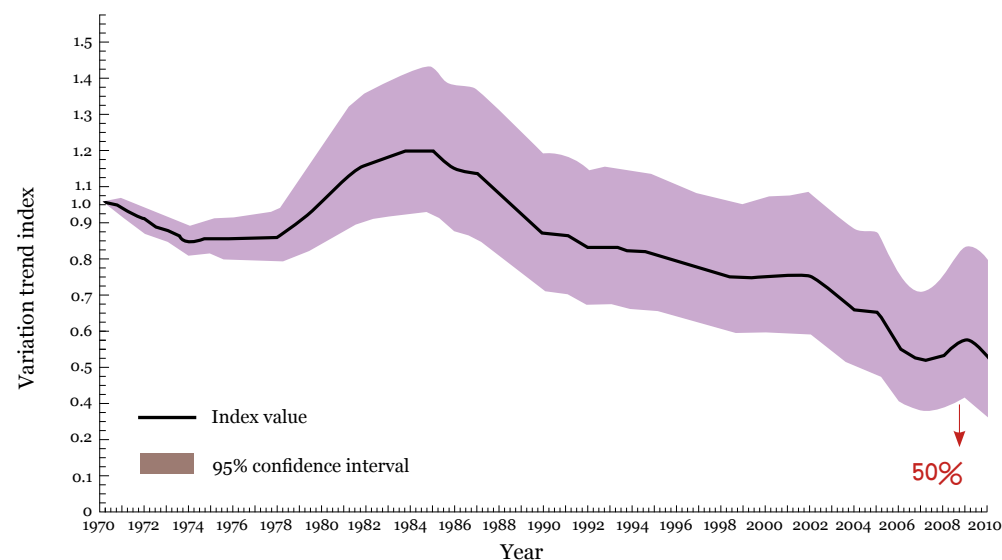


Figure 1.8 Index of population trends of Chinese mammals (1970~2010)

Data source: Institute of Zoology, Chinese Academy of Sciences, 2015

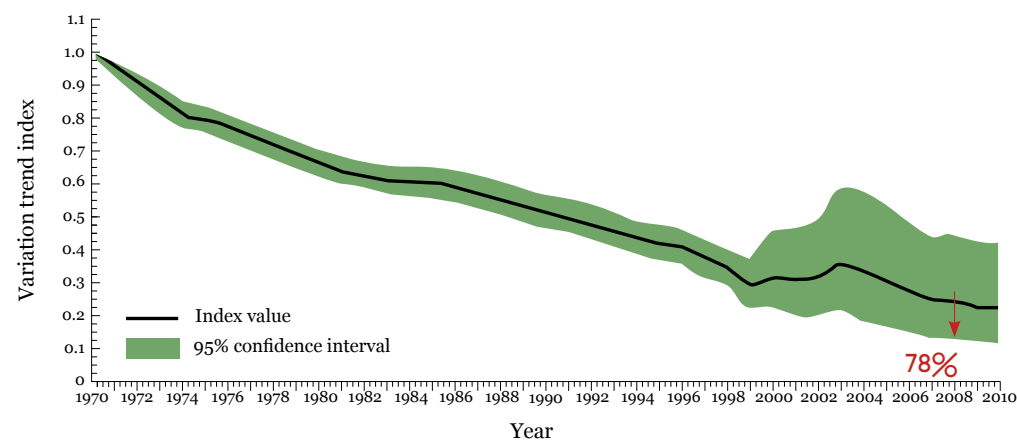


Figure 1.9 Index of population trends of forest ecosystem mammals (1970-2010)

Data source: Institute of Zoology, Chinese Academy of Sciences, 2015

- **Index of population trends of prairie and desert ecosystem mammals**

Estimated from trends in 348 populations of 60 mammal species living in Chinese prairie and desert ecosystems, the index has increased by 26% from 1970 to 2010.

The reasons why prairie and desert mammals have thrived include: drought and desert expansion in the northern hemisphere; sparse population and undeveloped economy; adaptation strategy of desert species to the environment and global climate change.

- **Index of population trends of mammals in farmland and urban ecosystems**

Estimated from trends in 336 populations of 43 mammal species living in farmland and urban ecosystems, the index grew rapidly in the late 1990s, before stabilizing, and then started to drop early this century. The index decreased by 38% from 1970 to 2010. These trends are explained by the predominance in farmland and urban ecosystems of rats and rodents whose population size is strongly influenced by the nature and intensity of human activities. The population of all animals greatly declined following the natural disasters and the historic havoc of the 1960s and the 1970s. Populations of rats and mice recovered and stabilized as habitats improved with the development of agriculture after the reform and opening-up initiative was rolled out. There have been ongoing efforts to eliminate rats and mice, as pests and disease carriers, and extensive use of pesticides and deratting techniques have gradually reduced their populations.

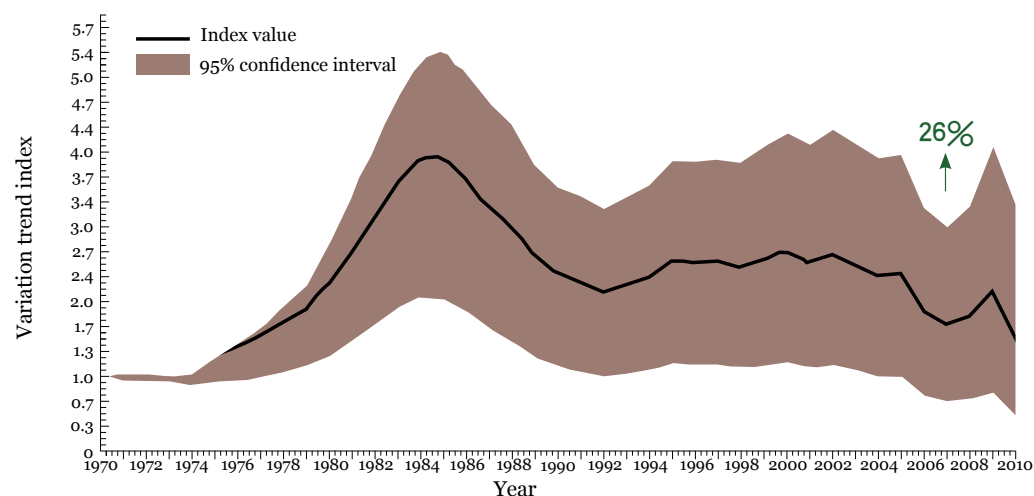


Figure 1.10 Index of population trends of prairie and desert ecosystem mammals (1970-2010)

Data source: Institute of Zoology, Chinese Academy of Sciences, 2015

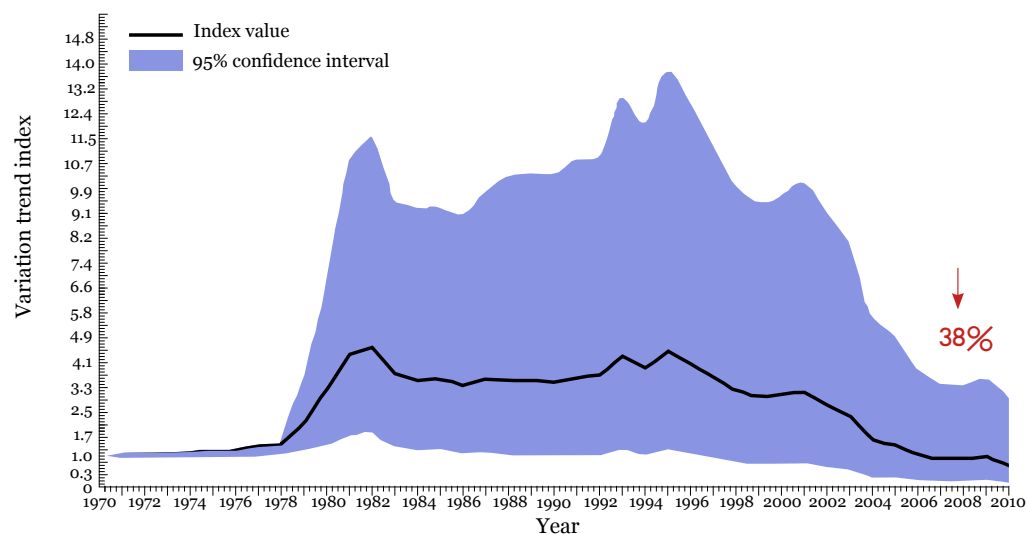


Figure 1.11 Index of population trends of mammals resident in farmland and urban areas (1970-2010)

Data source: Institute of Zoology, Chinese Academy of Sciences, 2015

Ecological Footprint

The Ecological Footprint adds up the ecological goods and services people demand that compete for space. It includes the biologically productive area (or biocapacity) needed for crops, grazing land, built-up areas, fishing grounds and forest products. It also includes the area of forest needed to absorb additional carbon dioxide emissions that cannot be absorbed by the oceans. Both biocapacity and Ecological Footprint are expressed in a common unit called a global hectare (gha).

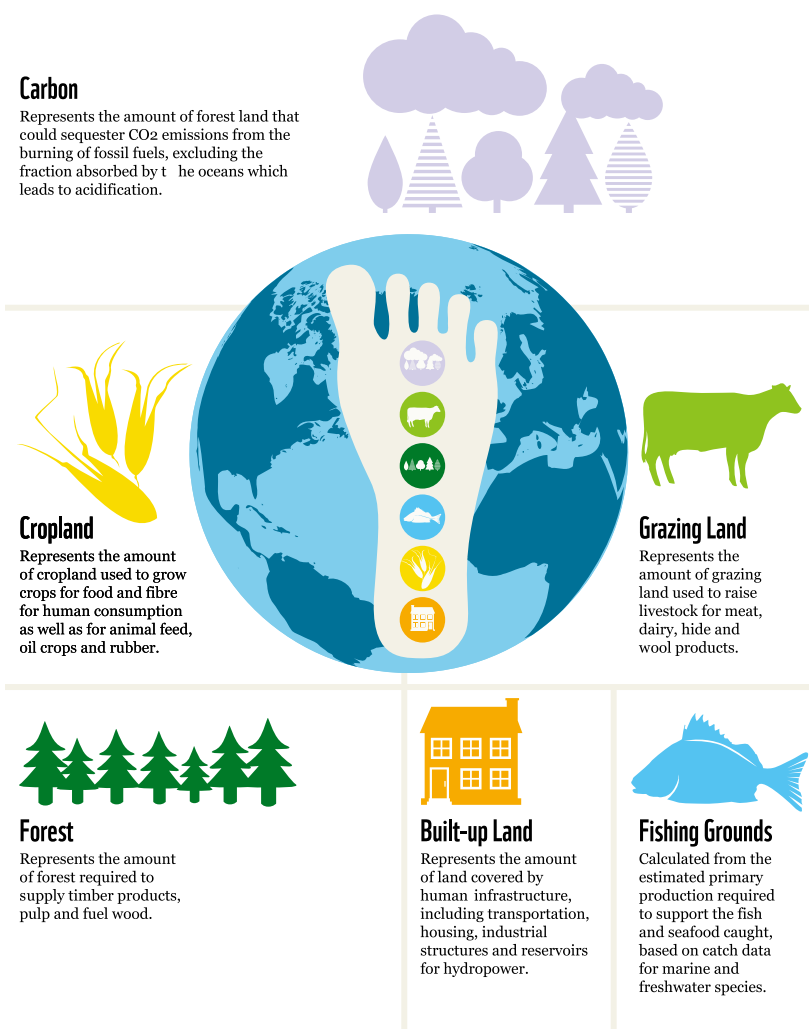


Figure 1.12 Components of the Ecological Footprint

Every human activity uses biologically productive land and/or fishing grounds. The components of the Ecological Footprint are: cropland, grazing land, forest land, built-up land, fishing grounds and carbon.

Data source: Global Footprint Network, 2001

Global Context

In the 1970s, humanity entered a state of global ecological overshoot where the Ecological Footprint of humans exceeded the biocapacity of the Earth. Since then, overshoot has increased to the point where approximately 1.5 Earths are required to provide the biocapacity demanded by humanity. Nature may endure short periods of ecological overshoot with minimal signs of loss; however, continuing to operate with an ecological deficit—by harvesting renewable resources faster than they can regenerate—can have major environmental implications, including degradation of ecological assets, and depletion of natural reserves, biodiversity loss, and ecosystem collapse (LPR 2014).

The size and composition of a nation's per capita Ecological Footprint reflects amount and types of goods and services used by an average person in that country, including the energy used in providing those goods and services. The carbon component represents more than half the Ecological Footprint for a quarter of all countries tracked and is the largest single component of Footprint for approximately half of all countries tracked.

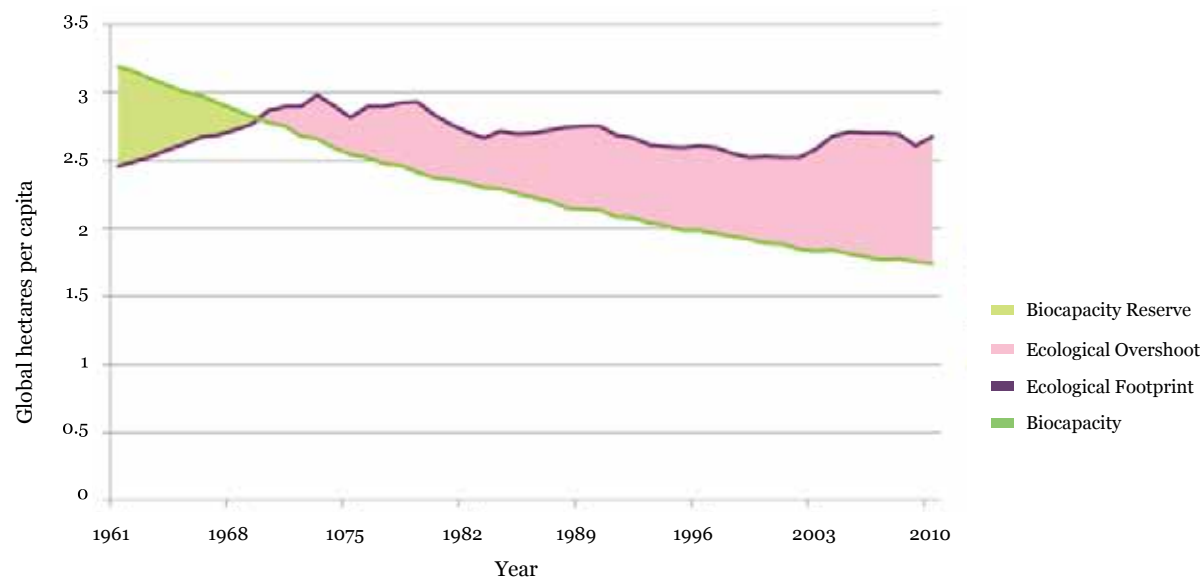


Figure 1.13 Trends in global Ecological Footprint and biocapacity per person between 1961 and 2010 (Global Footprint Network, 2014).

Data source: Global Footprint Network, 2014

A nation's demand for ecological goods and services can exceed what its own ecosystems supply, creating an ecological deficit. Nations can operate with an ecological deficit in three ways: by drawing down their own stocks of ecological capital; by importing products and thus using the biocapacity of other nations; or by exploiting the global commons, such as by releasing carbon dioxide

emissions from fossil fuel burning into the atmosphere. Some nations overdraw their own biocapacity for export while simultaneously importing additional biocapacity from elsewhere. It is not possible for all nations to be net importers and nations that compete for imports to meet their domestic demands face the risk of resource scarcity.

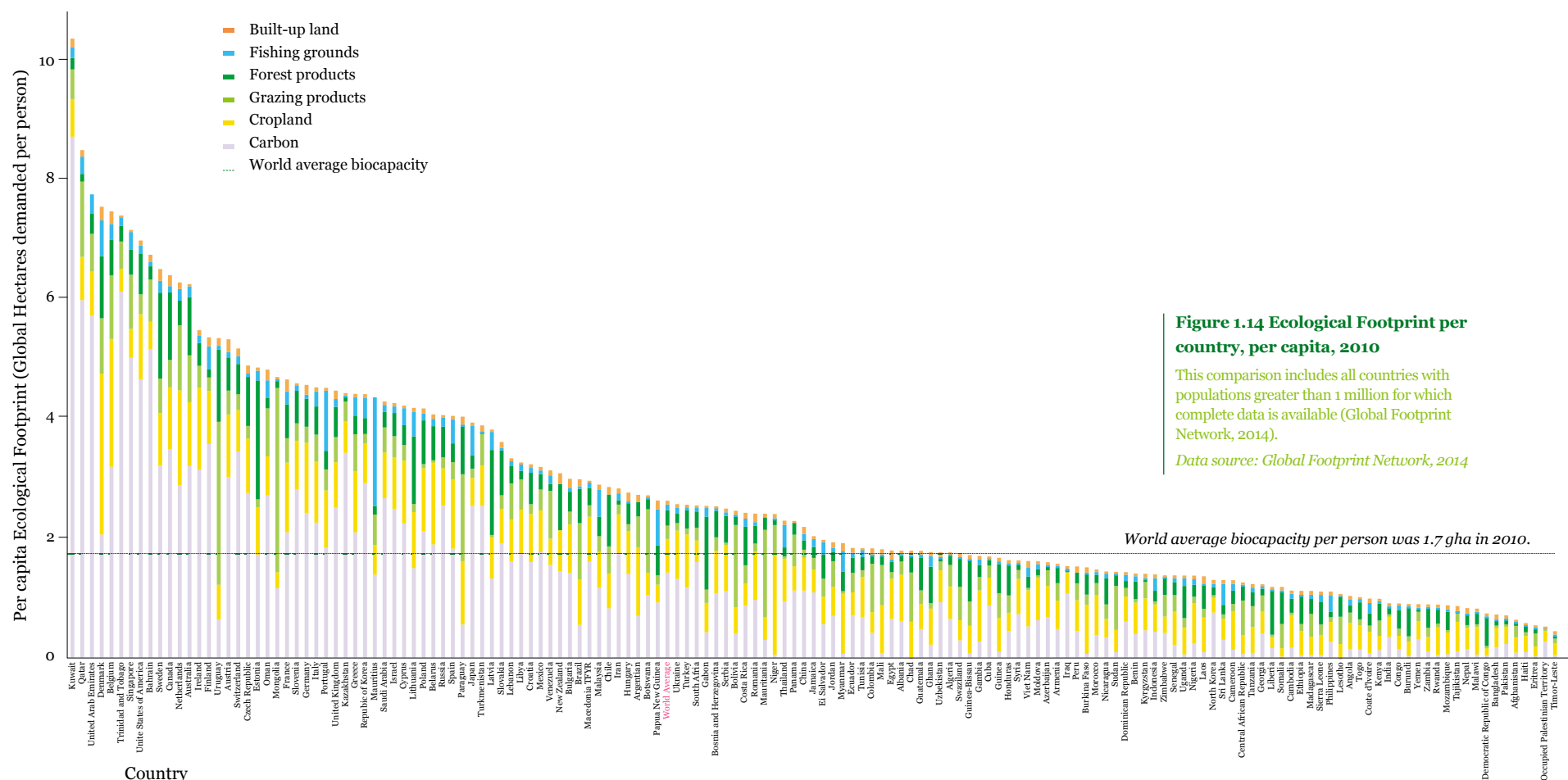


Figure 1.14 Ecological Footprint per country, per capita, 2010

This comparison includes all countries with populations greater than 1 million for which complete data is available (Global Footprint Network, 2014).

Data source: Global Footprint Network, 2014

Ecological Footprint of Different Economic Regions

Globally, total biocapacity is 1.2 times larger in 2010 than it was in 1961. However, the world population more than doubled during the same period, and as a result, the available biocapacity per person decreased by 46% from 3.2 to 1.7 gha (Figure 1.15). In all economic regions, population growth played a greater role than the increase in per capita Ecological Footprint in the increase in total Ecological Footprints. For the BRIC countries, population increased by 105% from 1961 to 2010. This was the second-lowest population increase compared to OECD countries, whose population increased by 59%. The greatest relative increase in population, at 277%, was in the African Union (AU) countries.

The per capita Ecological Footprint increased by 32% within BRIC countries, this was the second largest increase compared to ASEAN countries whose per capita Ecological Footprint increased by 41%. The African Union was the only group of countries whose per capita Ecological Footprint saw an overall decrease in this period (-3 %).

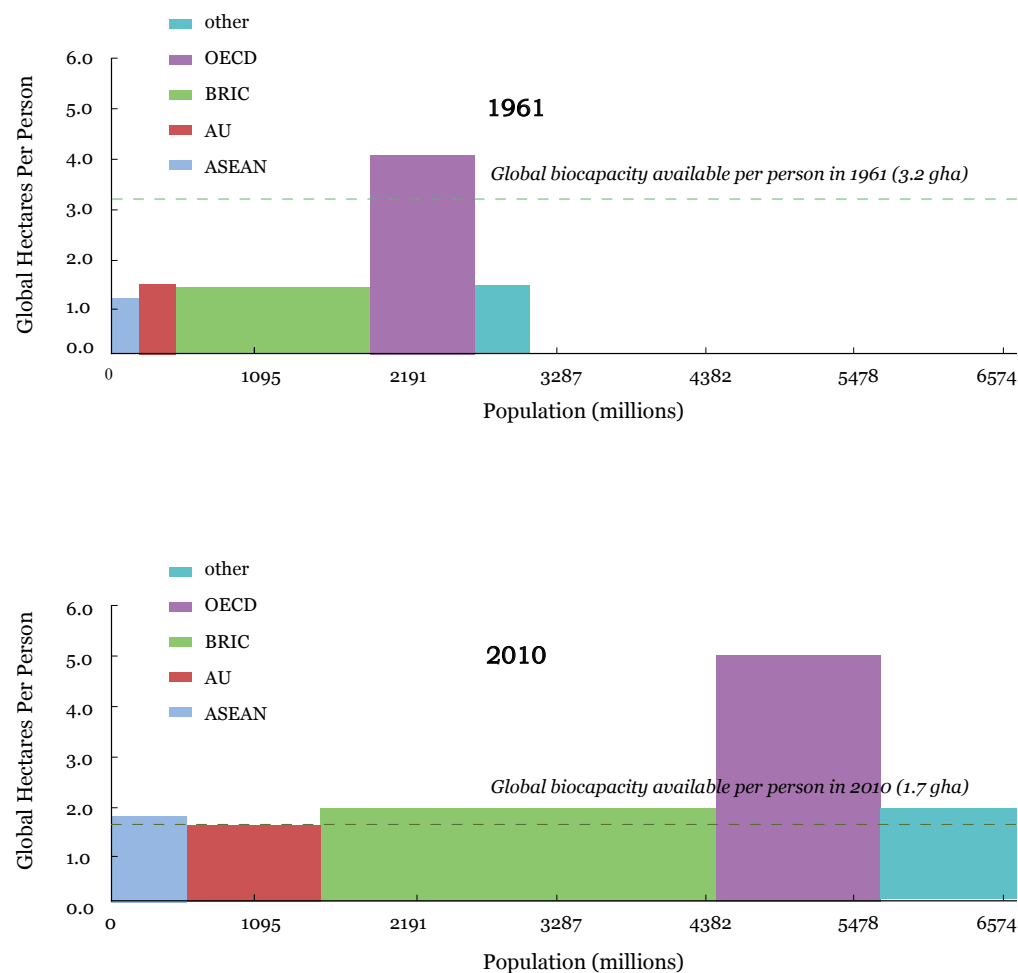


Figure 1.15 Ecological Footprint of economic regions (BRIC, OECD, AU, ASEAN) in 1961 and 2010.

“Other” includes the 133 countries not included in those economic regions. The size or area of each box represents the total Ecological Footprint of that region (per person Ecological Footprint x total population). The width of the bar indicates the population of the region, and the height of the bar indicates the per capita consumption within that region.

Data source: Global Footprint Network, 2014

The total biocapacity of ASEAN, AU, BRIC, and OECD country groups has increased from 1961 to 2010; however, the distribution of biocapacity across these regions has shifted. Overall, ASEAN, AU and “other” countries have increased their share of global biocapacity while OECD and BRIC countries have decreased their relative share. BRIC countries now hold a 3% smaller share of global biocapacity than they did in 2010.

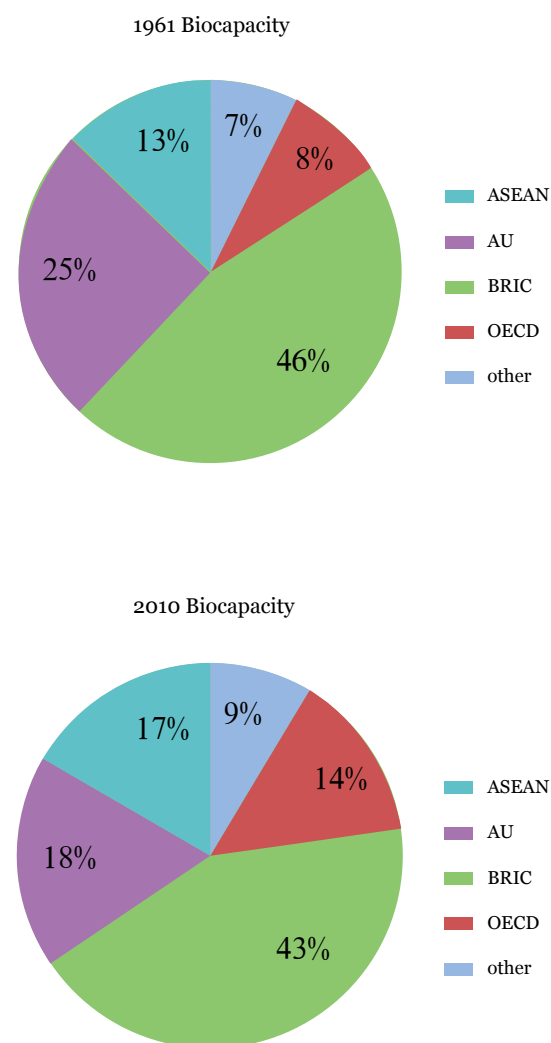


Figure 1.16 Global biocapacity share by economic region

Data source: Global Footprint Network, 2014

Ecological Footprint in China

The per capita Ecological Footprint of China has increased at a steady rate since 1961. This trend continued with larger variability throughout the 1990s, and starting in the early 2000s, China's per capita Ecological Footprint grew rapidly, concurrent with a period of massive economic growth (Figure 1.17). In 2010, the average Chinese resident required 2.2 gha of productive land to provide the environmental goods and services they used. While this was smaller than the global average Ecological Footprint of 2.6 gha, it was more than twice the per capita biocapacity available in China in 2010 (1.0 gha), indicating that the bio-productive areas within China were not able to provide the renewable resources and services for consumption by its population.

China is hardly alone in such ecological overspending. China has the largest share of the world's overall Ecological Footprint, followed by the United States and India. However, China's population is four times that of the United States.

Indeed, different regions of the world are endowed with different resources. In a globalized world, countries meet their demand for resources through trade. As resources become increasingly limited, countries running an ecological deficit can be exposed to economic risk if the costs of imports rise.

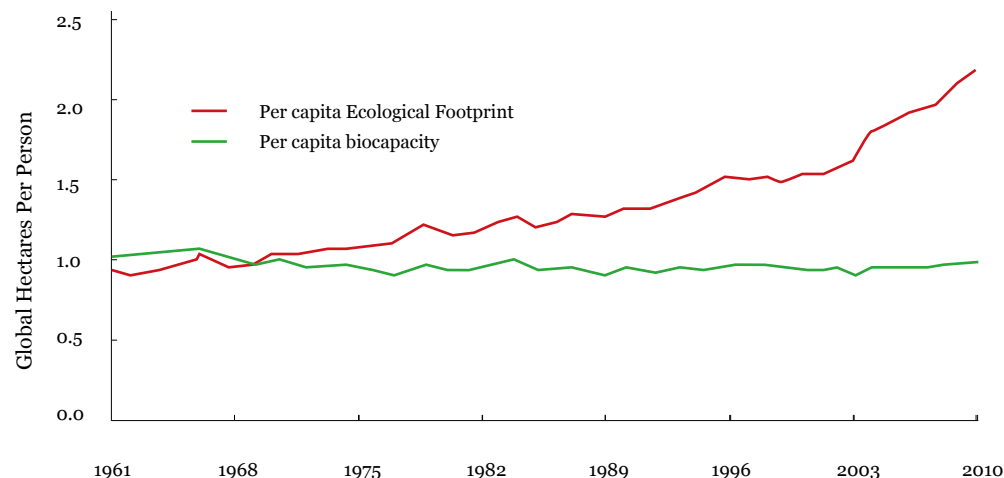


Figure 1.17 Per capita Ecological Footprint and biocapacity for China

Data source: Global Footprint Network, 2014

Countries can generate or exacerbate an ecological deficit if they emit more carbon dioxide into the atmosphere than their own ecosystems can absorb, as measured by the carbon Footprint.

Countries in this situation, including China, the United States and many others, are more exposed to the risks of fossil fuels and carbon emissions from fossil fuels becoming more expensive.

Cropland was the largest component of the Ecological Footprint in China until the late 1980s. Since then the carbon Footprint has become the largest and fastest growing component of China's Ecological Footprint. Along with rapid economic growth during this period, there was a massive increase in energy consumption in China, which is a major driver of the carbon Footprint. Fluctuations in the 1990s and increased growth rate of the Ecological Footprint per person in the 2000s are primarily due to changes in the per person carbon Footprint. In 2010 carbon Footprint comprised 51% of the total Ecological Footprint, closely followed by crop land, which comprised 25% (Figure 1.18). The remaining Footprint components have increased with the exception of forest land, which has decreased by 19% since 1961 as the average Chinese resident consumes fewer forest products.

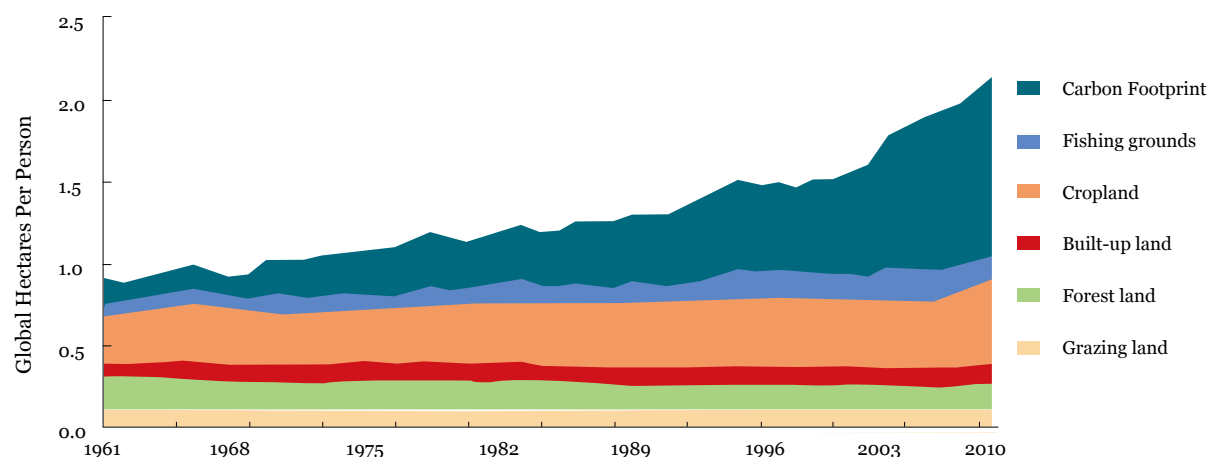


Figure 1.18 China's Ecological Footprint components, 1961-2010
(Global Footprint Network, 2014).

Data source: Global Footprint Network, 2014

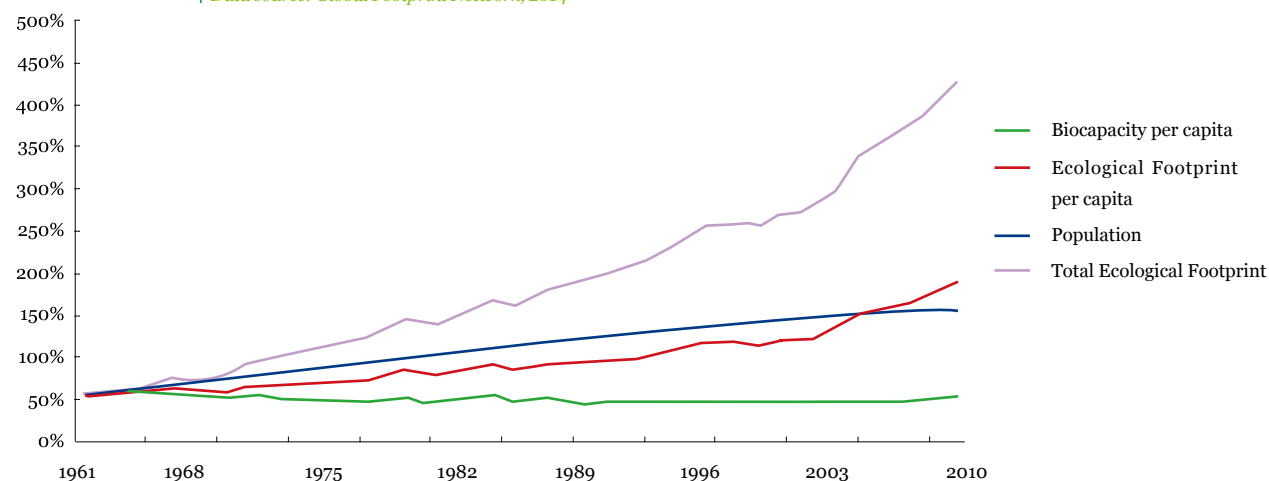


Figure 1.19 Analysis of drivers of China's biocapacity deficit since 1961

Data source: Global Footprint Network, 2014

The Biocapacity and Ecological Footprint of Each Province

The spatial distribution of biocapacity in China is relatively stable. In 2012, half of the country's biocapacity was still concentrated in nine provinces, namely Shandong Province, Henan Province, Inner Mongolia Autonomous Region, Sichuan Province, Heilongjiang Province, Yunnan Province, Hebei Province, Jiangsu Province, and Hunan Province (shown in Figure 1.20). The proportion of biocapacity found in Shandong Province and Henan Province has decreased by 0.1-0.3% compared to 2010, while that in Heilongjiang Province, Yunnan Province and Liaoning Province has gone up. The proportion in other provinces has seen little change.

These changes reflect differing development pathways in the different regions, and, in particular, the effects of urbanization. The total biocapacity in most regions of China increased from 2010 to 2012. The highest growth in biocapacity occurred in three provinces in Northeast China (Heilongjiang Province, Jilin Province and Liaoning Province), two provinces in North China (Inner Mongolia Autonomous Region and Shanxi Province), and one province in Southwest China (Yunnan Province) (shown in Figure 1.21). In contrast the total biocapacity of ten provinces, including Shandong Province, Henan Province, Zhejiang Province, Fujian Province, Ningxia Hui Autonomous Region, and Xinjiang Uygur Autonomous Region has declined to varying degrees. Factors contributing to this decline include the influence of climate and land use changes including urban expansion.

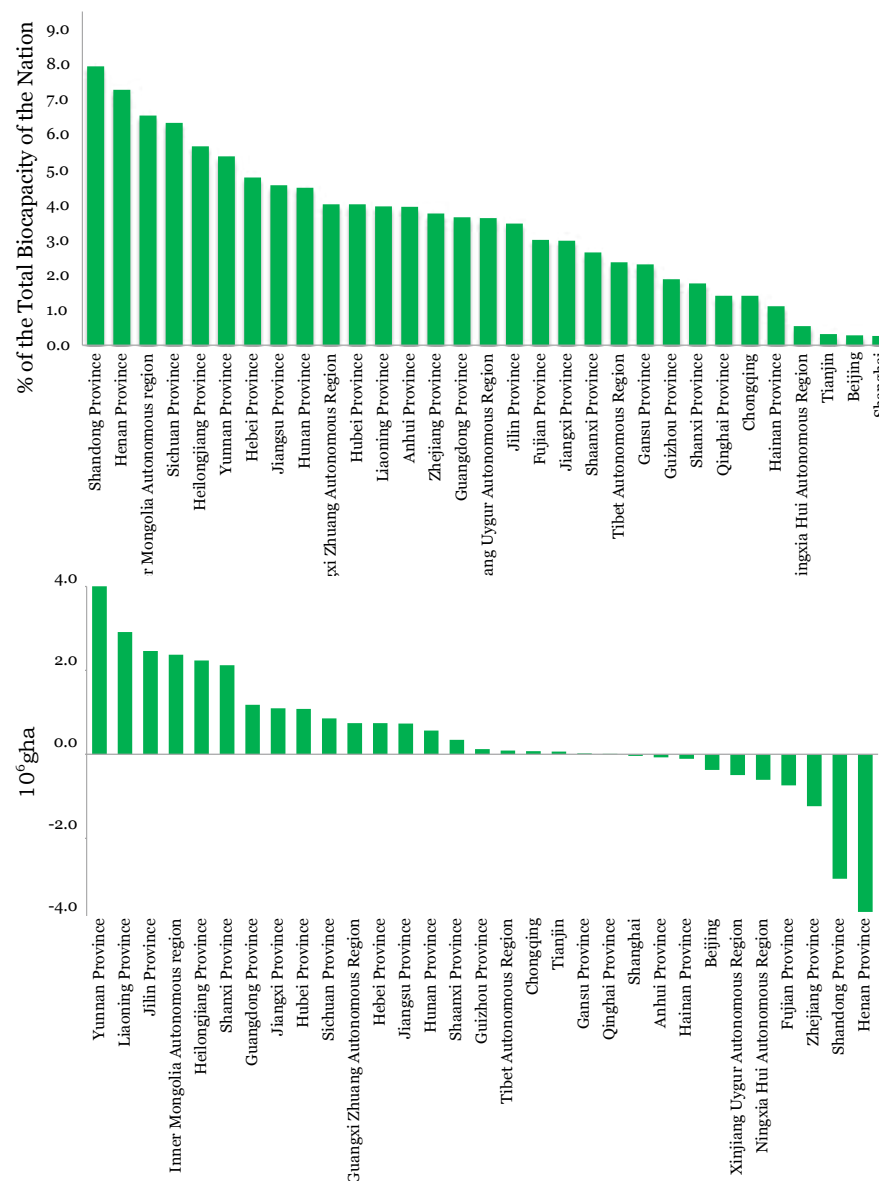


Figure 1.20 Total biocapacity of all provinces in mainland China (2012)

The nine provinces with the largest total biocapacity account for 50% of the national biocapacity.

Data source: IGSNRR, 2014

Figure 1.21 Variation of the total biocapacity of each province in mainland China over the period 2010-2012

Two-thirds of Chinese provinces saw an increase in biocapacity over the period 2010-2012. The greatest increases were in three provinces in Northeast China (Heilongjiang Province, Jilin Province and Liaoning Province), two provinces in North China (Inner Mongolia Autonomous Region and Shanxi Province), and one province in Southwest China (Yunnan Province). The central government should give more ecological compensations to provinces that have contributed to the increase in ecological services.

Data source: IGSNRR, 2014

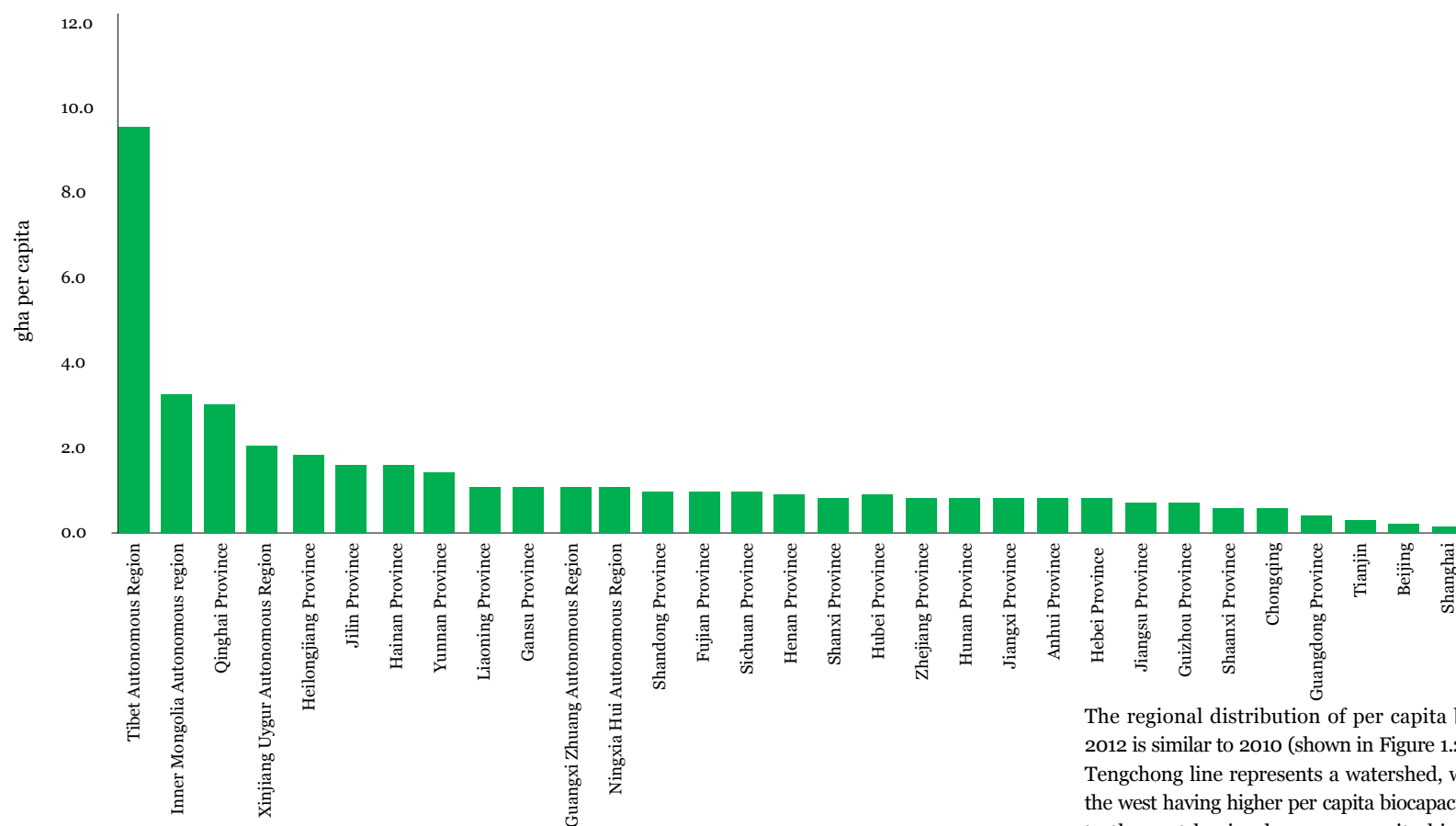


Figure 1.22 Per capita biocapacity of all provinces in mainland China (2012)

Affected by both population distribution and ecological resource distribution, Chinese provinces with relatively high per capita biocapacity, such as the Tibet Autonomous Region, Qinghai Province, Inner Mongolia Autonomous Region, and Xinjiang Uygur Autonomous Region, are mainly located to the west of the Aihui-Tengchong line. Provinces to the east of the Aihui-Tengchong line have relatively low per capita biocapacity. This east-west divide in the distribution of per capita biocapacity has been a longstanding characteristic.

About two thirds of provinces have experienced changes of one or two places in the national ranking of biocapacity, compared to 2010.

Data source: IGSNRR, 2014

The regional distribution of per capita biocapacity in 2012 is similar to 2010 (shown in Figure 1.22). The Aihui-Tengchong line represents a watershed, with regions to the west having higher per capita biocapacity and regions to the east having lower per capita biocapacity. The combined influence of variation in population growth rate and difference in biocapacity growth rate has changed the rankings of many provinces on the per capita biocapacity ranking list. Most of the changes fall within one to two places, with the exception of Liaoning Province whose per capita biocapacity moved forward by four places over the two year period owing to the combined effect of low population growth and high biocapacity increase.

There are notable variations in Ecological Footprint between provinces (shown in Figures 1.23 and 1.24), with provinces in East China having higher per capita Ecological Footprints than those in Central and West China. This difference is influenced by social and economic development variations between provinces, differing natural environments and geographical settings and varying dietary preferences. The increase in per capita Ecological Footprint is relatively small compared to the per capita economic wealth of each province in China. This may be related to China's deep-rooted tradition of frugality. The per capita Ecological Footprint increase in Northern provinces from 2010 to 2012 was around 0.4 gha or above, reflecting the combined effect of the increased availability of commercial energy and increased domestic energy demand for household cleaning appliances and temperature regulation. The average increase in the per capita Ecological Footprint in other provinces is around 0.2-0.3 gha. The per capita Ecological Footprint in Beijing and Shanghai has started to drop as a result of improved energy efficiency.

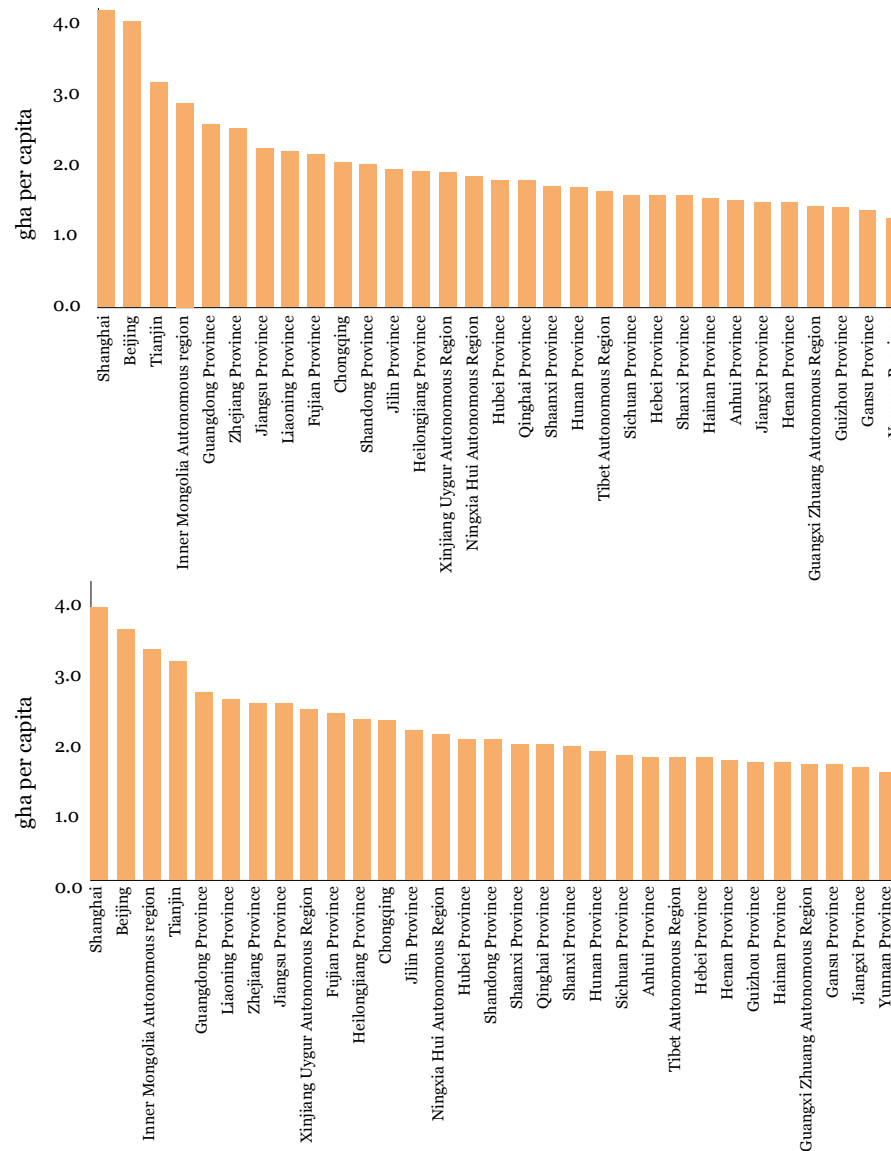


Figure 1.23 Per capita Ecological Footprint of provinces in mainland China (2010)

Regional per capita Ecological Footprints differ markedly between the Eastern and Western parts of China. In general, the per capita Ecological Footprint of eastern provinces is relatively high, while that of the western and central provinces is relatively low.

Data source: IGSNRR, 2014

Figure 1.24 Per capita Ecological Footprint of provinces in mainland China (2012)

The per capita Ecological Footprint in Beijing and Shanghai dropped in 2012 compared to 2010, mainly as a result of improved energy efficiency.

Data source: IGSNRR, 2014

The distribution of the total Ecological Footprint varies significantly amongst regions. The highly populous provinces located in Central and Eastern China typically have larger Footprints (shown in Figure 1.25). Five provinces – Guangdong Province, Jiangsu Province, Shandong Province, Henan Province and Sichuan Province – account for 35% of the China's total Ecological Footprint.

Carbon footprint continues to be the main component driving the increase in the Ecological Footprint in individual provinces and in China as a whole (shown in Figure 1.26). Carbon footprint accounts for more than 50% of the regional Ecological Footprint in all provinces except for Tibet. The carbon Footprint of a province comprises direct energy consumption by households as well as carbon embedded in goods and service consumed, which is determined by the energy intensity and the energy conversion efficiency involved in the production of those goods and services. About half of the provinces in China saw a decline in the percentage of carbon Footprint in their regional Ecological Footprint between 2010 and 2012, reflecting government action of taking the energy intensity and carbon intensity as the hard constraining standards of development. There is potential to reduce the rates of growth in the carbon Footprint at household level and in production of goods and services.

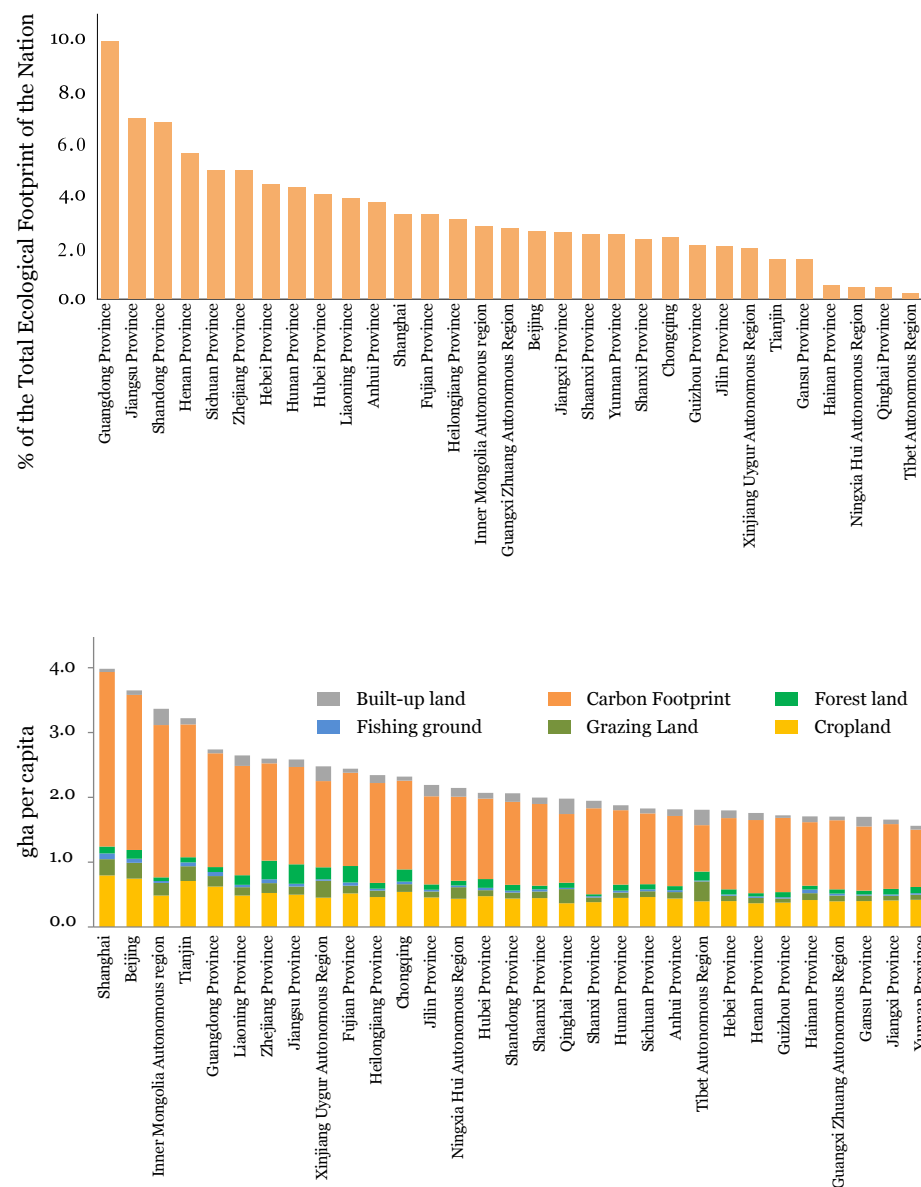


Figure 1.25 Total Ecological Footprint of provinces in mainland China (2012)

The rankings of provinces by total regional Ecological Footprint changed between 2010 and 2012. This change was more strongly influenced by population changes than by change in per capita Ecological Footprint. Guangdong Province's total Ecological Footprint has dropped a little as a result of displacement of its industrial structure, and the resulting decline in the rate of population growth.

Data source: IGSNRR, 2014

Figure 1.26 Components of the Ecological Footprint in provinces in mainland China (2012)

The carbon Footprint is a main component of the Ecological Footprint of residential consumption. Much of the carbon Footprints is indirect in nature and is hidden in the non-energy commodities and services used by households. Compared to 2010, the carbon Footprint percentage of about half of Chinese provinces of the regional Ecological Footprint dropped in 2012. Nationwide efforts to control carbon intensity through indexing have played an important role in this change.

Data source: IGSNRR, 2014

Six provinces in China had an ecological surplus in 2010 (shown in Figure 1.27), meaning that their regional biocapacity exceeded their Ecological Footprint or, in other words, that regional biocapacity could meet the consumption demands of the local population. However, by 2012, just two provinces - the Tibet Autonomous Region and Qinghai Province - had an ecological surplus (shown in Figure 1.28). The per capita ecological deficit in the Inner Mongolia Autonomous Region, Yunnan Province and Hainan Province is very small at around 0.15 gha. Large-scale ecological construction in these three provinces is expected to bring about a rapid return to ecological surplus. The nature of resource development and industrial transformation in the Xinjiang Uygur Autonomous Region means it is less likely to return to ecological surplus in the immediate future. With regard to Footprint components, seven provinces (Guangdong Province, Jiangsu Province, Zhejiang Province, and the four municipalities under direct control of the Central Government -- Chongqing, Beijing, Shanghai and Tianjin) are in deficit based on their demands for food production alone. These provinces are at more immediate risk of local environmental degradation than those whose ecological deficit is represented by the shortage in land required for carbon absorption.

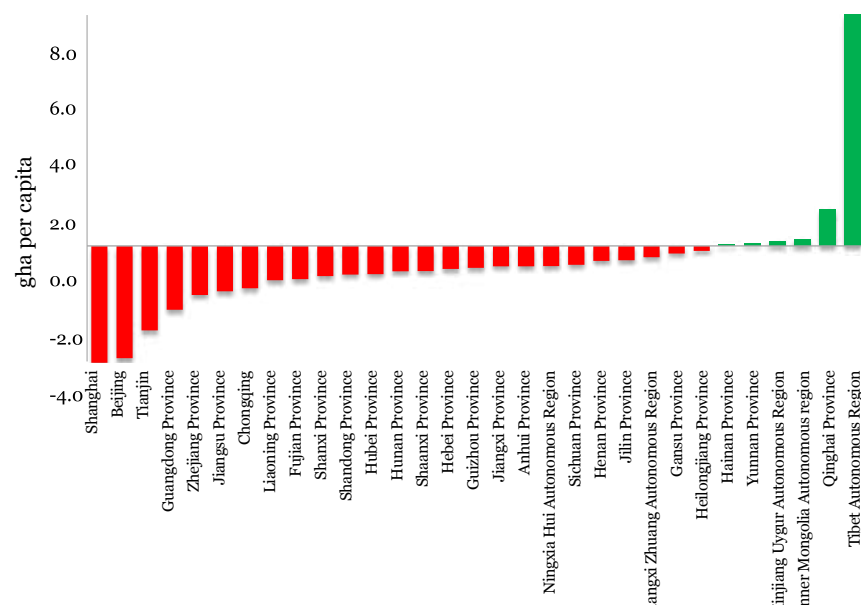


Figure 1.27 The ecological deficit/reserve of provinces in mainland China (2010)

The negative numbers (red bars) in the figure refer to ecological deficits, and the positive numbers (green bars) refer to ecological surpluses.

Data source: IGSNRR, 2014

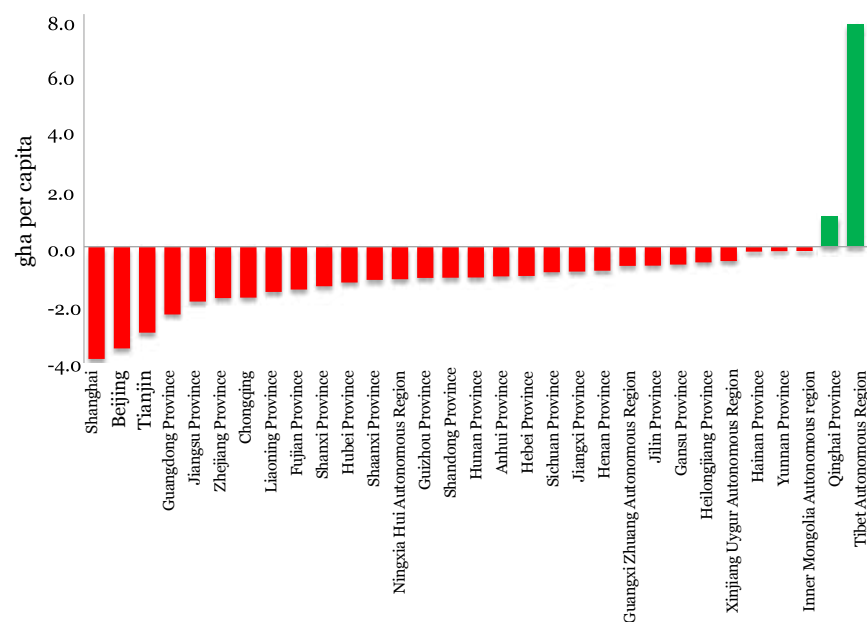


Figure 1.28 The ecological deficit/reserve of provinces in mainland China (2012)

The per capita ecological deficits of Beijing and Shanghai dropped between 2010 and 2012 while those of other provinces rose by varying degrees.

Data source: IGSNRR, 2014

Water Footprint(WWF)¹

Water is a critical natural resource for the development of human society and crucial to food security and ecosystem health. The strong links between these systems imply that we cannot focus on one factor for development at the price of another; rather, a coordinated approach to utilizing water in a sustainable manner is a prerequisite for healthy social development.

Complementing the Ecological Footprint, Water Footprint

measures the volume of water consumed in product manufacturing and service. It reflects the status of water resources in the ecosystem and provides a supporting tool for safeguarding and continuous use of energy, water and food.

Water Footprint expands the traditional approach to water resource assessment to describe in a consistent manner the demand exerted on water resources by human production and consumption activities in different areas. Water Footprint is comprised of three components: the blue Water Footprint, green Water Footprint and

grey Water Footprint. Blue Water Footprint refers to the volume of surface water and underground water consumed in agriculture through irrigation and in product manufacturing. Green Water Footprint mainly refers to the volume of natural precipitation existing in soil and used by crop growth. Grey Water Footprint refers to the volume of fresh water polluted as a result of production processes. Surface Water Footprint and underground Water Footprint can be distinguished according to the source of water resources used to grow crops or manufacture products.

Figure 1.29 components of Water Footprint

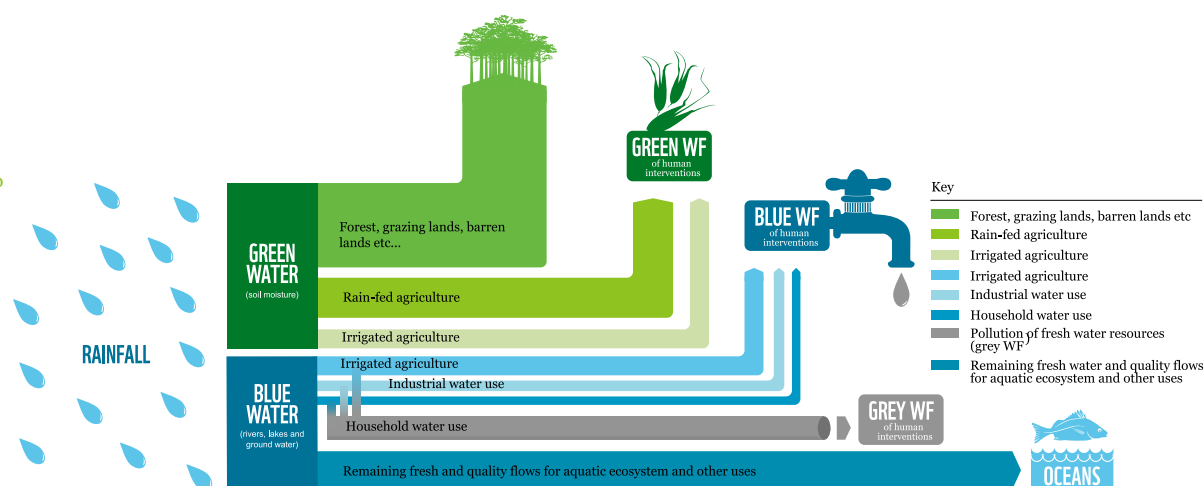
The Water Footprint comprises three components: green Water Footprint, blue Water Footprint and grey Water Footprint.

Green Water Footprint is the volume of rainwater that is taken up by crops from the soil and subsequently evaporated.

Blue Water Footprint is the combined volume of surface and underground water used in households, agriculture and during the production of goods.

Grey Water Footprint is the volume of water required to dilute water pollutants to such an extent that the quality of ambient water remains above designated quality standards.

Data source: African Ecological Footprint Report, WWF 2012



¹ This Section only calculates and lists 31 provinces of Mainland China due to data limitation.

Water Footprint of Production

The Water Footprint of production refers to the volume of water resources used in the production of crops and manufactured goods and in provision of services within a country or territory, regardless of the place where the products and services are consumed.

In 2010, China's Water Footprint of production was 1.15 trillion m³, of which, green water accounted for the highest proportion at 45%, blue water accounted for 29% and grey water accounted for 26%. In 2012, China's Water Footprint of production was 1.17 trillion m³, of which, green water accounted for 46%, blue water for 28% and grey water for 26%. As the largest proportion of China's of Water Footprint of production, green water plays a

critical role in water resource security and food security and is characterized by a low opportunity cost and small negative impact on the environment. In contrast, the grey Water Footprint is of immediate concern as a result of the pollution to the water environment resulting from industrial and agricultural production.

As in 2009, the Water Footprint of production varied significantly amongst provinces in 2010-2012 (Figure 1.31 and Figure 1.32). This is a result of interaction among a number of factors, including the social and economic development patterns of provinces, production activities, natural environments and geographical settings and dietary preferences of the population of a region. In general, the Water Footprint of production is higher in Chinese regions where agriculture is the mainstay of the economy. Large cities and regions with underdeveloped

agriculture have lower Water Footprints of production.

The distribution patterns of China's Water Footprint of production indicate that agriculture is a major water consumer. Food is the foundation for the survival of humanity and water resources underpin food security. This implies that safeguarding food security depends on the rational management of water resources, including groundwater in regions where surface water is scarce.

The Water Footprint of production can be divided into underground blue Water Footprint, surface blue Water Footprint and green Water Footprint based on the source of water resources utilized in production (as shown in Figure 1.30, which excludes grey water).

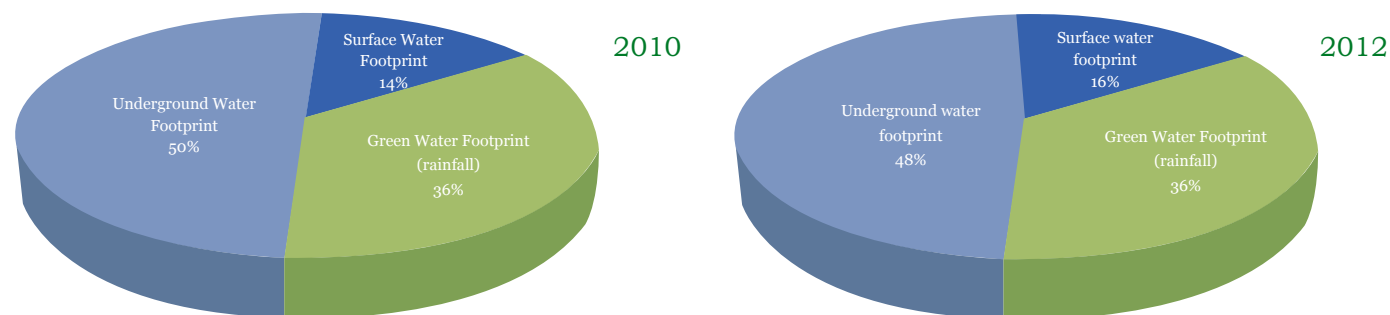


Figure 1.30 Composition of Water Footprint of Major Regions of North China Plain (Beijing, Tianjin, Hebei) (2010-2012)

The Water Footprint of production of major regions of the North China Plain mainly comes from underground water resources. The underground Water Footprint, accounts for 50% of the region's Water Footprint of production, while green Water Footprint accounts for 36% and surface water blue Footprint for about 15%. This region is an important food production region yet surface water in rivers and streams is scarce. Food production has been sustained by underground water resources and the availability of groundwater determines the food production potential of the region.

Data Source: IGSNRR, 2014

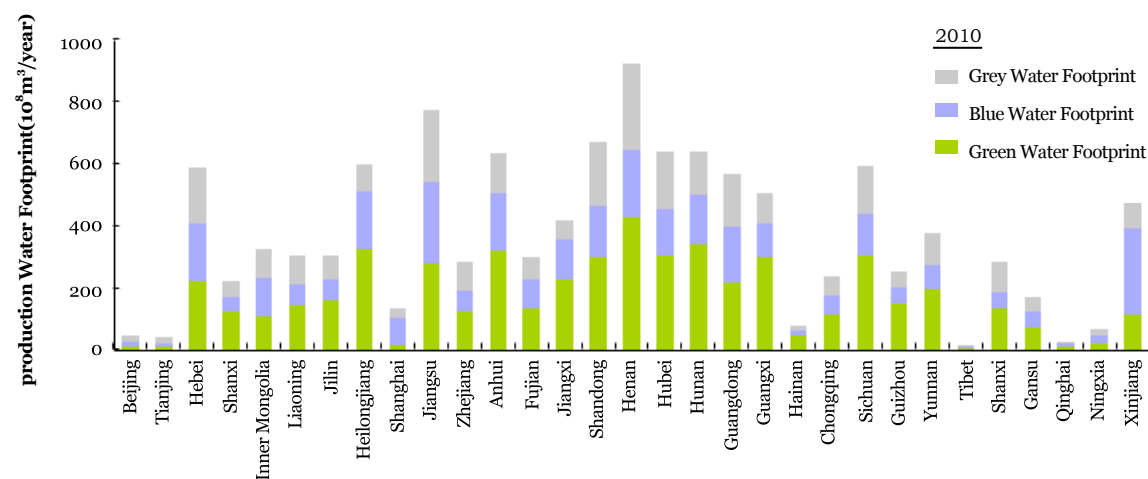


Figure 1.31 Production Water Footprint of Provinces of Mainland China (2010)

China's provinces differ significantly the magnitude and components of their Water Footprints of production. In general, green water accounts for a larger proportion of Water Footprint in regions with a humid climate and abundant rainfall (e.g. Guangxi, Guizhou) and blue water accounts for a larger proportion in regions characterized by a dry climate and low rainfall (Xinjiang). The proportion of grey water is higher in regions with more developed industry, agriculture and economy.

Data Source: IGSNRR, 2014

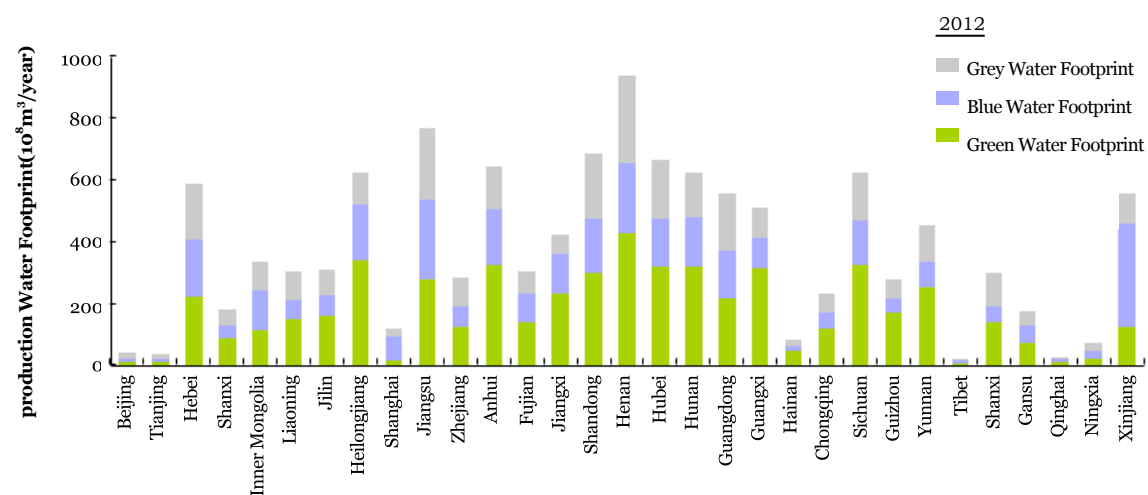


Figure 1.32 Production Water Footprint of Provinces of Mainland China (2012)

Compared with 2009 and 2010, the Water Footprint of production of China's provinces showed a general increase, while distribution patterns remained unchanged. Henan remains the province with the highest Water Footprint of production while the rank of other provinces changed only slightly. Social production activities represent a growing demand for water resources.

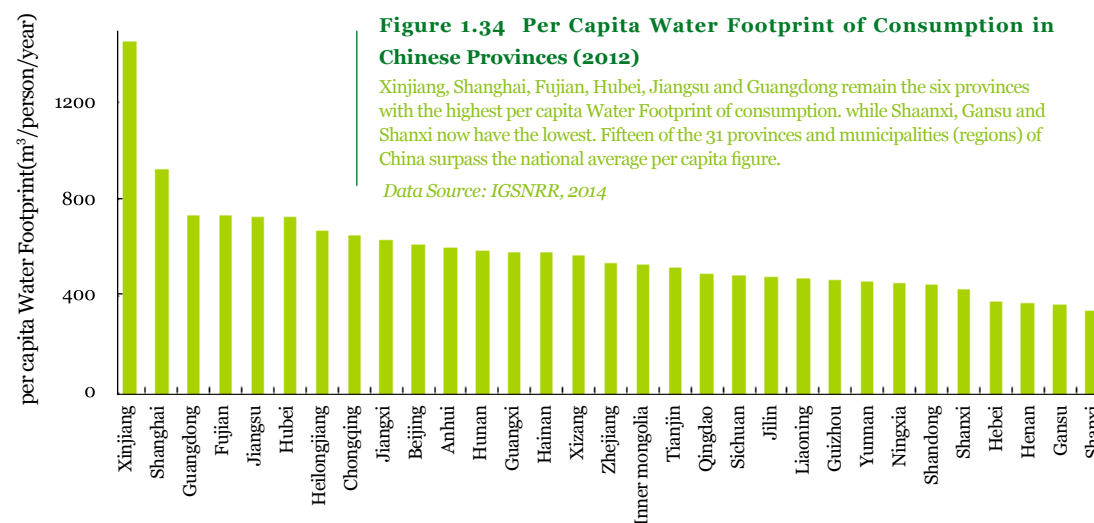
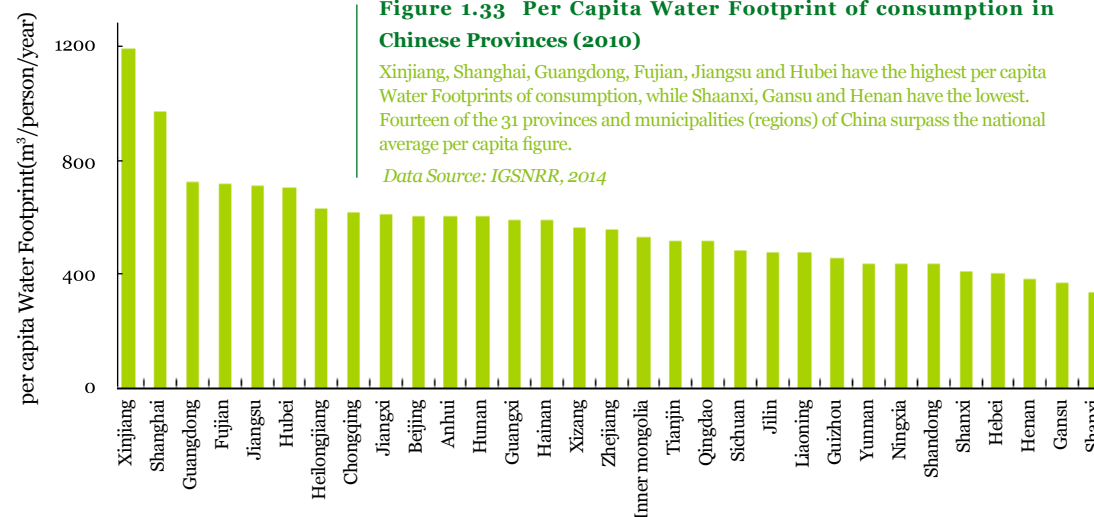
Data Source: IGSNRR, 2014

Water Footprint of Consumption

The Water Footprint of consumption of a country or territory refers to the volume of water resources necessary for manufacturing products and services consumed by its population, regardless of where those products and services are actually produced.

In 2010–2012, the ranking of Water Footprint of consumption of various provinces underwent only minor changes, with little change to the overall patterns. The Water Footprint of consumption is highest in the economically developed southeast region which has a large population (Guangdong and Jiangsu) and lowest in the vast, less economically developed and sparsely populated Qinghai-Tibet Plateau (Tibet, Qinghai) (Figure 1.33 and Figure 1.34).

China's per capita Water Footprint of consumption was 552 m³/person/year in 2010 and 567 m³/person/year in 2012. The spatial distribution of the per capita Water Footprint of consumption in China is uneven and reflects the combined effects of personal consumption choices and different virtual water contents of consumer goods. In general, southeast coastal provinces have higher consumption Water Footprint than inland provinces. The per capita Water Footprint of Xinjiang is more than twice of the national average, reflecting the lifestyles and consumption habits of the residents of that region. Regional climates also play a role in determining the water efficiency of crop production. Efforts to reduce the consumption of local products and increase the consumption of external products which have lower virtual water in view of higher production efficiency can play an important role in reducing the Water Footprint of consumption and protecting water resources in regions where water is scarce.



Water Stress

Changes to the Water Footprint of production may reflect the changes in the status of the water resources of a country or territory. Water stress is defined as the ratio of the volume of surface or underground water resources consumed annually by households, industry and agriculture of a region to the volume of annually renewable water resources of the region. The extent of water stress faced by different regions in China varies considerably and there is a mismatch between regions of higher demand and areas of higher availability.

In 2010-2012, water resources were under medium to high pressure in northern China and under severe pressure in the North China Plain region where water resource utilization is at unsustainable levels. Southern China had abundant water resources and the pressure there was lower while the Qinghai-Tibet Plateau, an economically underdeveloped area, was not subject to water pressure (Figure 1.35 and Figure 1.36).

Despite experiencing high or severe water pressure between 2010 and 2012, there have been some positive changes in northern China. Specifically, Beijing, Tianjin and Shanxi saw the pressure on water resources reduced from 'severe' to 'high', suggesting that the 'new economic development mode' is playing a positive role in resource utilization.

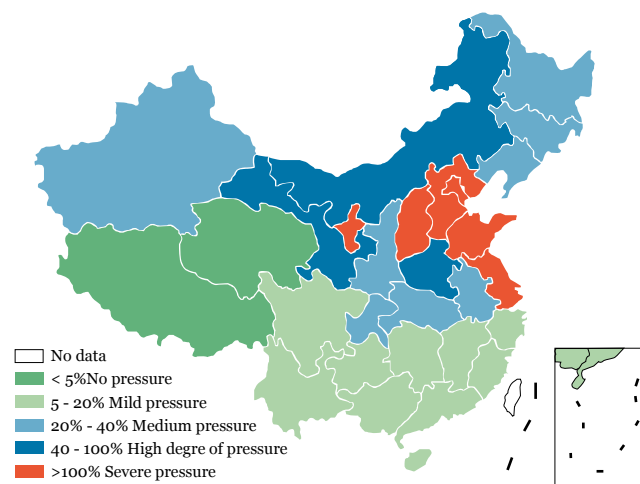


Figure 1.35 Distribution of Water Resource Pressure in China (2010)

Data Source: IGSNRR, 2014

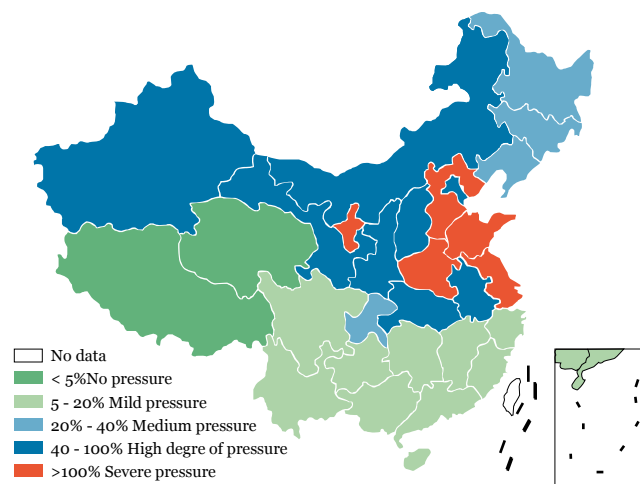


Figure 1.36 Distribution of Water Resource Pressure in China (2012)

Data Source: IGSNRR, 2014

Chapter Two

Key Drivers Analysis



Development and Ecological Footprint

Industrialization has brought about a new material civilization in many parts of the world and has delivered benefits in the form of unprecedented economic growth. Industrialization has also transformed humans' ability to shape and influence natural systems as more and more natural capital is transformed through the social economic system before being returning to nature in the form of wastes.

The world's ecosystems are currently facing the strongest development pressure in human history, which in turn presents humans with an unparalleled level of ecological risk. Based on a model which defines the safe operating space for humanity, one third of the nine planetary boundaries have now been exceeded (shown in Figure 2.1), namely the loss of biodiversity, the nitrogen cycle and climate change (Stockholm Resilience Centre, 2009). All of the three indices are closely related to biocapacity.

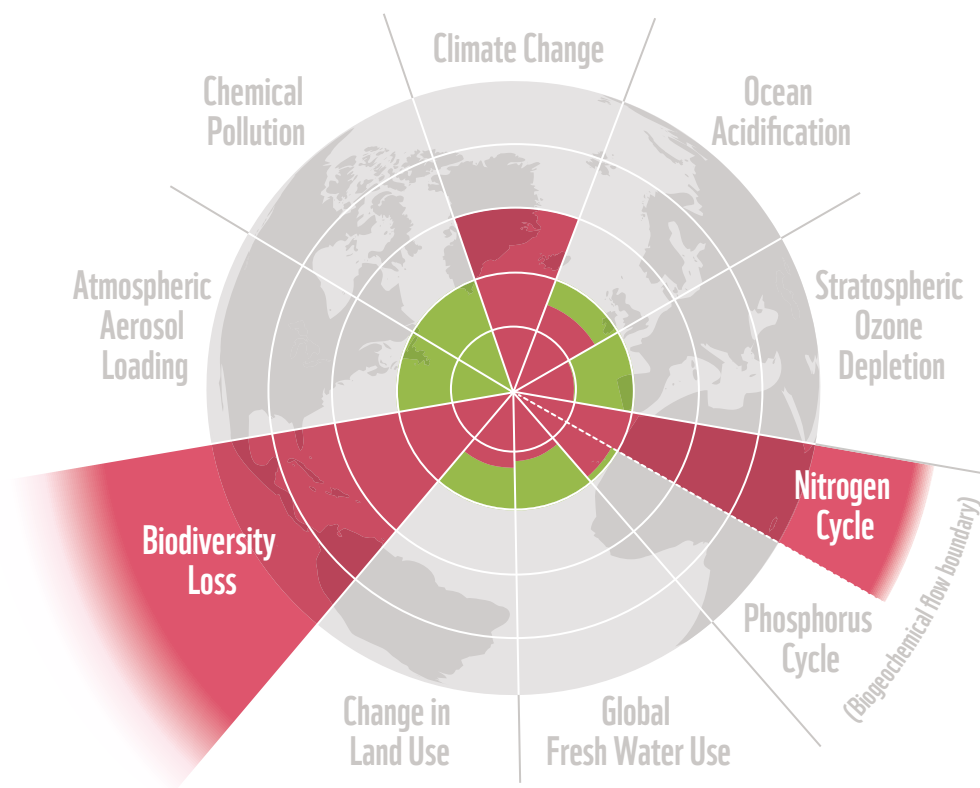


Figure 2.1 Planetary Boundaries: one third of the nine boundaries have now been exceeded.

In 2009, 28 renowned scientists identified and defined a planetary boundaries framework composed of nine indices. The boundaries define a 'safe operating space' where humanity can develop and prosper. Dramatic or irreversible environmental influences may occur beyond these boundaries.

Data source: Stockholm Resilience Center, 2009

China's Footprint has more than doubled since the 1970s, a reflection of its growing economy. China's economic restructuring in the 1980s and the early 1990s was marked by spikes in its per capita demand on resources. The economy's slowdown in the late 1990s curbed resource demands, but by 2003 China's Footprint resumed its steady growth. It is notable that China's Footprint and HDI value grew continuously between 2007 and 2010, a period when many economies were in turmoil and global demand on ecological services dipped.

Among the countries included in Figure 2.2, China has seen the largest improvements in human development between 1980 and 2010, with a 69% increase in HDI from 0.41 to 0.69, compared to an average 25% increase amongst all countries. UNDP defines an HDI of 0.7 as the threshold for high human development and for such a large country to develop so rapidly is a significant achievement. However the 68% increase in HDI did not come without cost. During this same period, the per capita Ecological Footprint increased by 80%, from 1.21 gha to 2.19 gha. Compared to other BRICS countries, China's growth showed the least efficient ratio in HDI to Ecological Footprint increase. During this transition, the Ecological Footprint of the average Chinese resident increased beyond the global per capita available biocapacity (of 1.7 gha per person in 2012). As countries strive to improve the welfare of their residents, the traditional development trajectory of rapid and resource intensive growth will become increasingly untenable if it is associated with ecosystem degradation and loss of ecosystem services. While short term economic gains can rapidly improve human development, the ability to produce, conserve and access ecological resources will be a key factor in sustaining long-term human development.

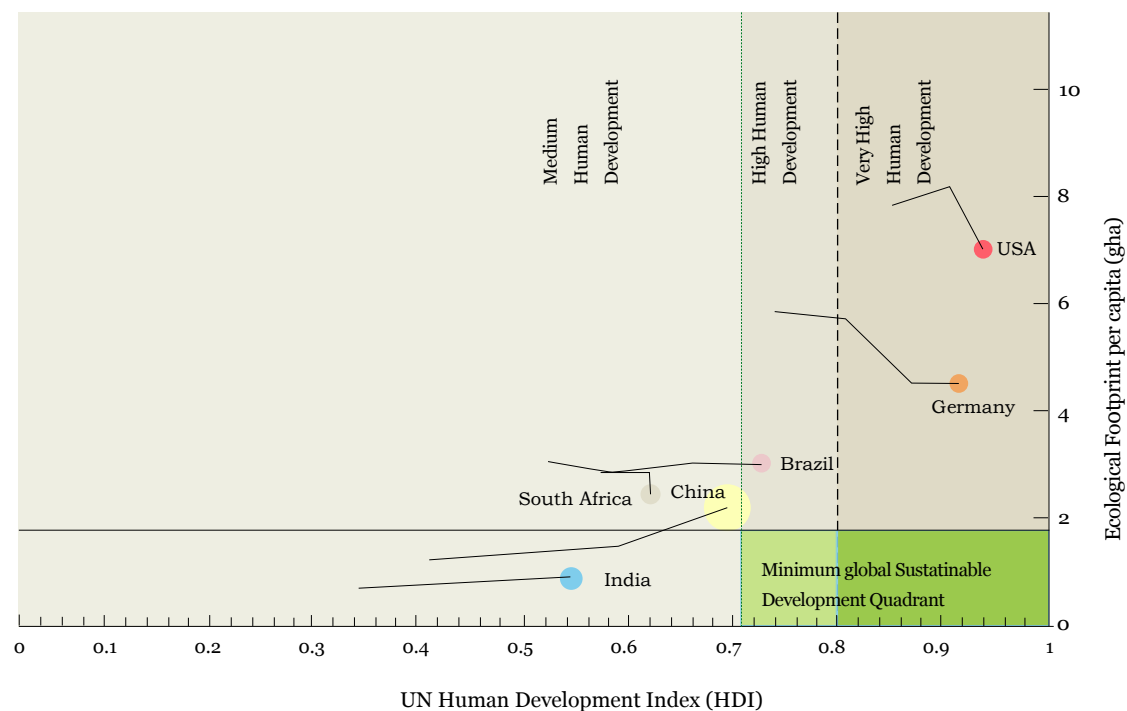


Figure 2.2 Ecological Footprint and Human Development Index for Brazil, China, Germany, India, South Africa, USA showing 1980-2010 trajectory.

Data source: Global Footprint Network, 2014; UNDP, 2013

China shoulders the heavy responsibility for development and wellbeing of nearly one fifth of the world's population while its territory includes less than one tenth of the world farmlands. As China's economy has become more open and market-oriented, Chinese economy and society have made astonishing development achievements and China's economy has expanded rapidly to become the world's second largest. From 1978 to 2010, China's average GDP growth rate was as high as 9.89%. In recent years, China economic growth rate slowed down to about 7%. While China's economy as a whole is large, its per capita GDP at US\$6,000 in 2012 is still relatively low (characterized as medium level in global terms). China thus continues to afford a high level of priority to economic and social development in the context of sustainable development.

Economic development, social development and environmental protection are the three pillars of sustainable development. We can use GDP to measure economic development, the human development index to measure social development, and the balance between biocapacity and Ecological Footprint to measure ecological protection. Here, we adopt single indices to analyze the relationship between China's socio-economic development and biocapacity, Ecological Footprint, and ecological surplus/deficit.

During the five decades since 1960, China's total biocapacity has doubled, while its economy increased by 80 times (shown in Figure 2.3). While biocapacity has increased in a steady manner, the economy has been characterized by rapid and exponential growth. The Earth's biocapacity is relatively constant with limited growth capacity even under careful management. In contrast, the economy can expand rapidly. The need to support continued economic growth in the context of limited biocapacity is a practical priority and challenge to be addressed in the development of Chinese ecological civilization.

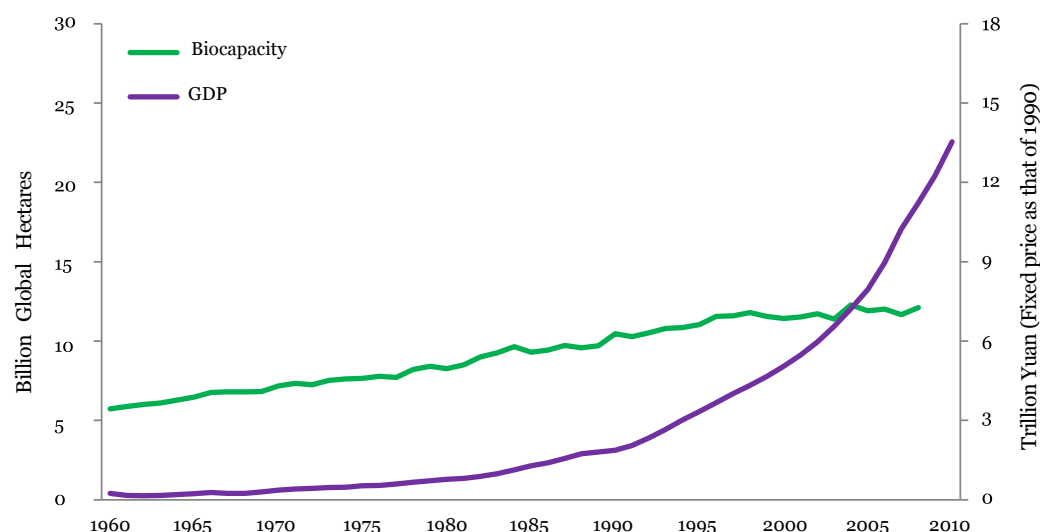


Figure 2.3 Comparison between China's economic development and its biocapacity

From 1960 to 2010, China's total biocapacity grew linearly and steadily, as a result of agricultural development and efforts to protect the natural environment. The average increase in productivity of Chinese agricultural land is higher than the world average.

At the same time, China's economy has been characterized by exponential growth. The practical challenge of how to support ongoing economic growth with limited biocapacity is central to China's concept of ecological civilization.

Data Source: IGSNRR (Data of biocapacity from GFN; Data of GDP from China Statistical Yearbook)

Affected by the increases in individual wealth and changes in lifestyle, China's total Ecological Footprint increased by more than four times from 1960 to 2010 while its economy grew by more than 80 times (shown in Figure 2.4). These trajectories indicate the increased ecological efficiency of the economic system but also indicate that such increases in efficiency have not been able to fully compensate for the growth in Ecological Footprint. China has recently slowed down its GDP growth rate to place a greater focus on the quality of development. The rate of increase in China's Ecological Footprint is also slowing down, and the elasticity of the Ecological Footprint tends to decline (shown in Figure 2.5). This is forced by the status quo of resources and environment on the one hand. On the other hand, it is the result of China's initiative to make adjustments and transformations. Looking ahead it is expected that China's total Ecological Footprint can be stabilized before gradually falling back. Eventually, the per capita Ecological Footprint in China is expected to be stabilized at a level close to the global per capita average.

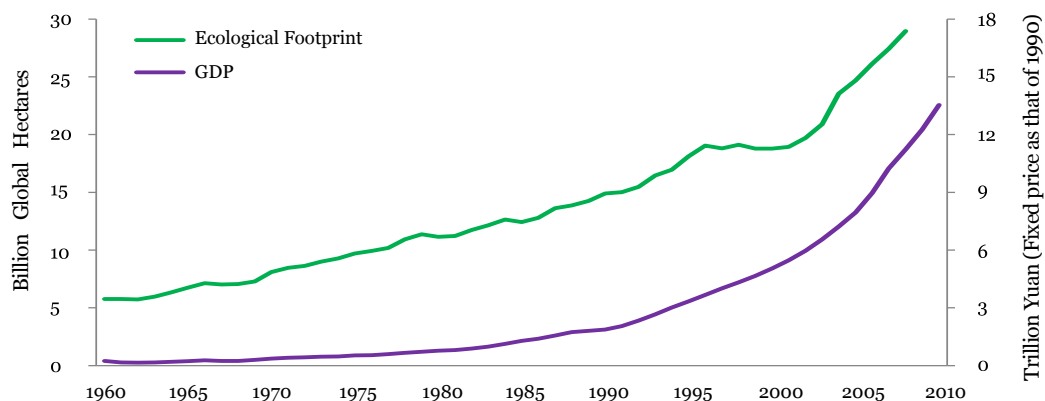


Figure 2.4 Comparison between the development of Chinese economy and the increase in Ecological Footprint

From 1960 to 2010, China's Ecological Footprint increased by only one twentieth of its economic growth, as a result of the increased ecological efficiency of the economic system. However, increases in ecological efficiency cannot fully compensate for the increased demand for goods and services.

Data source: Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, (The data of Ecological Footprint come from GFN, and the data of GDP come from China Statistical Yearbook.)

Data Source: IGSNRR (Data of Ecological Footprint from GFN; Data of GDP from China Statistical Yearbook)

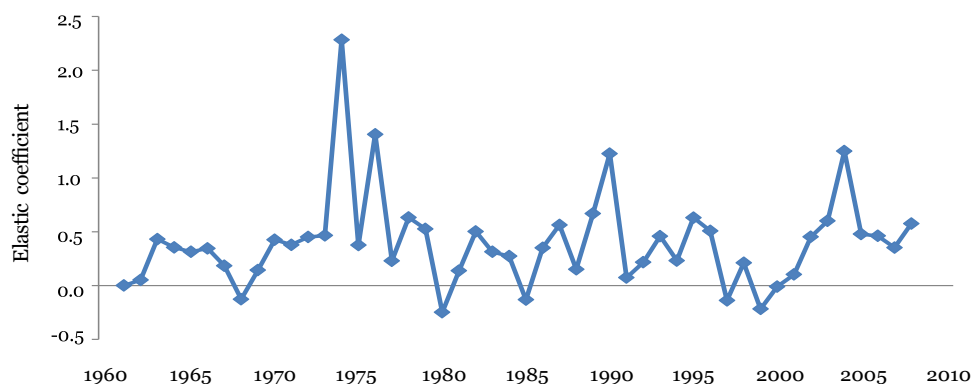


Figure 2.5 The variation in the elasticity coefficient of China's Ecological Footprint

The elasticity coefficient of the Ecological Footprint equals the ratio of the Ecological Footprint growth rate and the GDP growth rate, indicating the increasing or decreasing percentage of the total Ecological Footprint for every 1% of GDP growth.

Data Source: IGSNRR, 2014

Urbanization and Ecological Footprint

China is in a process of rapid urbanization. In 1980, only 19% of the population was living in cities and towns, while by 2012 that number had climbed to about 52%. The increase in per capita wealth brought by urbanization has stimulated the growth in per capita consumption in urban and rural areas, resulting in an increase in per capita Ecological Footprint. China's urbanization rate and Ecological Footprint have grown in parallel over the past three decades reflecting that per capita Footprint has grown in a proportional manner to average per capita income. In all provinces in mainland China, the average per capita income of the urban population is higher than that of the rural population. Figure 2.6 describes the relationship between the average per capita income in various regions in mainland China and the per capita Ecological Footprint. It shows that higher individual incomes are associated with higher Ecological Footprints. At the same time, urban expansion is also associated with the loss of biocapacity if this expansion takes places in areas of high bio-productivity such as farmlands, forests, grasslands and wetlands. Some areas are experiencing a simultaneous increase in per capita Ecological Footprint and decrease in per capita biocapacity. While an increasingly convenient transportation network has made the spatial movement of ecological resources and other products easier, cities cannot continue to expand in space, population size and industrial agglomeration without limit. The spread of Ecological Footprint will not only add to the country's ecological pressure, but also poses safety hazards to the area.

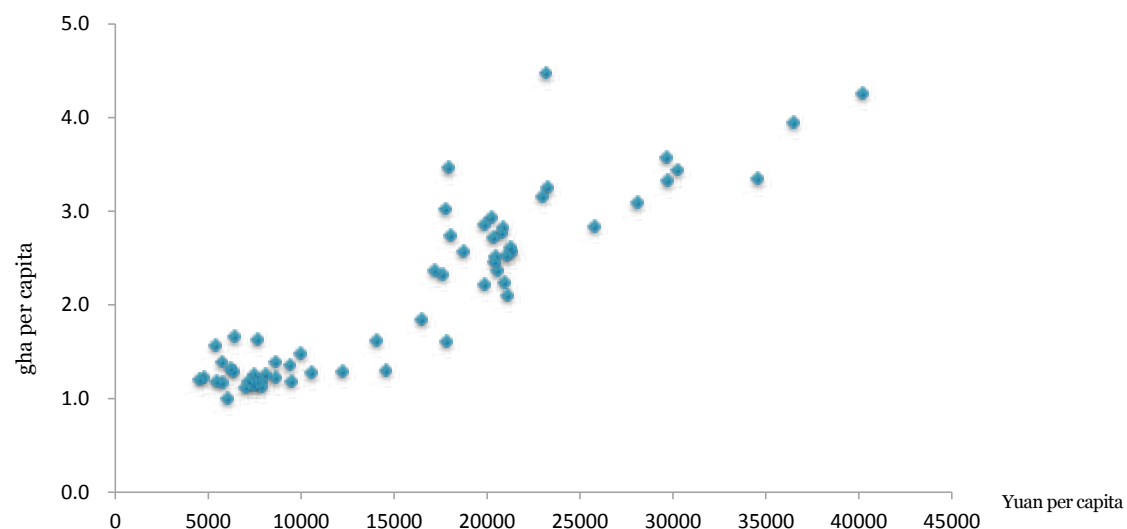


Figure 2.6 The relationship between the average per capita income in various regions in mainland China and the per capita Ecological Footprint (2012)

Data source: IGSNRR, 2014

As the capital of China, Beijing's urbanization rate reached 86% in 2012, with a residential population of 20.69 million. Although Beijing has now reached a high level of cultural development, and its per capita Ecological Footprint has started to drop, the rapid expansion over the past few decades and resulting increase in Ecological Footprint

and decrease in biocapacity make Beijing a good case study for analyzing the relationship between urbanization and Ecological Footprint. Beijing's population has grown rapidly since the 1980s, driven by both economic growth and location advantages. However, from 2000 to 2012, Beijing's built up area (shown in Figure 2.7) approximately

trebled in size from 490 km² to 1,361 km². This increase is three times the rate of population growth in the same period, and twice the rate of expansion of built up areas in Shanghai and Tianjin.

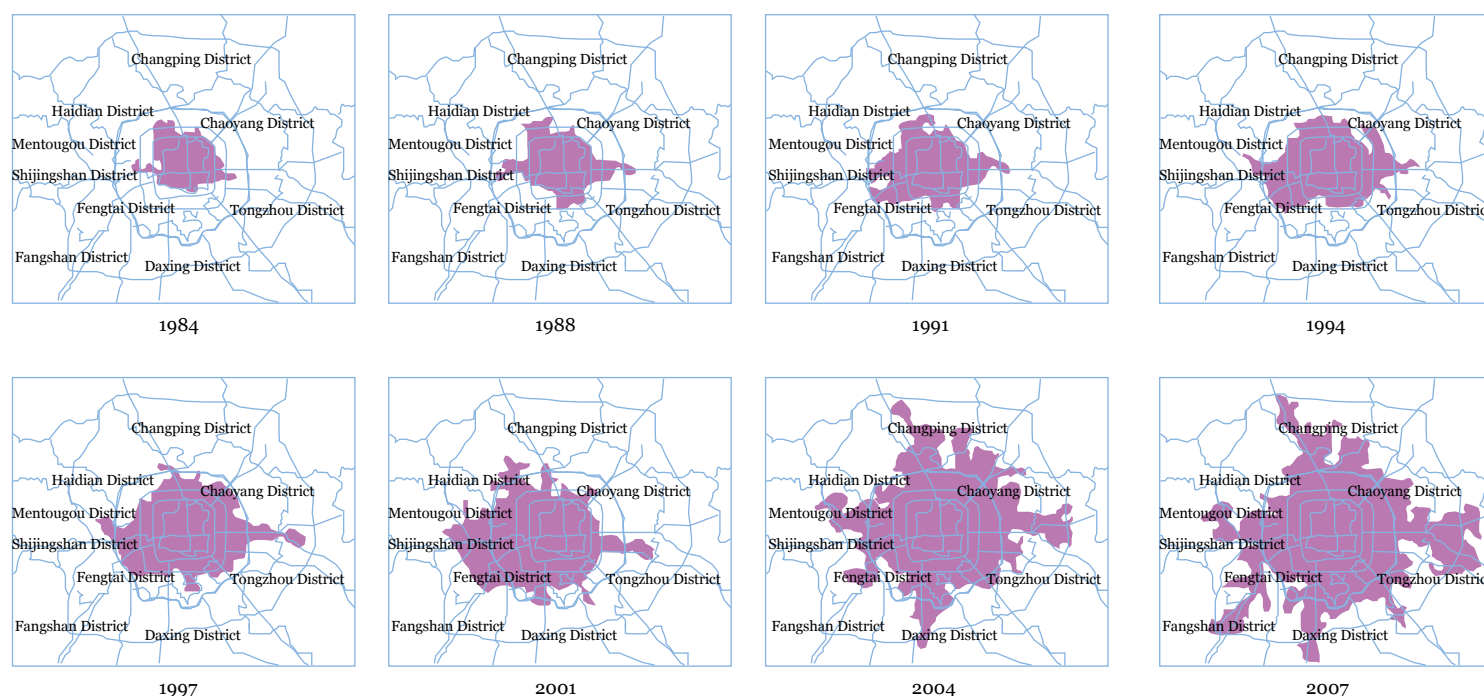


Figure 2.7 Spatial expansion of the built up area in Beijing

Data source: Mu Xiaodong etc., 2012

Beijing's city area expanded by nearly eight times from 1984 to 2007.

The rapid expansion of the city has squeezed the surrounding bio-productive land area, and Beijing's per capita biocapacity declined over the past three decades as its per capita Ecological Footprint increased. The fall in per capita Ecological Footprint between 2010 and 2012 has not yet reversed the trend of Beijing's increasing dependence on the biocapacity of outside areas. From 1985 to 2012, the ratio of Beijing's Ecological Footprint to biocapacity has nearly quadrupled to the point where it now demands about 21.5 times of the amount of biocapacity available within the region to support the consumption mode of the local population (Figure 2.8). Food products used in Beijing are transported by an average 300-1000 km (shown in Figure 2.9), a transport distance that is growing each year and is associated with a growing carbon footprint (shown in Figure 2.10). The Ecological Footprint of a typical fruit basket purchased in Beijing is now made up in equal parts by cropland and carbon footprints.

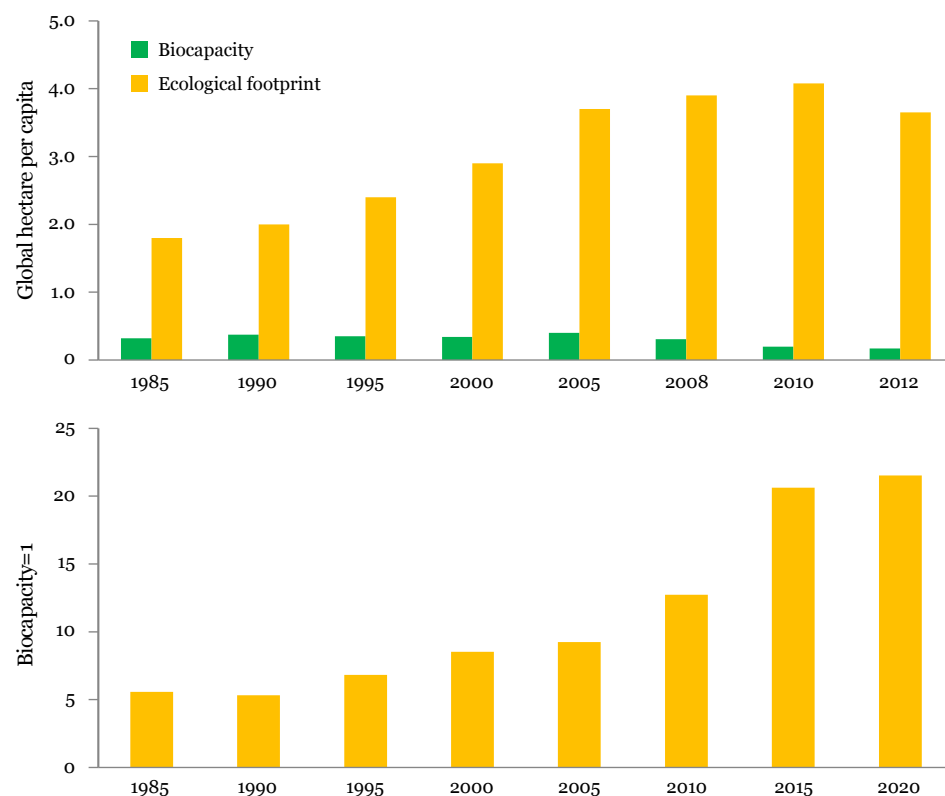


Figure 2.8 Comparison between Beijing's per capita Ecological Footprint and its per capita biocapacity

The figure on the above shows the absolute comparison between Beijing's per capita Ecological Footprint and its per capita biocapacity. The figure on the below shows the ratio between Beijing's per capita Ecological Footprint and its per capita biocapacity. Beijing's per capita ecological deficit gradually increased from 1985 to 2010 before dropping slightly between 2010 and 2012. However, the ratio between per capita Ecological Footprint and the biocapacity has continued to increase. In 2012, Beijing needed an area with 21.5 times of its biocapacity to support its demand for goods and services. By comparison, London's Ecological Footprint is 120 times of its area.

Data source: IGSNRR, 2014

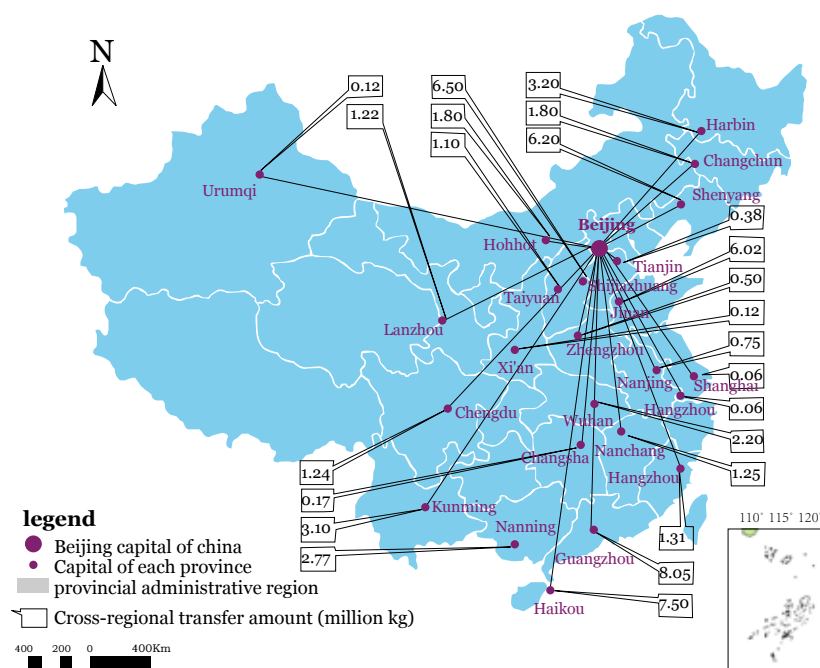


Figure 2.9 Network diagram showing spatial distribution of Beijing's dietary resources (2012) in Beijing (2008-2012)

Data source: IGSNRR, 2014

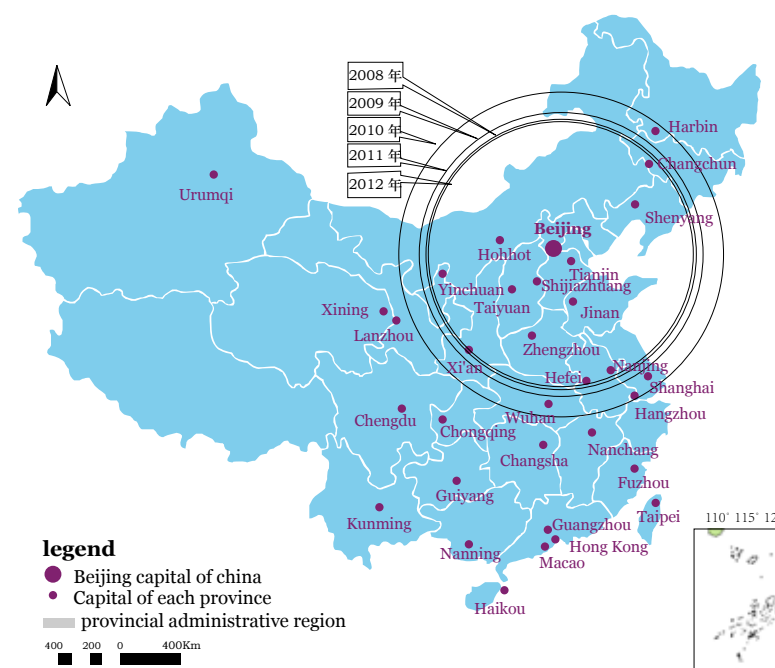


Figure 2.10 Average transportation distance for fruit consumed in Beijing (2008-2012)

Data source: IGSNRR, 2014

While ecological resources can be transported, many invisible ecological services provided by the ecosystem, such as air purification and water and soil maintenance, cannot be moved. The haze and fog that frequently occur in China are partially due to meteorological factors, but are also a sign of the excessive pressure placed on ecosystem services in the region, which presents direct risks to human health.

Urban areas cannot continue to expand in an indiscriminate manner. Sufficient ecological space should be set aside to provide ecological goods and services for the wellbeing of the local population, including production of fresh food, air purification, and space for leisure. China has made immense efforts in the area of 'ecological construction' including the afforestation of over one million hectares of forest each

year. However if the urban areas continue to grow at the current rate, these new forest lands will not be sufficient to compensate for carbon emissions resulting from food transport. The Beijing case study underscores how the sustainable development of a region calls for consideration of the full range of associated human pressures.

Global Impact of the Ecological Footprint

Building on earlier reports, this version of the report continues to analyze the global impact of China's biological resource consumption from the perspective of the biomass footprint. The 'biomass footprint' refers to the total area of the ecological land (including forest land, crop land, grazing products and fishing grounds) needed to provide a given population with various kinds of biomass products that they consume. This report is based on an analysis of the same 455 types of trade products that were addressed in the China Ecological Footprint Report 2012.

Since 1961, China's Ecological Footprint of consumption has grown slightly faster than its Ecological Footprint of production. When the biocapacity consumed by China's residents can not be met through domestic production (Fig 2.11), it must be supplemented by trade. Both the import and export of biocapacity have increased over time for all Ecological Footprint components. The recent increase in imported biocapacity is most prominent in grazing products and forest land footprints (Fig 2.12), where the increased trend in the Footprint of imports has been accompanied by a decreasing trend in the Footprint of production.

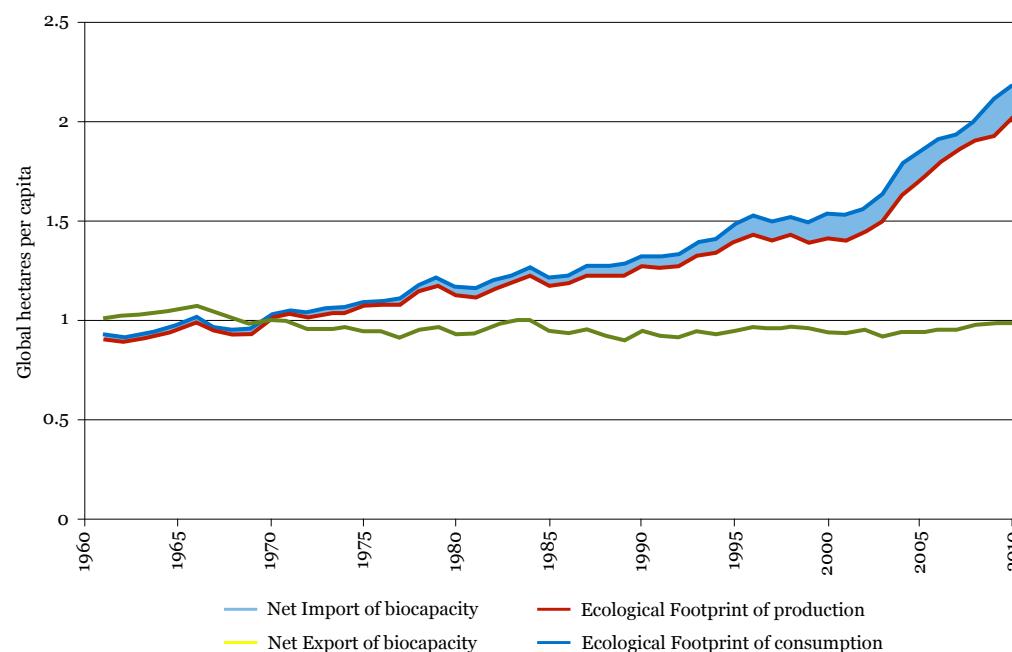


Figure 2.11 China's Ecological Footprint and trade balance

Data source: Global Footprint Network

With regard to the cropland Footprint, there has been a steady increase in production from 1961 to 2010. Despite China's aim to maintain self-sufficiency of food, cropland imports have been increasing since the early 2000s. While the trade in cropland products accounts for a relatively small percentage of overall production and consumption Footprints, the recent increase in cropland imports reflects the changing consumption patterns of Chinese residents.

The carbon Footprints of production and trade are growing faster than any other component of China's Footprint (Figure 2.12). In the 2000s, the Footprint of production for carbon increased sharply. In contrast to other Footprint components, which show imports growing faster than exports, the embodied carbon emissions in imports and exports are increasing at a similar pace.

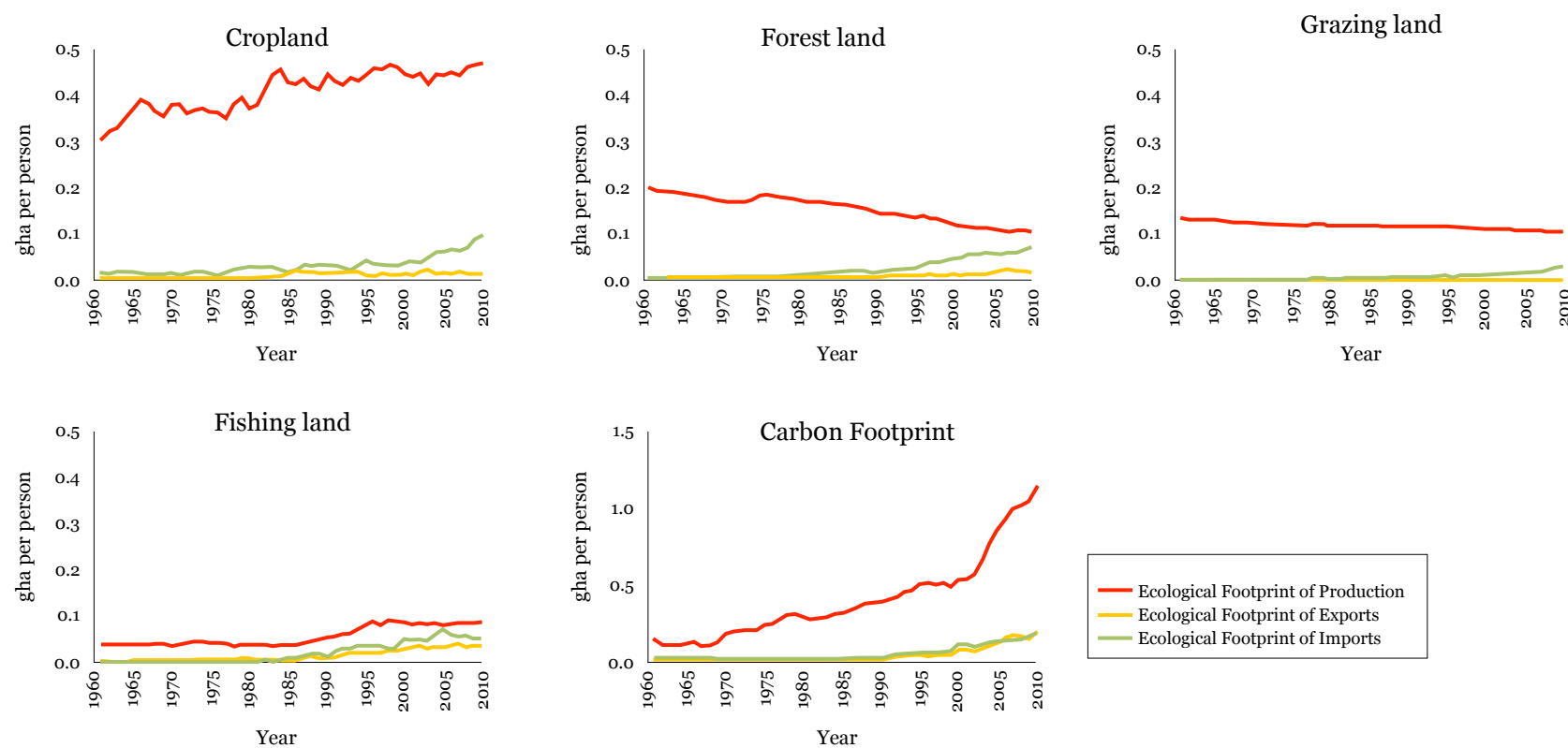


Figure 2.12 Ecological Footprint of Production and Trade for five Footprint categories.

Data source: Global Footprint Network

*note: the scale for the y-axis, "carbon Footprint" is different from other Footprint categories.

The Import and Export of Biocapacity in China ¹

In 2012, China was the net importer of biocapacity in the international trade of biomass commodities with its net imported biocapacity accounting for approximately 1.3% of the total biocapacity of the globe. While net imported per capita biocapacity has increased significantly, the domestic ecosystem is still the main source of biomass products for Chinese residents.

About two thirds of China's biocapacity import and export generated by trade in biomass products with just 26 countries (shown in Figure 2.13 to Figure 2.17). The main exporters of biocapacity to China in this period were countries that have rich per capita ecological resources, such as Australia, Brazil, Canada, Russia, New Zealand and Indonesia (shown in Figure 2.13 and Fig 2.15). There are distinct regional differences in the origins of different types of imported biocapacity. For instance, the biocapacity imported from Australia and New Zealand is mainly grazing products, the biocapacity imported from Canada and Russia is mainly forest land, and the biocapacity imported from Brazil is mainly cropland. China's biocapacity is mainly exported to the Asia-Pacific region and North America (shown in Figure 2.14 and Figure 2.16). A large part of the China's imported grazing products reenters the global biocapacity market via the clothing trade. Chinese international trade in biomass can thus be viewed as a source of mutual benefit.

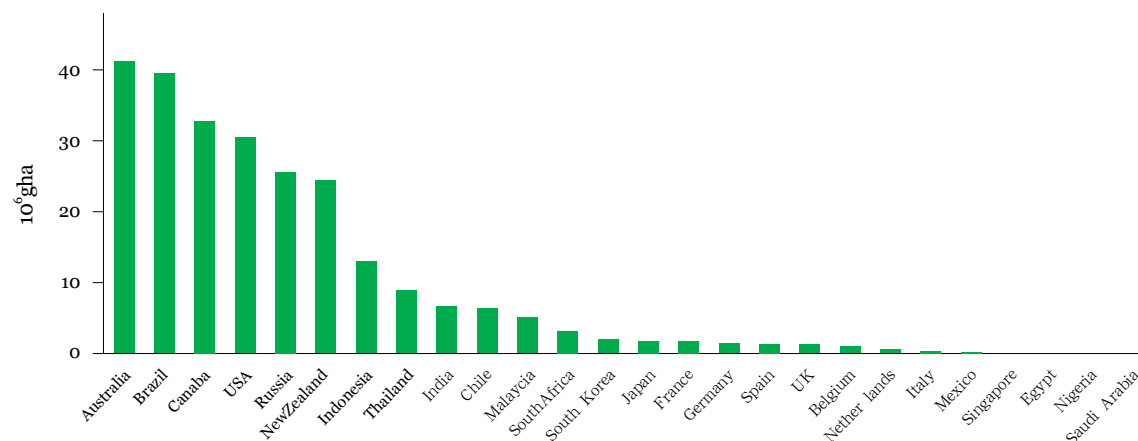


Figure 2.13 The biocapacity imported by China in its biomass trading with 26 countries (2012)

The major exporters of biocapacity to China are countries with rich per capita ecological resources.

Data source: Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, 2014 .

Data source: IGSNRR, 2014

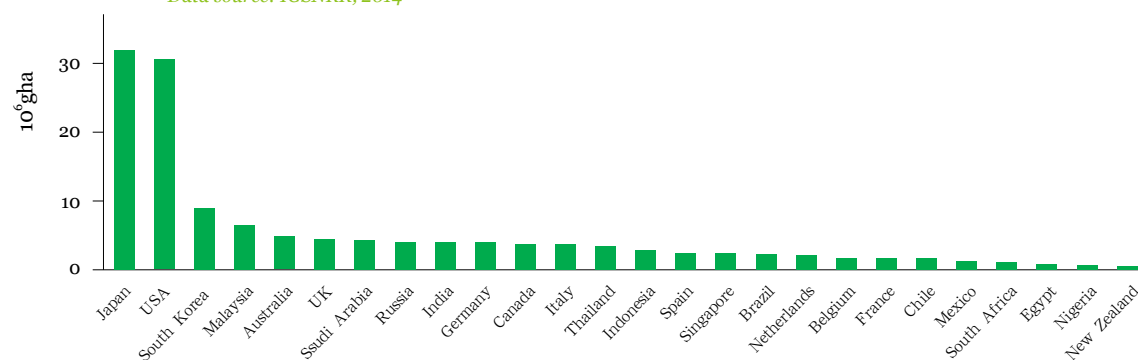


Figure 2.14 The biocapacity exported by China in its biomass trading with 26 countries (2012)

The main destinations for China's biocapacity exports are North America and the Asia-Pacific Region.

Data source: IGSNRR, 2014

¹ The embodied carbon footprint of traded products is not included in this analysis.

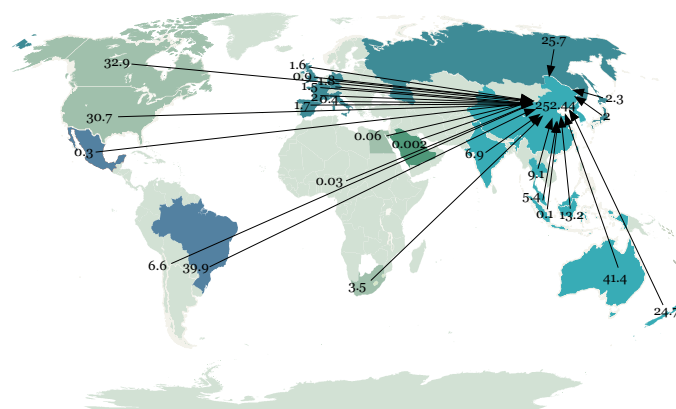


Figure 2.15 Biocapacity import of China (2012)

Data source: IGSNRR

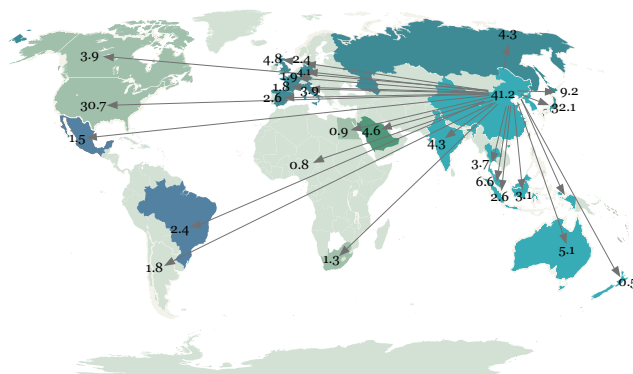


Figure 2.16 Biocapacity export of China (2012)

Data source: IGSNRR

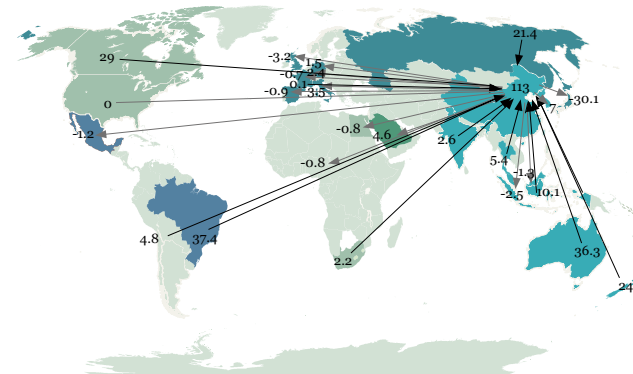


Figure 2.17 Net biocapacity import/export of China (2012)

Data source: IGSNRR

The growing scarcity of per capita ecological resources implies that China should consider its role in the reallocation of global ecological resources through trade from the perspective of both national and global ecological protection. China is expected to become more active in the global ecological

resource trade. While international trade can facilitate an optimized allocation of global ecological resources by allowing deficits in one country to be met by surpluses in another it can also degrade the ecological resources of exporting countries. The later effect is of particular concern where trade affects

biodiversity hot spots, such as Brazil and Indonesia. Efforts by China to green its international trade can play an important role in the protection of the global environment and ecological resources.

Footprint Analysis Sampling of China's Key Trading Partners

■ Brazil

Brazil is one of an ever decreasing number of countries enjoying an ecological reserve, and, has the largest of any country, totaling 6.4 gha per capita. From an overall resource perspective, Brazil's trade partners face little risk from depletion of Brazil's domestic biocapacity in the near future. Nevertheless, Brazil's reserve is slowly shrinking as a result of increased domestic consumption and liquidation of its natural resources to improve short term economic conditions. If the trends in Ecological Footprint and biocapacity continue as they have in the past, Brazil may eventually face an ecological deficit, which would leave the many countries which depend on its natural resources facing the need to identify new sources.

As a trade partner, China may still face specific risks when trading with a resource-rich country such as Brazil. China's import of soybeans, for example, has increased dramatically since the late 1990s in order to meet direct consumption and supply the growing pork industry. In 2010, soybeans comprised 54 percent of China's cropland import, with 34% of all soybean imports sourced in Brazil. Additional expanding industries which are deriving products from Brazil are the meat and paper industries. Volatility in these commodity markets, especially soybeans, could arise from decreases in local biocapacity resulting from changing weather or rainfall patterns or from local socio-economic instability. If China is unable to meet its demands through domestic production or from other sources worldwide, loss of imported biocapacity from Brazil could trigger major losses in domestic pork production, among other industries.

Brazil's Ecological Footprint and Trade Balance

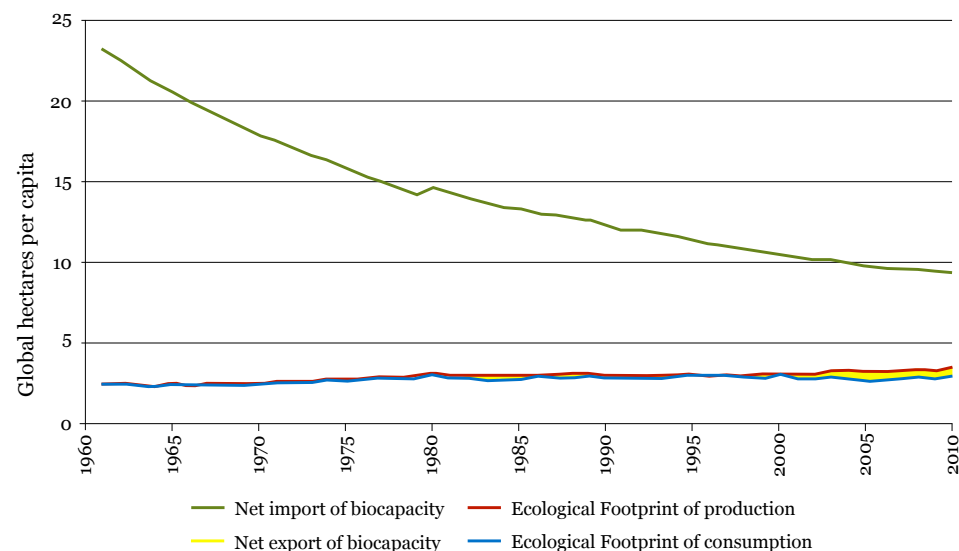


Figure 2.18 Brazil's Footprint of Production Consistently Outpaced its Footprint of Consumption throughout the 2000s.

Data source: Global Footprint Network

Footprint Category (Imported demand on biocapacity)	Item	% of China's Ecological Footprint of Imports	% of Item Ecological Footprint imported from trading partner
Carbon	Soya bean oil	0.2%	40%
Crop Land	Soybean oil	3%	65%
	Sugar Raw Centrifugal	0.3%	60%
	Soybeans	54%	34%
Grazing Land	Offals of Cattle, Edible	7%	63%
	Meat of Cattle, Boneless	18%	27%

Table 2.1 China's major Ecological Footprint of imports from Brazil

Data source: Global Footprint Network

■ Russian Federation

The Ecological Footprint of the Soviet Union increased steadily from 1961 as a result of population growth and rising demand for fossil fuels and by time the USSR dissolved into the Russian Federation in 1991, the nation had fallen into ecological deficit. Since 1991, the Russian Federation has emerged with new boundary lines as a biocapacity-wealthy nation and began to liquidate its natural capital. In other words, the USSR, a net importer of biocapacity, became a net exporter of biocapacity when it transformed into the Russian Federation.

As a close neighbour to China, the Russian Federation is a source for many commodities. Industrial roundwood from Russia represents a major component of imported biocapacity, accounting for 23% of China's total biocapacity imports, and 42% of its total industrial roundwood imports.

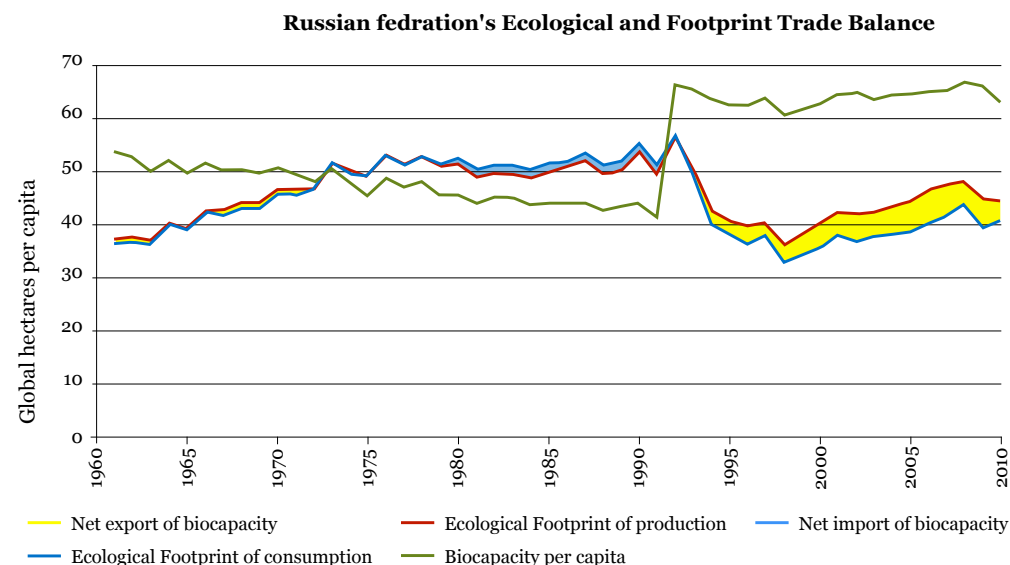


Figure 2.19 The Russian Federation has been a net exporter of biocapacity since 1991.

Data source: Global Footprint Network

Footprint Category (Imported demand on biocapacity)	Item	% of China's Ecological Foot- print of Imports	% of Item Ecological Footprint imported from trading partner
Carbon Footprint	Potassic fertilizers and materials	0.7%	41%
	Fertilizers, nes	0.2%	36%
	Fish, fresh, chilled or frozen	0.9%	36%
	Nickel and nickel alloys, unwrought	0.2%	35%
	Pig iron, including cast iron	0.1%	29%
Forest Land Foot- print	Industrial Roundwood, Non Coniferous, Other ²	2%	45%
	Industrial Roundwood, Coniferous ³	23%	42%
	Sawnwood, Coniferous	9%	37%

Table 2.2 China's major Ecological Footprint of imports from Russian Federation

Data source: Global Footprint Network

² Industrial roundwood-Wood in the rough (Non-Coniferous-Other). This commodity aggregate includes all industrial wood in the rough of non-coniferous species of origin other than tropical.

³ Industrial roundwood-Wood in the rough (Coniferous). This commodity aggregate includes all industrial wood in the rough (sawlogs and veneer logs, pulpwood and other industrial roundwood) of coniferous species. Source: FAOstat.

■ Indonesia

The average Indonesian resident has maintained a relatively stable Ecological Footprint over time but growth in overall population has contributed to increases in total Ecological Footprint. The resulting steady decline in per capita biocapacity means Indonesia recently entered into ecological deficit. On its current path as a net exporter, Indonesia faces an increasing ecological deficit. The implications of ecological deficit will become more important as resource scarcity increases, and net export of biocapacity will become increasingly untenable.

Indonesia is the largest Asian producer of cocoa, and is an important source country for China, supplying 52% of its total imports of cocoa. While cocoa and other imports such as palm cake make up a very small percentage of China's total Ecological Footprint, the continued reduction of biocapacity in Indonesia may pose a future risk for specific industries since such a high percentage of these products comes from Indonesia. Alternative sources for these items may temporarily alleviate China's increasing demand, but as the rest of Asia develops, demand is likely to increase in other countries.

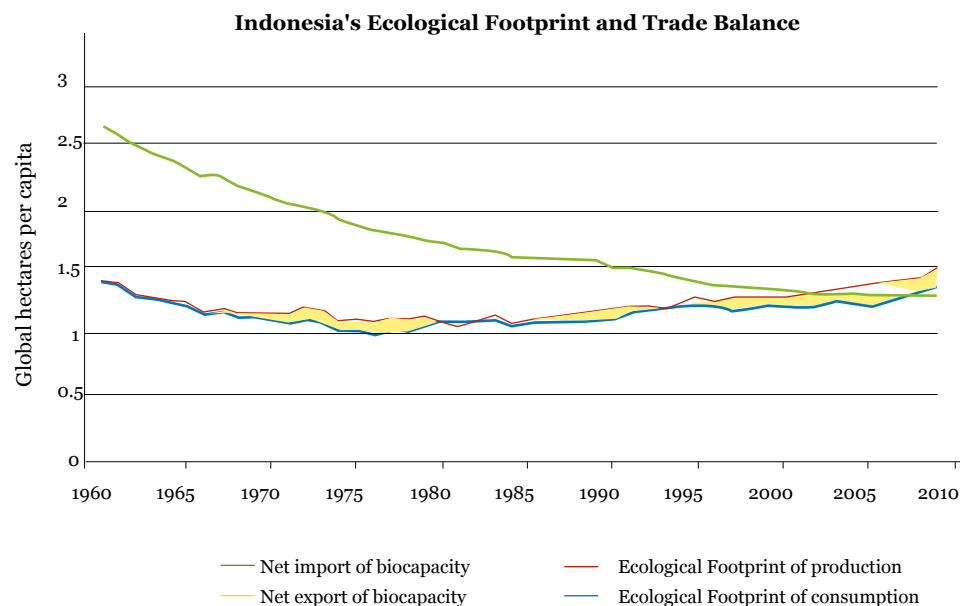


Figure 2.20 Indonesia's Ecological Footprint of consumption and production has been increasing gradually since the 1980s. During this period, Indonesia has been a net exporter of biocapacity in nearly every year.

Data source: Global Footprint Network

■ Gabon

Gabon has been a major exporter of biocapacity since 1961. The mining and forestry industries played a key role in the boosting the economy until the development of the oil industry which allowed Gabon to become one of Africa's strongest economies. Forest land products comprise the majority of biocapacity exports, and the observed data appear to be highly variable. Much of the production of timber in Gabon is reported to be occurring through unofficial and unrecorded activities⁴, which suggests that both the Ecological Footprint of production and consumption may be underestimated. While records of trade are generally more reliable, it remains unclear whether the estimates of forest product trade with China are underestimated. In 2010 the industrial roundwood from Gabon comprised 16.3% of China's total imports of industrial roundwood.

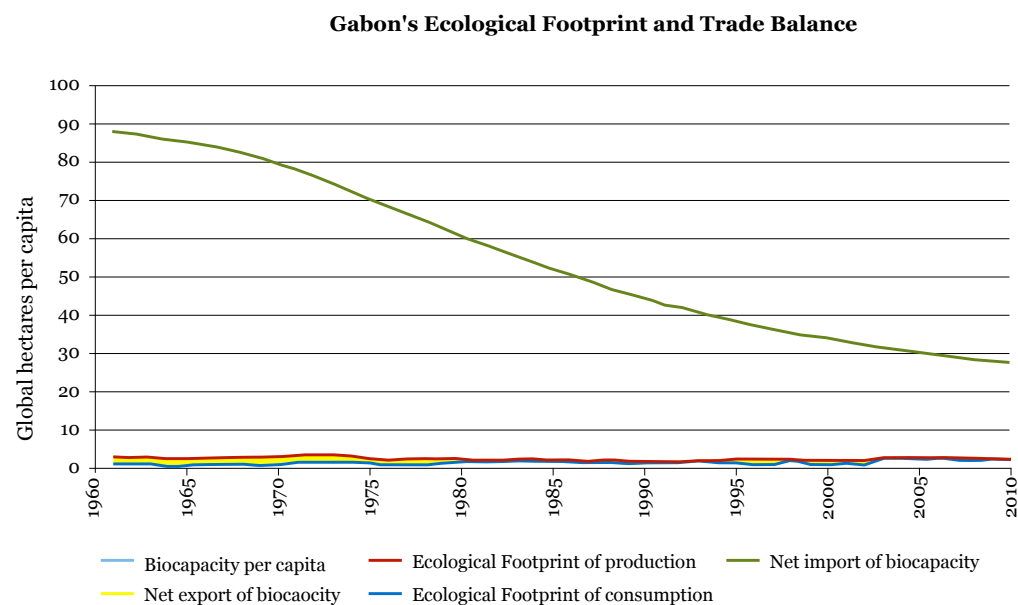


Figure 2.21 Gabon has been a net exporter of biocapacity since the late 1970s.

Data source: Global Footprint Network

⁴ Source: The World Bank report No. 36638 - GLB

Chapter Three

**Call for Action - China: Ecological
Civilization Construction**



Ever-worsening ecological deficit and ecological debt, present current problems for China as well as a risk which to its further development. This is a scenario faced by the world as a whole and by many individual countries. Although China's Ecological Footprint is expanding, it is committed to developing towards a harmonious and win-win relationship with the nature. This report demonstrates that China needs to act in a proactive and responsible manner to further control, curb and resolve the ecological pressures and risks that have accompanied its development in order to secure lasting benefits for the Earth and for future generations.

China's per capita GDP exceeded US\$6,000 in 2012 and its human development has reached the medium level, ranking in a middle position among all countries across the globe. There is still scope for further development to meet its residents' aspirations. China now has an opportunity to draw on the experience of developed countries while recognizing the reality of its limited natural resources and the state's responsibility for protecting global resources. In 2012, China signalled that equal priority should be given to the construction of ecological civilization and to socio-economic development, explicitly laying out a future development path focusing on "ecological civilization". China's progress towards ecological civilization will require a fundamental, comprehensive, stable and sustained effort in view of significant regional differences, huge population pressure, and rapid urbanization and industrialization. This calls for high-level vision and design, as well as efforts from all segments of society in exploration, innovation, active participation and action. The following paragraphs outline suggestions for constructing ecological civilization based on the analytical contents in this report.

(1) Reasonably allocate ecological capital, and build a mutually beneficial partnership for

exchanging materials and services among various regions.

China's import of biocapacity can be expected to have as far reaching effects on the world trade pattern as its imports of petroleum and iron ore. This is also a challenge to the economic costs of China's trade. At the International level, China needs to increase its efforts to incorporate the concept of ecological civilization into international investments and trading, to ensure trade contributes to optimized allocation of global ecological resources, and to reinforce the international cooperation platform for greener development. At home, China needs to adopt biocapacity and Ecological Footprint as indices, comprehensively consider the spatial association amongst regions, and establish economic zones featuring ecological balance. This will avert the environmental risks associated with long-distance transportation of ecological products and will promote the coordinated development within and between all economic zones, so as to facilitate the implementation of the ecological compensation system in an a comprehensive manner.

(2) Improve the wellbeing of rural residents, and guide the rational growth of Ecological Footprint in rural communities.

Agricultural wastes are associated with wastage of resources and increased Ecological Footprint as well as degradation of the local environment, affecting production conditions and the quality of life of rural residents. Further investment in the public finance and technology of rural areas is required to promote the development of an agricultural recycling economy, increase production yields and income, and generate jobs for residents. Carbon footprint is growing rapidly in rural areas, in part as a result of the "locked-in" effect of carbon footprint: some two decades for buildings and one decade for household appliances. Bonuses and subsidies for energy-saving

buildings and appliances should be widely applied in rural areas. A balanced diet should be rigorously promoted to prevent residents changing their diets in an unsustainable manner as their income increases, since this is harmful for the both the health of the planet and the residents themselves.

(3) Attach great importance to the reasonable urban layout, and guide the rational growth of Ecological Footprint in urban areas.

Risk evaluations should be undertaken for cities on the effect of distance on Ecological Footprint, so as to provide a basis for scientific decision-making regarding the scale of urban agglomerations and cities. Urban planning should prioritise land consolidation and avoid uncontrolled low density expansion. Urban development should focus on design and apply the models of eco-friendly and smart cities. The construction and coverage of carbon efficient infrastructure, such as public transportation, should be expanded. The heat valuation consumption based on heat quantity should be promoted to reduce the Ecological Footprint household consumption. Residents should be provided with electronic bills on household resource consumption with information on consumption of different appliances to encourage them to pay more attention to their environmental influence and help them to establish a better consumption ethic based on resource savings and environmental protection. Sustainable consumption should be publicized by various media channels, such as TV, radio, newspaper and the Internet, so as to make consumption habits greener.

(4) Improve the resource utilization efficiency of production, and provide more options for green consumption products and services.

An Ecological Footprint evaluation and labelling system for products based on their full life cycle should be

developed to provide a basis for decision making by fiscal and taxation, finance and other government departments. The resource investment level and the material investment intensity for development should be lowered. Levels of recycling and reuse of resources and the ecological efficiency of the economic production system should be increased. Capital should be channelled to industrial sectors that have adopted energy and resource saving measures through comprehensive fiscal, taxation and financial policies. The utilization and trade of "resource animals" should be strictly controlled through effective publicity and protective measures. This is particularly urgent for the rapidly declining amphibian and reptile species that are highly vulnerable to environmental change and are heavily exploited as a result of the ongoing belief in their traditional medicinal value.

(5) Strictly control the total energy consumption, promote the low-carbon based energy structure, and reduce the carbon dioxide emission intensity of energy consumption.

Control indices on energy saving and emission cutting should be strictly implemented to force the restructuring of energy production, policy incentives for the development and utilization of renewable energy should be enhanced, and the percentage of renewable energy in energy consumption should be increased. At the same time, the carbon emission intensity of energy consumption per unit of GDP should be lowered. The use of energy labels on household appliances and buildings should be widened to include more products and services, so as to stimulate more producers to adopt low energy consumption product designs and production techniques.

(6) Strictly protect ecological lands, conserve and develop natural productivity.

The ecological land protection system should be strengthened and strictly implemented with firm boundaries established for protecting farmlands, grasslands, forest lands and fishery lands. The natural asset accounting system should be established and improved, and changes in assets should be considered during the administrative performance assessment of government officials. The construction land index of all regions should be directly linked to the variation in biocapacity. With regard to territorial planning, differentiated land management and control strategies should be adopted for different functional areas including green and intensive 'production areas', attractive and clean 'living areas', and healthy and protected 'ecological areas'. The development of highly-efficient crop production, animal husbandry, forestry and fishery industries should be promoted in a comprehensive and environmentally friendly manner in order to boost agricultural productivity and maintain the steady and continuous growth of biocapacity, while protecting and cultivating soil fertility. Wetland resources and biodiversity resources should be protected. Agricultural yields should be boosted while maintaining the development capability of the nature. Existing natural reserves are key ecological lands. Isolated areas should be linked by ecological corridors in order to form a connected habitat network among the reserves, thereby reducing the impact of habitat fragmentation on animals.

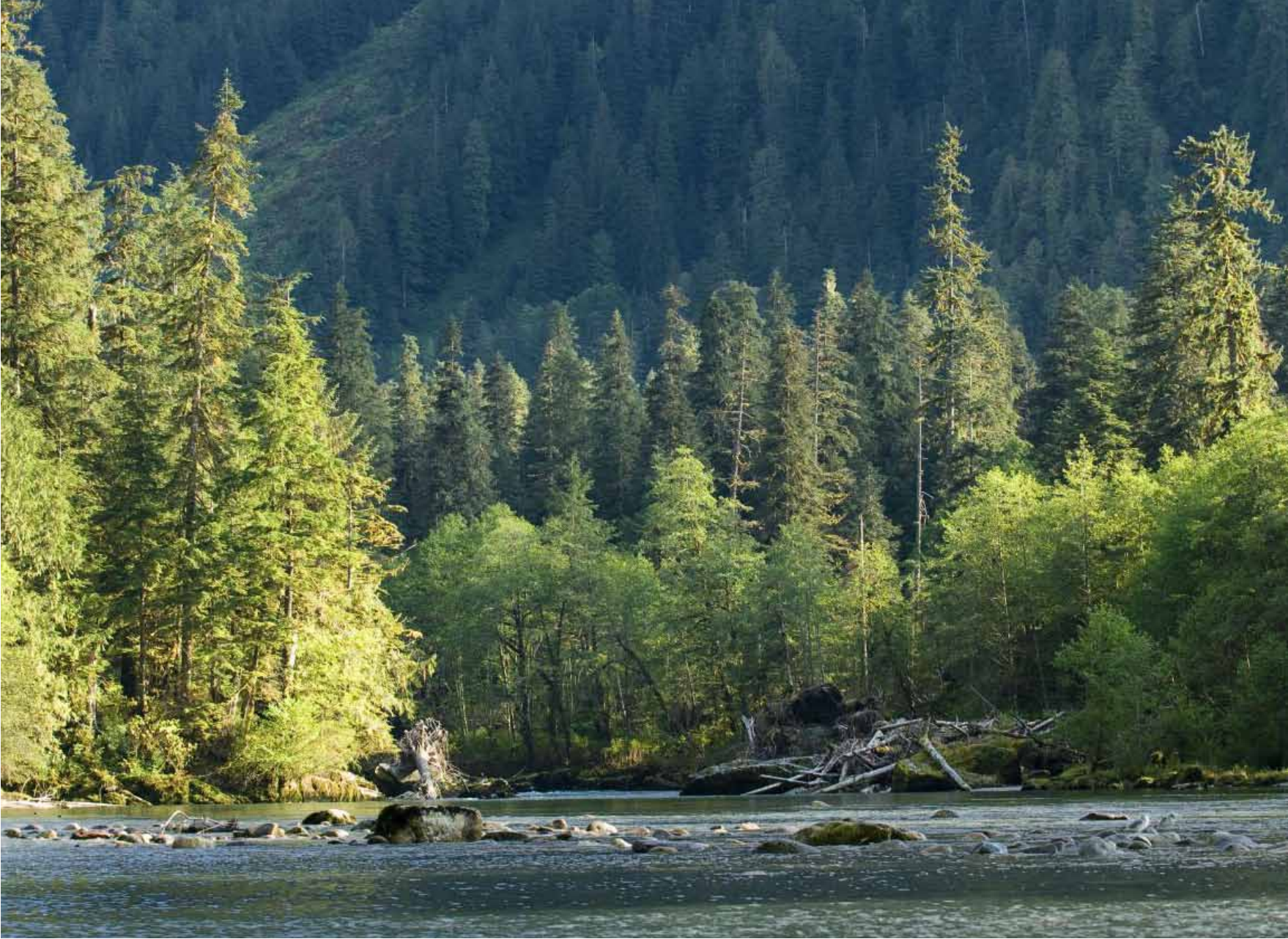
(7) Carry out ecological compensation in a comprehensive manner, strengthen the vitality and elasticity of the ecosystems, and enhance the service providing ability of ecosystems.

With Ecological Footprint and biocapacity as the indices, a system for regular performance evaluation of the

ecological environment should be put in place in different regions in order to incorporate the concept of ecological responsibility into the decision-making processes of interest groups such as the government and companies, and make it easier to detect and trace responsibilities for ecological damage. Ecological compensation in various forms, such as capital, technology and policy, should be delivered to areas that provide essential ecological services, such as biodiversity reserves, the key suppliers of biocapacity, and areas with rapid growth in ecological capacity, so as to ensure the sound development of the ecosystems in these areas, as well as improvement in residents' livelihoods. Particular attention should be given to nature conservation during the industrialization and urbanization of fragile ecological service providing regions, especially those with mineral resources of national importance, such as the Xinjiang Uygur Autonomous Region. Protective mine development technologies should be adopted to restore damaged ecosystems in a timely manner and prevent further degradation of the biocapacity. A special ecological deficit tax should be imposed on regions lacking ecological services, especially those with a downward trend in such services. Revenues should be used to address the ecological risks resulting from development, to finance resource conservation and environmental protection, and to broaden the scope of compensation funds that are provided for ecological service supplying regions.

Chapter Four

WWF One Planet Solutions



WWF One Planet Solutions

Better choices can be made and practical solutions do exist

WWF's "One Planet Perspective" outlines better choices for managing, using and sharing natural resources within the planet's limitations – so as to ensure food, water and energy security for all.



PRESERVE NATURAL CAPITAL
restore damaged ecosystems, halt the loss of priority habitats, significantly expand protected areas



PRODUCE BETTER
reduce inputs and waste, manage resources sustainably, scale-up renewable energy production



CONSUME MORE WISELY
through low-Footprint lifestyles, sustainable energy use and healthier food consumption patterns



REDIRECT FINANCIAL FLOWS
value nature, account for environmental and social costs, support and reward conservation, sustainable resource management and innovation



EQUITABLE RESOURCE GOVERNANCE
share available resources, make fair and ecologically informed choices, measure success beyond GDP

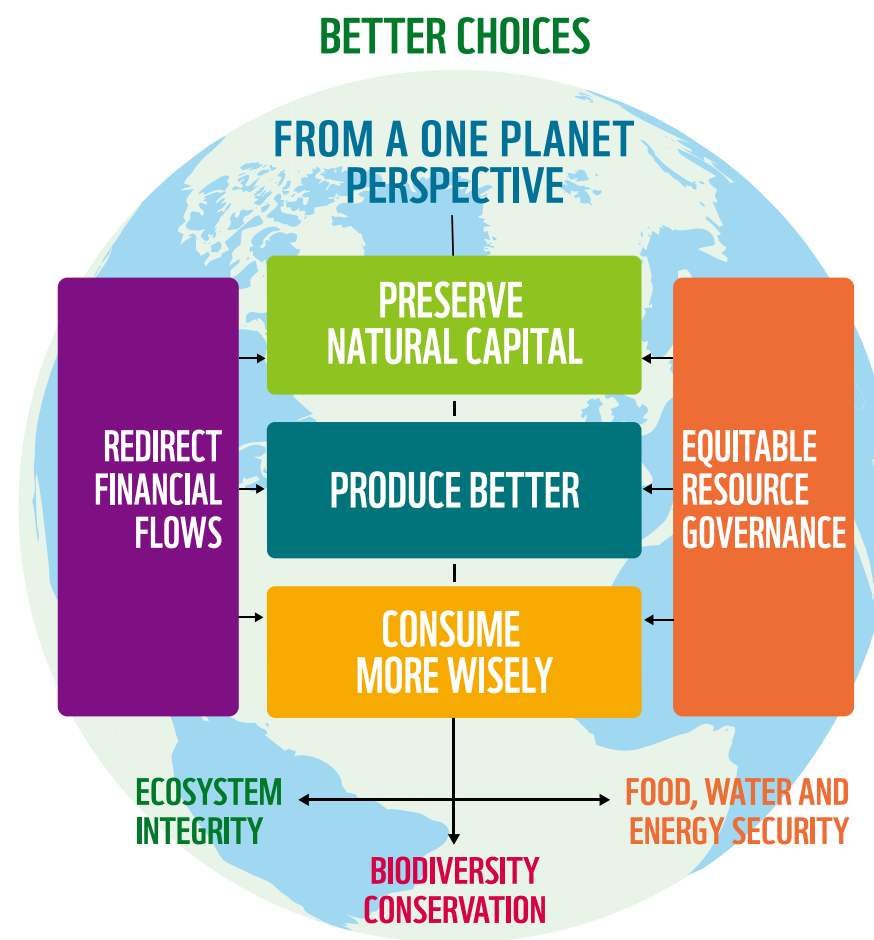


Figure 4.1 One Planet Perspective

Data source: WWF, 2012

1

Green Transformation of A Dairy Giant

Few people in Shanghai do not know Bright Dairy: the time-honored enterprise with more than a hundred years of operating experiences familiar to many generations in Shanghai. Today, Bright Dairy is one of China's largest dairy product producers and sales companies with one of the most complete industrial chains.

Inextricably linked to people's daily lives, the dairy industry is a huge water consumer. China deficiency in water resources means problems such as water pollution and water environment degradation are gradually becoming more severe as the economy and society enjoy rapid growth. Currently, 700 million people from 43 countries around the world are suffering from water shortages. By 2025, 3 billion people are expected to live in water-stressed countries around the globe.

In 2011, the World Wide Fund for Nature (WWF) introduced the Water Stewardship mode into the Yangtze River basin. The 'Suggestion on Implementing the Strictest Water Resource Management System' released by the State Council in early 2012 boosted WWF's efforts to protect China's fresh water resources.

As a reputable and state-owned enterprise and leading company in the dairy product industry located in the downstream catchment of the Yangtze River in East China, Bright Dairy realized that its traditional production mode could no longer meet the needs of the new era, in which enterprises should shoulder more environmental protection responsibilities, reduce resource depletion, and eliminate environmental pollution. Since 2013, WWF has helped Bright Dairy to implement a series of Water Stewardship activities designed to reduce the company's production-related Water Footprint and improve the environment. Through "Green Cooperation" with WWF, Bright Dairy has explored the "water and energy-saving, cost-cutting, efficiency boosting and sustainable

development maintaining" standard that meets the demands of dairy producers from the perspective of the complete industrial chain.

Zhang Chongjian, Chairman of the Board of Bright Dairy, said that "water resources are the most important strategic supplies for the safe production of dairy product producers. The larger the production scale, the greater the demand and consumption of water resources. Since more than 85% of fresh milk is made of water, the water quality plays a decisive role in the quality of the dairy products. High-quality dairy products can only be made from 'safe, quality and reliable' water resources, which in turn realize the sustainable growth of dairy product producers."



View at the gate way of Jinshen Pasture



Feed on food freely



Grazing



Distributing foodstuff



Milking center



Mechanized milking

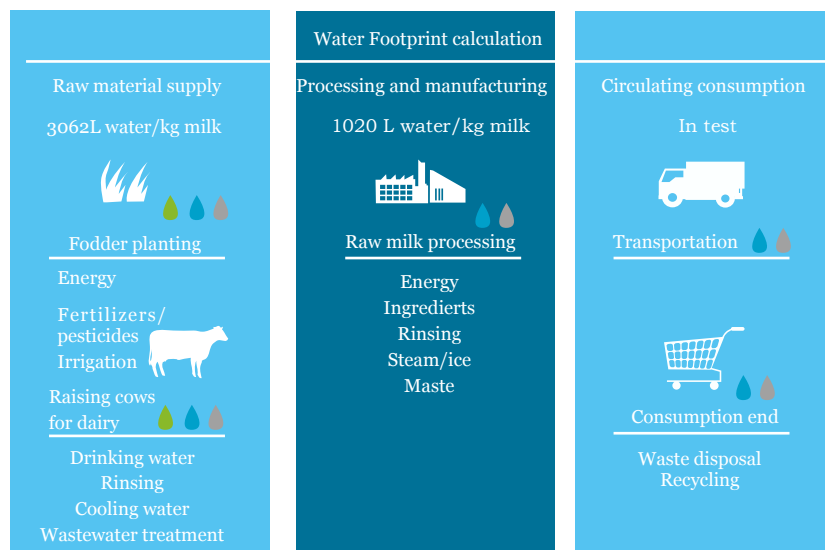
WWF's Water Stewardship Programme

Water Stewardship is one of WWF's three fresh water strategies. In contrast to the prevailing top-down water management system led by the governments, Water Stewardship is a water resource management project initiated by enterprises and with the participation of various stakeholders (companies, governments, social organizations, communities, etc.). The parties work together through a collaborative platform to reduce the effect of Water Footprint in the basin and to address the water risks together, so as to optimize the economic, social and environmental benefits and achieve sustainable development.

Since 2014, Bright Dairy has undertaken a series of actions in its Shanghai East China Processing Factory, Shanghai Jinshan Holstein Pasture, and the newly built pasture in Wuhan, Hubei Province: (1) Install water meters at every production link in pastures under construction (or that are newly built) in order to have real-time surveillance on the water usage of the pastures and to reduce the "blue Water Footprint" in the industrial chain; (2) Construct wastewater treatment stations in pastures with the aid of the World Bank Project, in an effort to reduce the "grey Water Footprint" in the industrial chain; (3) Supervise the water quality in basins around the pastures and the processing factories on a timely basis to reduce relevant regional water risks; and (4) Improve (or construct) water

recycling equipment in processing factories and pastures to increase water recycling efficiency and improve the company's water balance.

In two years' efforts, WWF has helped Bright Dairy complete calculation of its Water Footprint, evaluating the water risks and testing the water balance of its industrial chain. Bright Dairy has set a future goal to reduce its overall Water Footprint by 20%, of which raw material supply-related Water Footprint will be reduced by 23.3% (714.4 L of water/kg of milk), and the processing and manufacturing-related Water Footprint will be reduced by 10% (102 L of water/kg of milk). The realization of this goal will play an important demonstration role in improving the water management method of the entire industry.



Bright Dairy's Water Footprint Data

Water Footprint: an index measuring water usage including the direct usage by consumers or producers and indirect usage. Water Footprint falls into three categories, the blue Water Footprint (surface water and ground water used in production), the green Water Footprint (rain water used in production that does not become runoff), and the grey Water Footprint (related to pollution).

Water Footprint in large pastures is 16,400 tons of water/cow.

Water Footprint in medium-sized pastures is 15,300 tons of water/cow.

Water Footprint of fresh milk is 1172.80 L of water/kg of milk.

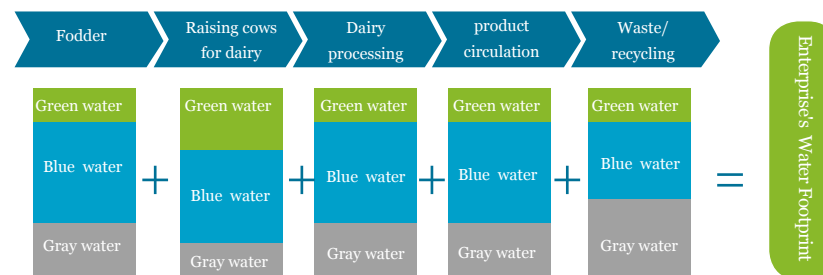
Water Footprint of yogurt is 1276.15 L of water/kg of milk.

Water Footprint of milk powder is 3908.76 L of water/kg of milk.

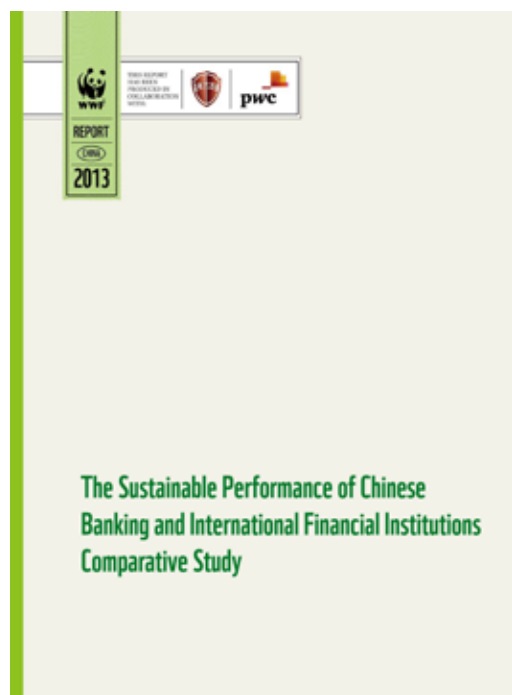
Of the 705 tons of water used by pastures every day, 495 tons are production-related water usage, 188 tons are cleaning-related water usage, and 389 tons are discharged wastewater. The wastewater discharge ratio is 55%.

Of the 681 tons of water used by processing factories every day, 504 tons of water are discharged with a discharge ratio of 74%, recycled percentage of 20% and an actual wastewater discharge ratio of 59%.

*(*The average monthly water usage in a household is about 10 tons, so 16,400 tons of water is sufficient to support one hundred families for more than a year.)*



2 WWF Actively Promotes the Implementation and Sustainable Development of Green Credit loan by China's Financial Institutions in the Banking Industry



Both Chinese and foreign financial institutions in the banking industry have been paying more attention to the management of environmental and social risks in recent years, and continuously regarding it as a key part of the process of making credit loan decisions and operation strategies. Hence, the CBRC, WWF and PwC jointly released the report -- the International Comparative Study on Sustainable Performance of China's Banking Financial Institutions in November 2013, investigating and interviewing 12 Chinese policy-based and commercial banks and 9 international financial institutions upholding

the "equator principle" in aspects such as the strategic and policy framework, organization management, procedures and tools, supervision reporting and verification, capacity building and sustainable financial products. Large amounts of valuable experiences and good practice are summarized in the report.

As China's first analytical report that evaluates and sorts out China's banking financial institutions' sustainable performance, this report points out that these institutions have reached a consensus on the importance of the management of environmental and social risks. The implementation of green credit loans can not only support China's economic transformation and industrial upgrade, effectively control high energy consuming and high pollution producing industries with excess production capacity, but also reduce banks' credit loan risks, boost their social image and reputation, and form new business growth points. In the survey, two thirds of the interviewed banks provided cases in which credit granting requests were either denied or suspended due to environmental and social risks. In the meantime, most banks interviewed stated that they would actively support energy-saving and emission-cutting projects, as well as those characterized by environmental protection, thus realizing a win-win situation for both economic interests and social benefits.

The report also shows that even though China's banking industry has made a great progress in implementing the "green credit loans", it is still faced with many difficulties and challenges, such as the lack of professionals, specialization and capability, which is urgently needed to be enhanced in the management of environmental and social risks, as well as banks' ability to communicate with external entities.

The study report has received positive responses and extensive compliments. On the basis of conducting in-

depth research, extensive discussions and scientific analyses, WWF will publish the report on a regular basis to continue evaluating the sustainable performance of China's banking industry. In the meantime, in light of the problems and challenges found in the report, WWF will actively cooperate with relevant government agencies, financial institutions, international organizations and industrial associations to conduct in-depth research on the green financial policy and events, and offer suggestions. WWF will hold special training and experience exchanging sessions on key industries. It will also cooperate with financial institutions to study the green finance, sort out, summarize and introduce the policy-making experiences and sound cooperation on environmental and social risk management of international institutions, in an effort to help China's banking industry better implement relevant policies on green credit loans.

Since China has carried out green credit loans, the number of projects has grown from 2,700 in 2007 to 14,000 in 2013, and loan balance has risen from RMB340 billion in 2007 to RMB1.6 trillion in 2013. By the end of 2014, the green credit loan balance of 21 major banks, including the Industrial and Commercial Bank of China (ICBC), the Agricultural Bank of China (ABC), the Bank of China (BOC), the China Construction Bank (CCB), the Bank of Communications, the Postal Savings Bank of China (PSBC), the China CITIC Bank, and the China Everbright Bank, has exceeded RMB6 trillion, accounting for 9.33% of all of their loans.

WWF will continue to promote the development of green credit loans in China, and be committed to financially influencing the capital flow, and promoting financial institutions to make active and effective contributions to ecological protection, environmental treatment, energy saving, emission cutting and sustainable growth.

3

Constructed Wetland – the Ecological Kidney in Upper Yangtze River Basin



“It is really amazing to see the improvement after the wetland is constructed with beautiful flowers and plants. You can never imagine that fish could swim in a pond of purified wastewater that used to be so black and bad smelling! Seeing the real change, my neighbors do not complain any more, and more and more families in the village are benefitting from the project.” – Wu Shibin, agritainment farmhouse owner and village leader of Yuanshan Village, Guanyuan City, Sichuan Province.

The Minjiang and Jialing rivers are two of the most important tributaries of the upper Yangtze River in China’s Sichuan Province and Chongqing Municipality. Now, a new form of business, “agritainment,” is booming among farmhouse owners within these two river basins. “Agritainment” refers to any farm-based tourism operation that offers agriculture-themed entertainment, such as hands-on farming experiences and on-site sourced and produced meals.

Agritainment in Sichuan province is growing fast and accounts for more than one-third of China’s agritainment revenue. By the end of 2012, there were more than 1.5 million farmhouses receiving more than 6 billion visitors. Income from agritainment is expected to reach RMB100 billion in 2015.

Mr Wu Shibin, the 53-year-old village leader, is one of hundreds of farmhouse owners in Sichuan Province. At the beginning of 2013, Wu started a small business, operating a restaurant and hostel at his compound. During the holiday season, he serves hundreds of visitors. Initially business was good, but only a few days after he opened the doors to guests, neighbors started complaining about wastewater and associated smells coming from the farm.

As a leader who cares about his village and its residents, Wu wanted to address the concerns.

He built a containment pool, which effectively collected wastewater but did not improve the smell. Daily wastewater produced by his agritainment business was leading to a number of environmental challenges, including impacting water quality in the lower reaches of the Minjiang and Jialing river basins.

Wu needed help and approached WWF. As part of its Yangtze River partnership with the Coca-Cola Company, WWF collaborated with Chongqing University’s College of Environmental and Chemical Engineering to pilot a wetland construction project aimed at controlling non-point pollution. Since its inception, the new wetland has functioned as an ecological kidney for Wu’s village as well as nearby villages, purifying wastewater from Wu’s agritainment business before it reaches the river. Ultimately, the installation of this wetland purifying system can demonstrate a possible solution for zero wastewater discharge from farmhouses and further reduce non-point water pollution from rural areas.

Today, behind Wu’s farmhouses, constructed wetlands have been transformed into delicate gardens. Purified wastewater is collected for future use in case of drought. In the reservoir, lotus flowers and water milfoil have been planted, and fish are swimming. Seeing dirty water purified by the wetland, local farmers, initially doubtful, are now believers in this innovative solution. Some farmers were even willing to provide materials and do the construction by themselves under WWF’s guidance. WWF plans to roll out the project in Chongqing, Guanyuan and Chengdu, so that more farmhouses will benefit.

4 Small Energy Efficient Stoves Protect Giant Panda Habitats

“By helping build energy efficient stoves in the families of local communities, the relationship between local people and us is getting better, it is very helpful for our protection work in the Giant Panda Nature Reserve.” --Zhang Mianyu, Officer, Mamize Nature Reserve, Sichuan province, China

Today, the last 1800 Wild giant pandas are only found in South West Central China, specifically in Qinling, Minshan, Qionglai, Liangshan, Daxiangling, and Xiaoxiangling Mountains of Shaanxi, Sichuan and Gansu Provinces. Their natural habitat is deciduous broadleaf, mixed conifer, and sub-alpine coniferous forests between 1200 to 3400 million hectares. Due to farming, deforestation, and other developmental factors, the giant pandas' natural habitat is rapidly disappearing.

Qeluo Nvxi is a young mother of Ni minority group living in a quite minority village close to Mamize natural reserve in Sichuan province, the southernmost area of the panda habitat. She can still clearly recall the interesting story that panda encountering human beings in her neighbour's backyard at her teenage. Twenty years ago, it was no rare to encounter or track pandas if local people went into mountains for firewood.

However, the deforestation and forest degradation caused by massive firewood consumption tremendously destroyed the panda habitats in the last decades, leading to acute challenge of ecological biodiversity loss of the Giant Panda nature conservation areas.

The impact is obvious to both pandas and human beings. “It's said there are about ten pandas living here, but I never discovered any of them, even when going into depths of mountains for hacking firewood.” Nvxi said. On the other

hand, the time dedicated to collect and cut firewood for Nvxi and her neighbours increase to about 3 months a year, almost doubled than twenty years ago. “Sometimes you just have to get up before sunrise and spend whole day in remote mountains in order to hack a bundle back before sunset.” Nvxi explained. An average local family as Nvxi's needs approximately 30 tons of firewood consumption per year, which means that 0.37 ha of forest is deforested.



Besides, another short come of traditional way of cooking is the low thermal efficiency of conventional cook stove, which is less than 10%. Nvxi has already taken granted, as most of her neighbours, for the heavy unhealthy smoke from the incomplete combustion of firewood while cooking.

Believing that forest protection is essential to panda and panda habitat conservation, WWF China together with Mamize Nature Reserve (located in Leibo County, Liangshan Autonomous Prefecture of Sichuan province in China) implemented the Energy Efficient Stove Project

in those Yi ethnic minority communities in 2012. Nvxi's family is among those first benefited from the project. The thermal efficiency of the new stoves is 30%, triple that of the conventional stoves. The stoves reduce firewood consumption by an estimated 10 tons per year and reduce CO₂ emissions by 7 tons per year. WWF also arranged for the CO₂ reductions to be traded in the international carbon market, creating an income used to fund expanding emission-reduction projects in the area.

This project not only provides ecological benefits to the diminishing forests that act as the habitat for the giant panda, but also greatly improves the lives of the villagers. The technological improvement to their everyday lives frees up the job of loggers to work on other forms of livelihood development and also creates a healthier environment for the housewives to cook.

Till date, 1,600 stoves have been built. Another energy efficient stove project is launched on May 2013 together with Shaanxi Huangguanshan Nature Reserve in Ningshan County, Shaanxi Province. About 1300 to 1400 cook stoves will be rebuilt or modified in 14 community villages by the end of 2014. “Generation by generation we live here, and we are proud for living in the common home with pandas.” Nvxi said.

5 Pandas' Habitats Benefit from Sustainable Utilization of Chinese Herbal Medicines



Yu Zerun, a villager from Daping village of Crystal town, said that in the past, the amount of *Schisandra chinensis* declined due to collection. by WWF

In an ordinary peasant's house located in Crystal town of Pingwu County, Sichuan Province, Joseph from the US, accompanied by staffers of World Wide Fund for Nature (WWF), carefully took a handful of red fruits same size as soybeans from a peasant, and observed them in the early autumn of 2014.

"They have bright color, full shape, uniform size and good quality," said Joseph while complimenting the fruits. He also brought good news to the peasants.

"This year we will continue to purchase these fruits, and raise the purchase price by 15%," said Joseph generously while looking at the fruits in his hands.

Joseph, the CEO of American Traditional Medicinals Corp.,

is also an old friend of Crystal town. His bond with Crystal town is resulted from *Schisandra chinensis*, a medicinal plant that grows red fruits.

Schisandra chinensis, a Chinese medicinal material that has five flavors, namely spicy, sweet, sour, bitter and salty. It has been widely applied to the treatment of various diseases that are difficult to cure. As the market's demand for *Schisandra chinensis* continues to grow in recent years, villagers of Crystal town are now in the face of a gradually difficult problem:

Located in the middle and upper stream of the Yangtze River, Crystal town is not only abound in valuable Chinese medicinal materials, such as the *Schisandra chinensis*, it is also adjacent to Xuebaoding, and other natural reserves. Hence, it is rich in biodiversity, and rare species such as wild pandas also reside here. As the Chinese medicine market became more heated over the past few years, more and more villagers from the town rushed to surrounding forests to collect the herbs.

When *Schisandra chinensis* close to the town were depleted, villagers had to travel further into the woods to collect the herbs, and even illegally broke into the nature reserves. While gathering herbal medicines, many villagers also cut down trees to build shacks for temporary shelter, and even hunted wild animals for food. Such practice not only made the collection of *Schisandra chinensis* unsustainable, it also severely damaged the pandas' habitats, threatening the survival and reproduction of wild animals, including the pandas.

"In order to gather more *Schisandra chinensis* in a short amount of time, we used to cut down branches directly with a knife, or even pulled the plants off the ground together with their roots. When the trees (for the herbs) were gone, the amount of medicines surely declined," said Yu Zerun, a villager of Crystal town.

In order to maintain and improve the livelihood of residents

living in communities around the pandas' habitats, and protect the medicinal plants at the same time, WWF, together with the "Sino-Europe Biodiversity Project", launched the sustainable pilot collection of *Schisandra chinensis* in Daping village, Crystal town in 2008. After the project was launched, experts from Chengdu University of Traditional Chinese Medicine, Wanglang National Natural Reserve, and other units paid frequent visits to the village. They passed the concept of sustainable collection to the villagers via vivid training sessions.

"We learnt from the training program that *Schisandra chinensis* should be collected after they mature. One should slowly remove them from the branch, instead of cutting off the entire plant. Such act not only improves the quality of the herbs, but also guarantees that *Schisandra chinensis* are available for collection each and every year. We stopped cutting down trees and hunting during herb collection, and we would actively report to the surrounding reserves if we spotted wildlife such as pandas," said Luo Zhongping, a villager.

In addition to large amount of trainings, the project, together with the villagers, elected the "medicinal material resource management team for Daping village", formulated a village regulation for Chinese herbal medicine collection, compiled the Sustainable Collection Guidelines for *Kadsura longepedunculata*. It also guided villagers to utilize medicinal plant resources in a sustainable manner. On the other hand, by holding activities such as the *Schisandra chinensis* Picking Festival to expand the market, the project helped villagers find buyers of *Schisandra chinensis*.

With the support of WWF, in the autumn of 2009, an order of 500 kg of sustainably collected *kadsura longepedunculata* (amount to about 3 tons of fresh *Schisandra chinensis* fruits) launched the cooperation between Daping village and American Traditional Medicinals Corp. This company purchased local *kadsura longepedunculata* with a price far higher than the ordinary market price.



For more cases and information, please visit: <http://www.wwfchina.org/specialdetail.php?pid=208>

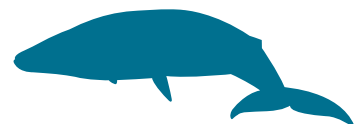


Qinling Mountainous Regions in Shaanxi Province (in Zhouzhi County and Foping County, Shaanxi Province)

WWF and the Guanyin Mountain Natural Reserve together launched the project for the effective management project of the panda corridor in the Qinling Mountain. After ten years of efforts, the panda habitats separated by National Highway 108 have been successfully connected to create an ecological corridor for wild animals. Such actions help create a balance between socioeconomic development and the construction of infrastructure on the one hand and the protection of global species and biodiversity-rich zones on the other.

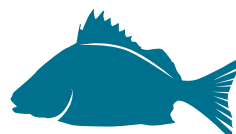
Wetland of former watercourse of Yangtze River located in Swan Shoal, Shishou, Hubei Province

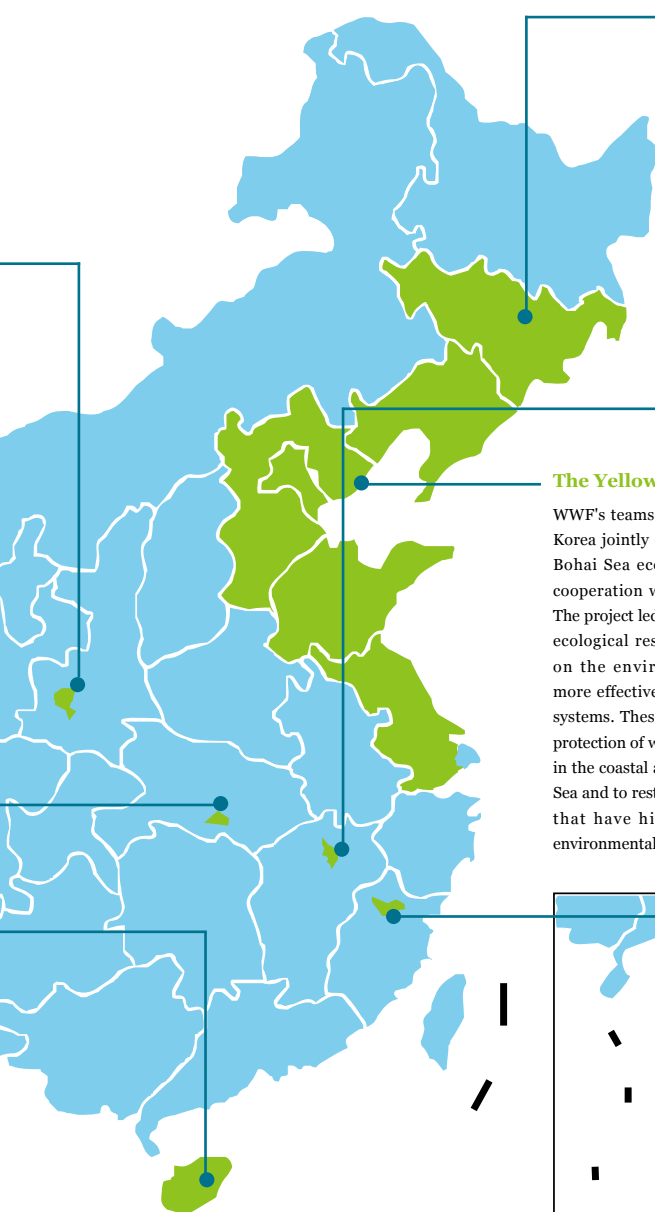
WWF launched a sustainable agricultural plantation demonstration project in the wetland of the former watercourse of Yangtze River in Swan Shoal of Hubei Province, a habitat for abundant rare wetland species such as cowfish and elk. The environmentally friendly production model and technical system has reduced agricultural pollution from non-point sources and protected wildlife and wildlife habitat. WWF is also committed to improving the value of and consumer demand for sustainable agricultural products, and to establishing a model for cooperation with rural cooperative organizations, enterprises, research institutions and social and environmental organizations, so as to realize an economically, socially and environmentally win-win situation.



Hainan Province

WWF and its partners conducted the "green tilapia industry" project in order to protect Hainan Province's unique ecological environment and reduce the water pollution and biological safety risks due to poor management of aquaculture. The project introduced the certification scheme of the Aquaculture Stewardship Council (ASC) to help Hainan Province establish a better aquaculture operation model. In October 2015, the tilapia aqua-farm in Hainan Province received China's first ASC certificate for raising and breeding tilapia.





Jilin Province

WWF conducted a pilot sustainable maize development project in Jilin Province to explore how best to ensure efficient and healthy maize production in counties with important wetland ecosystems. Use of drip irrigation under plastic film and the integration of water and fertilizer technology has reduced overexploitation of groundwater as well as the negative pressures exerted by maize plantations on wetlands, fresh water, soil, climate and species including waterfowl. Such efforts to realize a harmonious interaction between agricultural activities and the natural environment are core to sustainable development in China and elsewhere.



The Yellow Sea Ecoregion

WWF's teams in China, Japan and South Korea jointly carried out the "Yellow and Bohai Sea ecological region project" in cooperation with multiple stakeholders. The project led to designation of important ecological reserves, provided education on the environment, and introduced more effective management of ecological systems. These efforts are contributing to protection of wetland and fishery resources in the coastal area of the Yellow and Bohai Sea and to restoration of ecological regions that have high social, economic and environmental value.



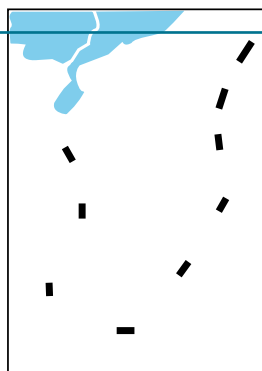
Areas surrounding the Nanji Wetland National Natural Reserve of Poyang Lake in Jiangxi Province

In order to resolve the food conflict between migrant birds and fishermen around the reserve, WWF jointly organised an "award based on the number of birds around the lake" with the local reserve, linking the protection of birds to the fishermen's interests. The award generated enthusiasm amongst the community to participate in the protection of birds. Today effective co-management with the communities has resolved the conflict between birds and humans, facilitating the protection of birds and their habitats and promoting the protection of the ecological systems in the Poyang Lake region.



Jianyang of Fujian Province

Together with its partners, cooperative enterprises and the forestry department, WWF has helped forestry and bamboo producers to obtain Forest Stewardship Council (FSC) certification for sustainable forest operations in bamboo forests and has improved the livelihood and welfare of villagers living in surrounding communities through complementary measures. WWF managed to raise people's awareness of environmental protection and achieve a win-win situation where enterprises can thrive and grow, the environment is protected, and the community maintains sustainable development.



APPENDIX A TECHNICAL QUESTIONS

<p>What is the difference between the index of population trends of Chinese terrestrial vertebrates and the global Living Planet Index?</p>	<p>The Living Planet Index is a population variation trend index based on data describing population time series of vertebrates around the world. Calculation of the index of population trends of Chinese terrestrial vertebrates has made reference to the calculation of the LPI. The data come from the Library of Chinese Vertebrate Population Trends. The index of population trends of Chinese terrestrial vertebrates is distinguished by the fact that the various living strategies adopted by different animal groups have been taken into consideration while interpreting the index. It reflects the influence of the species' own biological and ecological characteristics on the population trends</p>
<p>Why doesn't the index of population trends of Chinese terrestrial vertebrates use data on migratory birds?</p>	<p>The data on migratory birds are the most abundant in the Library. Many species migrate across and between countries and habitats in China may only be used at certain stages in the annual cycle – as winter or breeding habitats or even simply as a stop along a migration route. Birds migration routes can vary over time, across sometimes extended areas, and routes of some birds have reportedly changed due to climate change.</p> <p>There are a number of reasons why bird population monitoring data are not very reliable. Firstly, the birds may be monitored during different migration periods each year, resulting in artificial discrepancies in the monitoring data. This is because the bird's migration period varies annually and monitoring efforts cannot cover the entire migration period. Secondly, investigation points may be located at several sequential points along the same migration route; hence it is difficult to avoid repeated counting at multiple monitoring points. Repeated data will amplify a given trend. Thirdly, monitoring at a single location can lead to disparities in the data as a result of inter-annual variations in migratory routes, with a given site potentially hosting a disproportionately high or low proportion of the population.</p>
<p>How is the Ecological Footprint calculated?</p>	<p>The Ecological Footprint measures the amount of biologically productive land and water area required to produce the resources an individual, population or activity consumes and to absorb the waste it generates, given prevailing technology and resource management. This area is expressed in global hectares (hectares with world average biological productivity). Footprint calculations use yield factors to normalize countries' biological productivity to world averages (e.g., comparing tonnes of wheat per UK hectare versus per world average hectare) and equivalence factors to take into account differences in world average productivity among land types (e.g., world average forest versus world average cropland). A detailed methods paper and copies of sample calculation sheets can be obtained from www.footprintnetwork.org</p>
<p>What is included in the Ecological Footprint? What is excluded?</p>	<p>To avoid exaggerating human demand on nature, the Ecological Footprint includes only those aspects of resource consumption and waste production for which the Earth has regenerative capacity, and where data exists that allow this demand to be expressed in terms of productive area. For example, toxic releases are not accounted for in Ecological Footprint accounts. Nor are freshwater withdrawals, although the energy used to pump or treat water is included. Ecological Footprint accounts provide snapshots of past resource demand and availability. They do not predict the future. Thus, while the Footprint does not estimate future losses caused by current degradation of ecosystems, if this degradation persists it may be reflected in future accounts as a reduction in biocapacity. Footprint accounts also do not indicate the intensity with which a biologically productive area is being used. Being a biophysical measure, it also does not evaluate the essential social and economic dimensions of sustainability.</p>

What is the data source of Ecological Footprint?	In this report, Ecological Footprint and biocapacity results are presented based on the National Footprint Accounts (conducted by GFN) as well as analysis conducted by IGSNRR. The National Footprint Accounts are based mostly on United Nations datasets and reported at the national level. IGSNRR results are based on datasets from the National Bureau of Statistics in China and include sub-national results by urban and rural populations. All Ecological Footprint and biocapacity results are expressed in units of global average bioproductive hectares (global hectares). In this report, all the global data is updated to 2010, while all the Chinese provincial level data is updated to 2012.
How does the Ecological Footprint account for the use of fossil fuels?	Fossil fuels such as coal, oil and natural gas are extracted from the Earth's crust and are not renewable in ecological time spans. When these fuels burn, carbon dioxide (CO ₂) is emitted into the atmosphere. There are two ways in which this CO ₂ can be stored: human technological sequestration of these emissions, such as deep-well injection, or natural sequestration. Natural sequestration occurs when ecosystems absorb CO ₂ and store it either in standing biomass, such as trees, or in soil. The Carbon footprint is calculated by estimating how much natural sequestration would be necessary to maintain a constant concentration of CO ₂ in the atmosphere. After subtracting the amount of CO ₂ absorbed by the oceans, Ecological Footprint accounts calculate the area required to absorb and retain the remaining carbon based on the average sequestration rate of the world's forests. CO ₂ sequestered by artificial means would also be subtracted from the Ecological Footprint total, but at present this quantity is negligible. In 2008, 1 global hectare could absorb the CO ₂ released by burning approximately 1,450 litres of gasoline. Expressing CO ₂ emissions in terms of an equivalent bioproductive area does not imply that carbon sequestration in biomass is the key to resolving global climate change. On the contrary, it shows that the biosphere has insufficient capacity to offset current rates of anthropogenic CO ₂ emissions. The contribution of CO ₂ emissions to the total Ecological Footprint is based China Ecological Footprint Report 2012 56 on an estimate of world average forest yields. This sequestration capacity may change over time. As forests mature, their CO ₂ sequestration rates tend to decline. If these forests are degraded or cleared, they may become net emitters of CO ₂ . Carbon emissions from some sources other than fossil fuel combustion are incorporated in the National Footprint Accounts at the global level. These include fugitive emissions from the flaring of gas in oil and natural gas production, carbon released by chemical reactions in cement production and emissions from tropical forest fires.
Does the Ecological Footprint say what is a “fair” or “equitable” use of resources?	The Footprint documents what has happened in the past. It can quantitatively describe the ecological resources used by an individual or a population, but it does not prescribe what they should be using. Resource allocation is a policy issue, based on societal beliefs about what is or is not equitable. While Footprint accounting can determine the average biocapacity that is available per person, it does not stipulate how this biocapacity should be allocated among individuals or countries. However, it does provide a context for such discussions.
What is Water Footprint?	Water Footprint (WF) of a country or region shows the total volume of water directly or indirectly used to produce the goods and services consumed by inhabitants there. Water Footprint consists of two parts: the internal and the external. The Water Footprint can be considered from the perspective of production or consumption. The Water Footprint of production of a country or a region is the volume of freshwater used to produce goods and services within a given area, irrespective of where those goods and services are consumed. The Water Footprint of Consumption of a region is the volume of water used in the production of goods and services that are consumed by the residents of that region, irrespective of where the goods and services are produced. Water stress can be defined as the proportion of renewable surface water and underground water that is consumed by households, industry and agriculture in a given country or a region on a year round basis.
What is the methodology?	The unit of cubic meters is used to express Water Footprint. Water Footprint classification and accounts are generally consistent with those reported in the WWF Living Planet Report. The Water Footprint calculations are based on the Food and Agriculture Organization datasets.

APPENDIX B GLOSSARY OF TERMS

Biocapacity	The capacity of ecosystems to produce useful biological materials and to absorb waste materials generated by humans, using current management schemes and extraction technologies. Biocapacity is measured in global hectares (Global Footprint Network, 2012).
Carbon footprint	The demand on biocapacity required to sequester (through photosynthesis) the carbon dioxide (CO ₂) emissions from fossil fuel combustion. Although fossil fuels are extracted from the Earth's crust and are not regenerated in human time scales, their use demands ecological services if the resultant CO ₂ is not to accumulate in the atmosphere. The Ecological Footprint therefore includes the biocapacity, typically that of unharvested forests, needed to absorb that fraction of fossil CO ₂ that is not absorbed by the ocean (Global Footprint Network, 2012). There are several calculators that use the phrase "Carbon Footprint", but many just calculate tonnes of carbon, or tonnes of carbon per Euro, rather than demand on bioproductive area.
Ecological Footprint	A measure of how much biologically productive land and water an individual, population or activity requires to produce all the resources it consumes, and to absorb the waste it generates, using prevailing technology and resource management practices. The Ecological Footprint is usually measured in global hectares. Because trade is global, an individual or country's Footprint includes land or sea from all over the world. Ecological Footprint is often referred to in short form as Footprint (Global Footprint Network, 2012).
Global Hectare (gha)	Ecological Footprint and biocapacity are measured by gha, representing the average productivity of land globally.
Biocapacity deficit/surplus	The difference between the biocapacity and Ecological Footprint of a region or country. A biocapacity deficit occurs when the Footprint of a population exceeds the biocapacity of the area available to that population. Conversely, a biocapacity surplus exists when the biocapacity of a region exceeds its population's Footprint.
Water Footprint	The Water Footprint of an individual, community or business is defined as the total volume of freshwater that is used to produce the goods and services consumed by the individual or community, or produced by the business. The Water Footprint of a nation is defined as the total amount of water that is used to produce the goods and services consumed by the inhabitants of the nation.
Green Water Footprint	Green Water Footprint is the volume of rainwater that is taken up by crops from the soil and subsequently evaporated;
Blue Water Footprint	Blue Water Footprint is the combined volume of surface and underground water used in households, agriculture and during the production of goods.
Grey Water Footprint	Grey Water Footprint is the volume of water required to dilute water pollutants to such an extent that the quality of ambient water remains above designated quality standards.
Water Footprint of production	The Water Footprint of production of a country or a region is the volume of freshwater used to produce goods and services within a given area, irrespective of where those goods and services are consumed.
Water Footprint of Consumption	The Water Footprint of Consumption of a region is the volume of water used in the production of goods and services that are consumed by the residents of that region, irrespective of where the goods and services are produced.
Water stress	Water stress can be defined as the proportion of renewable surface water and underground water that is consumed by households, industry and agriculture in a given country or a region on a year round basis.
LPI	The LPI-Living Planet Index- reflects changes in the health of the planet's ecosystems by tracking trends in a large number of populations of vertebrate species. Much as a stock market index tracks the value of a set of shares over time as the sum of its daily change, the LPI first calculates the annual rate of change for each species' population in the dataset. (see annex 1 for more details.)
HDI	The HDI – Human Development Index – is a summary composite index that measures a country's average achievements in three basic aspects of human development: health, knowledge and a decent standard of living. The HDI contains three components: 1. Health: Life expectancy at birth (number of years a newborn infant would live if prevailing patterns of mortality at the time of birth were to stay the same throughout the child's life). 2. Knowledge: A combination of the adult literacy rate and the combined primary, secondary and tertiary gross enrolment ratio. 3. Standard of living: GDP per capita (PPP US\$). (Source: Human Development Report webpage).

APPENDIX C ADDITIONAL INFORMATION

Population trends in mammals with different living strategies

Why do some species prosper, while others gradually die out under the same environmental pressure? Animals' survival strategies in response to the environment are also crucial factors that determine the fate of the species. The difference between the indices of the mammals in different ecosystems and the ratio of species adopting different living strategies in various ecosystems are closely related.

Any species under a particular ecological pressure is possible to adopt a survival strategy that is conducive to the survival and development of its population. During the course of evolution, animals face two opposite evolution strategies -- the r strategy and the K strategy. r refers to the intrinsic strength growth potential, and K refers to the environmental load.

K-strategists: These species adopt the survival strategy of winning by quality. They usually have large size and long life, but low reproduction rate and long reproductive cycle. They provide good protection for their offspring. Typical K-strategists are large beasts such as pandas and Dongbei tigers. In fact, more than 90% of the protected beasts in China are K-strategists.

r-strategists: These species are opportunists adopting the strategy of winning by quantity. They usually have small size and short life, but high reproductive rate, short reproductive cycle, and high mortality. Typical r-strategists include murine, insects and most birds.

The variation trend index based on 67 K-strategist beasts in China indicates that the population size continued to drop from 1970 to the end of last century, before it is stabilized early this century. From 1970 to 2010, the population size of K-strategist species has dropped by 64%.

The variation trend index based on 87 beast species in China indicates that the population size drastically continued to rise from 1970 to the early 1980s, before entering a cyclical fluctuation status. The population size has increased by 36% from 1970 to 2010.

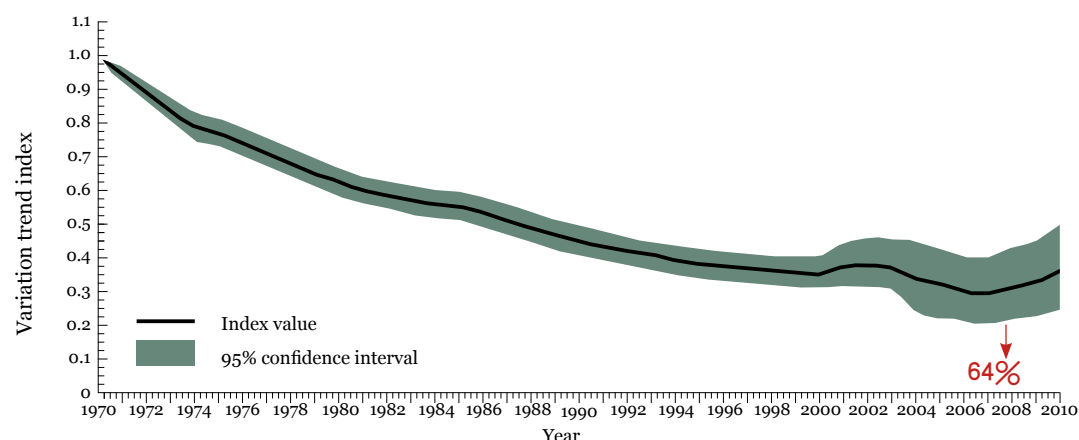


Figure A Index of population trends of K-strategist mammals in China

Data source: Institute of Zoology, Chinese Academy of Sciences, 2015

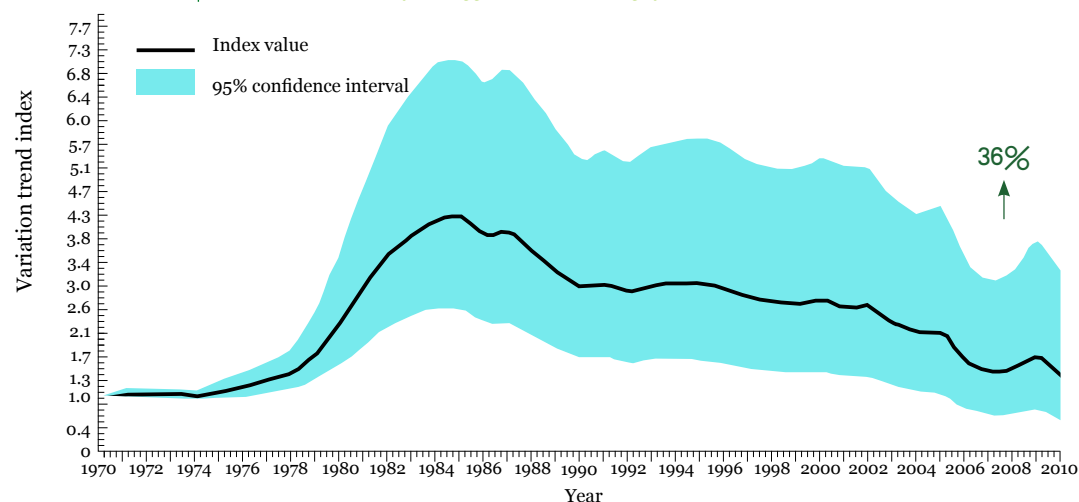


Figure B Index of population trends of r-strategist mammals in China

Data source: Institute of Zoology, Chinese Academy of Sciences, 2015

Why does the variation trend of r-strategists deviate from that of the K-strategists? The main reasons are as follows:

Different survival strategies in response to the environmental pressure

K-strategists are basically large and mid-sized beasts, of which 91% are state or province level protected species. People have clearly recognized its notable population drop, and have taken measures to protect them. Since K-strategist species are highly dependent on a stable environment, and they have low reproduction rate and long reproduction period, their population recovery is still very slow, even when the protection measures are implemented. Since their population density is low and their activity range is extensive, the problem of habitat fragmentation has greater influence on the genetic diversity of such populations. In contrast, for various rodents, especially the murine, even though humans have taken many measures to control their growth, their powerful adaptability and spreading ability still enable them to quickly respond to the drastically changed survival conditions. By rapidly reproducing and spreading, they firmly maintain the prosperous of their families.

Variation in the development trend of the habitats

Most K-strategist species live in the stable forest environment. Even though there are many K-strategist species living in the grassland and desert ecosystem, such as the ungulates in deserts, the species diversity there is far less than that in the forest ecosystem. On the contrary, represented by rodents, r-strategist species prosper as the northern hemisphere becomes drier, and deserts and grasslands expand. The continuity of their habitats is maintained, and some areas even exhibit a tendency of expansion. The significant drop of the K-strategist population, mainly composed of forest beasts, also reflects the continuous disappear of forests.

At different stages in the course of evolution

In a changing historic environment, some species die out, and some maintain a stable equilibrium state, while others are expanding since they are living in a suitable period. An important group of the r-strategist mammals, the differentiation and rapid expansion of many rodent species are accompanied by the drying and desertification of the northern hemisphere. Hence, many groups are at the stage of rapid differentiation and expansion, having high species diversity and large population size. In comparison, many K-strategists, especially large and mid-sized forest species, have a long history of evolution. They have been living in a stable environment, and maintain a balanced population. Some species gradually die out because of the degradation of their habitats and the changes in the overall global environment.

Economic value difference between K-strategists and r-strategists

Many of the K-strategists are deemed as economic species that have "utilization value", such as various kinds of large mammals. Since the emergence of human beings, they have served as the food source, their furs are used as clothes, and their bones and some organs are utilized as important ingredients for traditional medicines. Whether it is for survival or for obtaining economic benefits, K-strategists are mainly "used" in a way of cruel killing. On the contrary, only few r-strategist mammals, such as murine, are deemed valuable. Even though some are deemed as "harmful animals", thus becoming targets to be eliminated, they are hard to eradicate due to its large population, extensive distribution, and powerful population expansion and recovery capability. In addition, since most of them live in sparsely populated desert and grassland areas, they are basically not threatened, which allows them to develop stably.

Influence of population expansion and urbanization

For most K-strategists that are highly dependent on a stable environment, as the population expands, their habitats degrade or occupied by cities, they lost their home due to their failure in adapting to the changed environment. However, the r-strategists are highly adaptable to the new environment created by the humans; hence they can quickly occupy all blank ecological positions in the new habitats, realizing the establishment and expansion of new populations. For example, as forests are replaced by farmlands, various large beasts retreat to reserves, and other "shelters" where the forest habitat is reserved, while the farmlands create new suitable habitats for various kinds of murine, which are conducive to its expansion of its population. Some murine species can adapt to various habitats, including houses of urban residents, and the new environments created by humans. Since there are basically no natural enemies in these artificial environments, these omnivorous and highly adaptable creatures possess powerful reproductive capability, which allows their population to grow rapidly. They even manage to realize long-distance expansion thanks to facilities built by humans, such as highways and railways. Some murine, such as sewer rats, even become humans' company. They prosper thanks to the development made by human beings.

The LPI of Two Special Animal Populations

(1) Population decline due to "economic value"

Musk is the most important and precious medicinal material in the traditional medicine and it is also an expensive spice.

Excessive hunting and forest degradation reduced the population size of Chinese Musk Deer by 92% from 1970 to 2010, and they are now considered endangered.

(2) The spatial and resource competition between humans and their "close relatives"

Humans are the most prosperous and powerful species among primates, and also the most typical and successful K-strategists. The closer the genetic relationship between two species, the more intensive the competition of resources and space is. Humans have completely overcome our "ancestors" and "close relatives" in this competition. Suitable habitats such as cities and farmlands created by humans occupy the home that other primates need for survival. The LPI of 18 Chinese primate species indicates that the population size dropped by 84% from 1955 to 2010, and it has dropped by 62% from 1970 to 2010 alone.

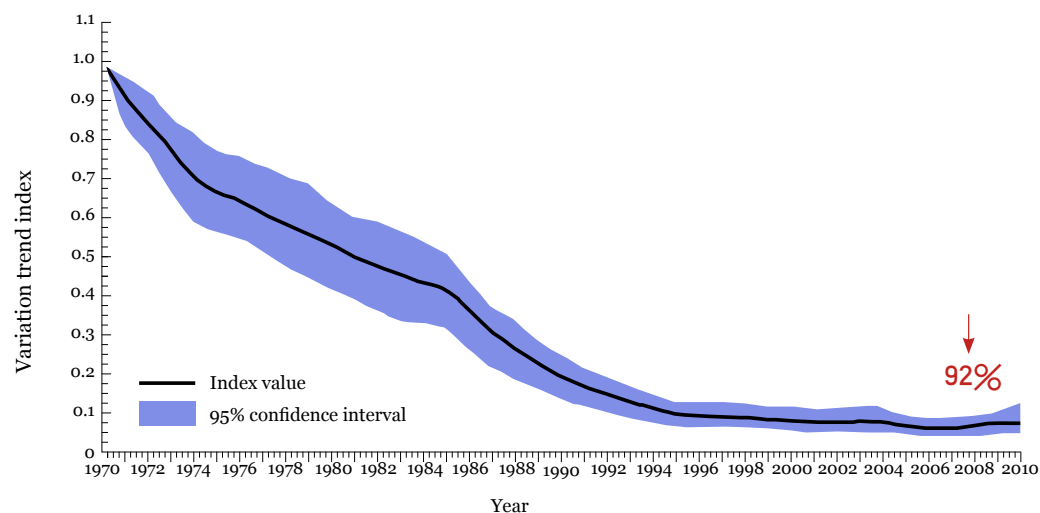


Figure C The LPI of Chinese Musk Deer

Data source: Institute of Zoology, Chinese Academy of Sciences, 2015

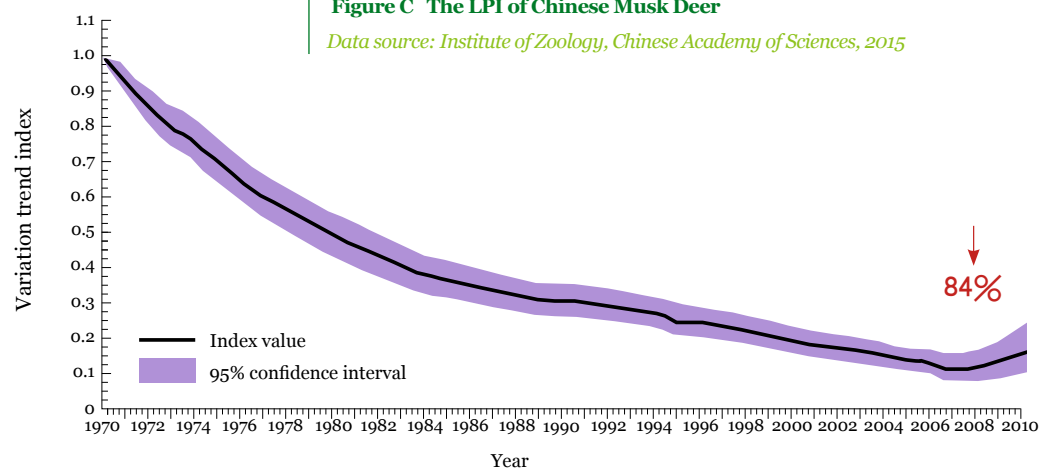


Figure D The LPI of 18 species of Chinese primates

Data source: Institute of Zoology, Chinese Academy of Sciences, 2015

Influence of the Ecological Footprint Left by the Imported and Exported Grains of China

China's grain trade has attracted much attention from the international community. Figures 12 and -3 show the magnitude in global hectares of Chinese grain imports and exports, calculated using trade data compiled by the Food and Agriculture Organization of the United Nations. The biocapacity flows represented by China's grain imports and exports has fluctuated significantly over the past five decades (shown in Figures 1 and 2) and there is no clear underlying trend in these data. While China's net import of grains has increased in recent years, the demand on global biocapacity is similar to that of the early 1960s and about half of its historic peak, as a result of global increases in agricultural productivity (shown in Figure 3).

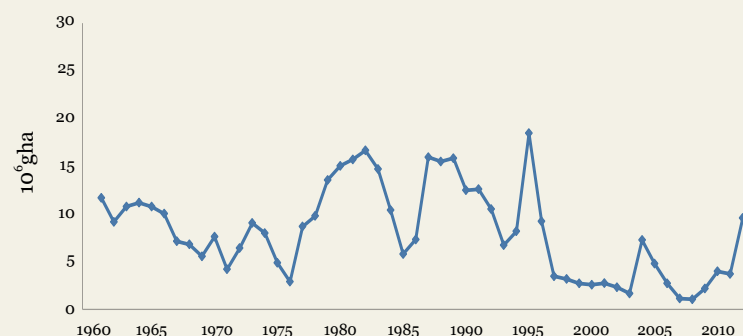


Figure 1 Biocapacity represented by grain imports to China (1960 to 2010).

The quantity of grain imported by China fluctuated considerably over five decades, as has the area of cropland needed to produce these grains.

Data source: IGSNRR, 2014

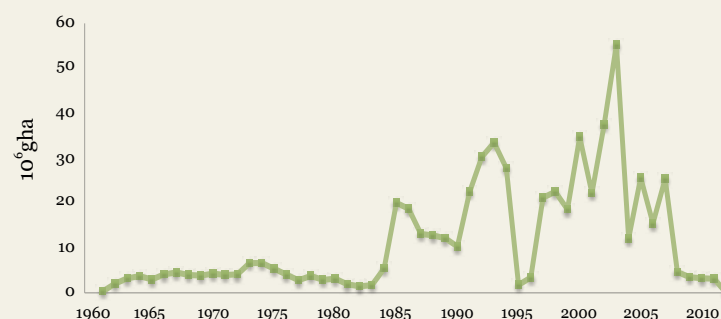


Figure 2 Biocapacity represented by grain exports from China (1960-2010).

China exported large quantities of grain between 1985 and 2005, a period when China's ecosystem underwent serious degradation. The decline in grain exports in recent years reflects an increase in environmental considerations in China's trade policy.

Data source: IGSNRR, 2014

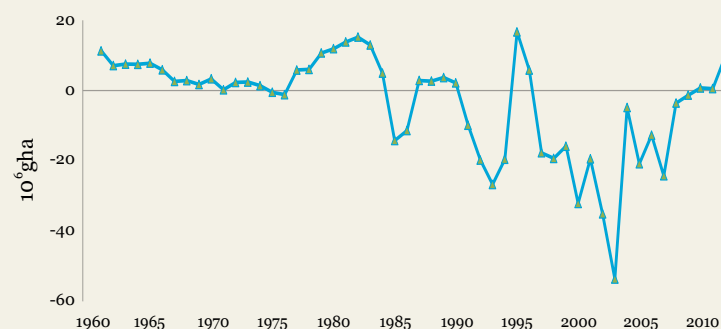


Figure 3 Biocapacity represented by net imports of grains to China (1960-2010)

China's grain imports have increased in recent years but remain below peak levels. The cropland area needed to support China's net grain import is about half of the historical peak in view of global increases in agricultural productivity.

Data source: IGSNRR, 2014

Influence of the Ecological Footprint Left by the Imported and Exported Oil Plants of China

The main raw materials for extraction of edible oils used at the household level in China are soybean, peanut, rapeseed, sunflower seed, and sesame seed. Figures 4, 5 and 6 show Ecological Footprint embodied in the five major edible oils and oilseeds imported and exported by China, based on trade data compiled by the Food and Agriculture Organization of the United Nations. China's consumption of edible oils and oilseed is increasingly dependent on other countries' biocapacity and imports have grown exponentially since the 1990s (shown in Figure 4). This reflects the priority afforded to grain production in China as well as the good availability of edible oils in international markets. Measured in terms of biocapacity, oilseed accounts for the largest proportion of imported and exported edible oil products (shown in Figure 5 and 6)

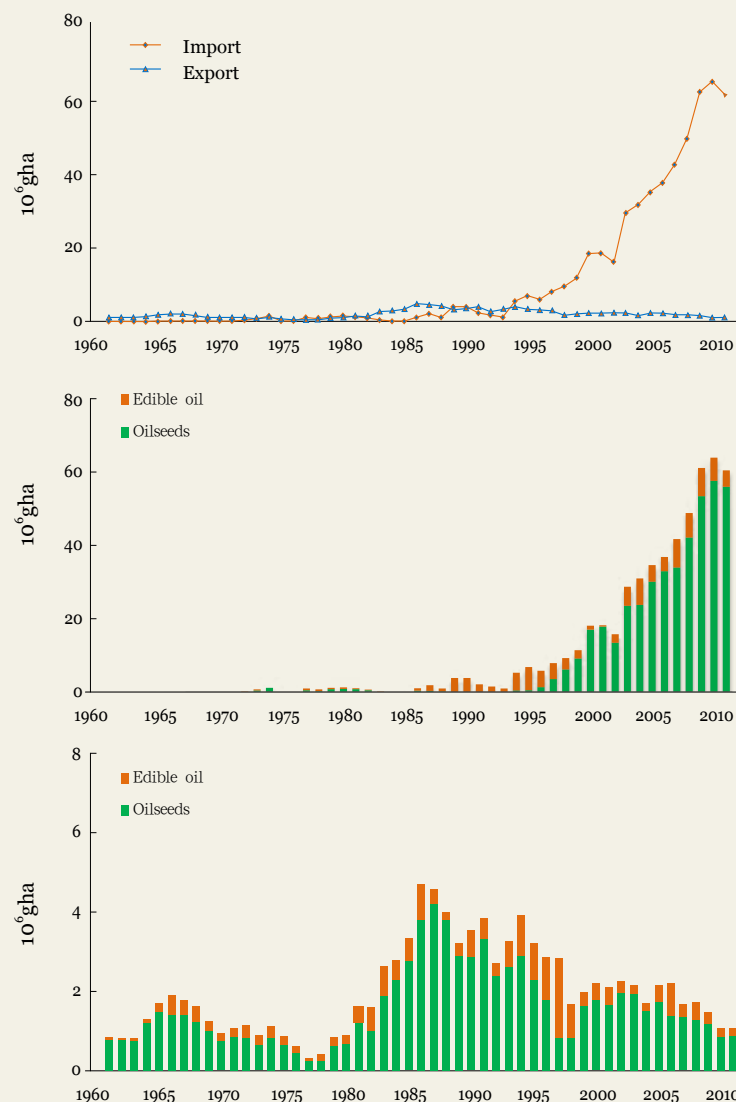


Figure 4 The amount of biocapacity needed to support China's export of five major kinds of edible oil and oil plants

The five major kinds of edible vegetable oil include peanut oil, soybean oil, rapeseed oil, sunflower seed oil and sesame oil.

China has been a net importer of the five types of oilseed and edible oils since 1993.

Data source: IGSNRR, 2014

Figure 5 Biocapacity represented by the five major types of edible oil products imported by China

Oilseeds include peanut, soybean, rapeseed, sunflower seed and sesame seed. Edible oils include peanut oil, soybean oil, rapeseed oil, sunflower seed oil and sesame oil.

In biocapacity terms, oilseeds, as the raw materials for edible oils, represent the largest and most rapidly expanding proportion imported edible oil products.

Data source: IGSNRR, 2014

Figure 6 Biocapacity represented by the five major types of edible oil products exported by China

Oilseeds include peanut, soybean, rapeseed, sunflower seed and sesame seed. Edible oils include peanut oil, soybean oil, rapeseed oil, sunflower seed oil and sesame oil.

In biocapacity terms, oilseed represents the highest proportion of exported edible oil products.

Data source: IGSNRR, 2014

Trading Partner	Item	% of China's Imported carbon Footprint	% of Item Footprint imported from partner country
Brazil	Soya bean oil	0.2%	40%
	Soya beans	3%	21 %
	Chemical wood pulp, dissolving grades	0.3%	19%
	Blooms, billets, slabs, etc. Of iron or steel	0.1%	16%
	Iron ore & concentrates ex roasted iron pyrit	1%	13%
Russian Federation	Potassic fertilizers and materials	0.7%	41%
	Fertilizers, nes	0.2%	36.3%
	Fish, fresh, chilled or frozen	0.9%	36%
	Nickel and nickel alloys, unwrought	0.2%	35%
	Pig iron, including cast iron	0.1%	29%
Indonesia	Ores and concentrates of nickel, incl. Matte	3%	40%
	Palm oil	0.8%	32%
	Coal /anthracite, bituminous/	0.8%	26%
	Natural rubber and similar natural gums	1%	18%
	Machine made paper & paperboard, simply fnshd	0.1%	15%
Gabon	Sawlogs and veneer logs non conifer	1%	1.9%
	Petroleum, crude & partly refined	5%	0.1%
	Raw cotton, other than linters	0.5%	0.0%
	Non ferrous metal scrap	0.5%	0.0%
	Natural rubber and similar natural gums	1%	0.0%

Table A Imported carbon Footprint.

Top 5 contributing items to EF imports of embodied carbon from Brazil, Russian Federation, Indonesia and Gabon in 2010.

Data source: Global Footprint Network

Trading Partner	Item	% of China's Exported carbon Footprint	% of Item Footprint Exported to partner country
Brazil	Phosphatic fertilizers and materials	0.1%	19%
	Plates etc of iron or steel uncoated under 3	0.6%	16%
	Transmission, conveyor or elevator belts/rubbe	0.1%	0.1%
	Penicillin streptom. Tyrocidine & oth. Antibi	0.1%	8%
	Electric lamps	0.2%	7%
Russian Federation	Uppers, legs & other prepared parts of footwear	0.1%	13%
	Fibreboards & buildg brds of	0.3%	9%
	Nuts, bolts, screws, rivets, washers, etc.	0.9%	7%
	Oth. Coated iron or steel plates etc under 3	2%	7%
	Other fresh vegetables	0.6%	7%
Indonesia	Starches, inulin, gluten, albumin, substances, glu	0.2%	19%
	Phosphatic fertilizers and materials	0.1%	14%
	Prepared paints, enamels, lacquers, etc.	0.3%	13%
	Steam generating boilers	0.2%	13%
	Other fresh vegetables	0.6%	10%
Gabon	Cement	1%	2%
	Mineral crushing etc. & glass working machine	0.2%	0.4%
	Tubes and pipes of iron or steel, welded, etc	0.4%	0.2%
	Bars and rods of iron or steel, ex wire rod	0.4%	0.2%
	Universals etc. Of iron or steel, over 4.75 m	0.5%	0.2%

Table B Exported carbon footprint.

Top 5 contributing items to EF imports of embodied carbon from Brazil, Russian Federation, Indonesia and Gabon in 2010.

Data source: Global Footprint Network

Partner country	Item	% of China's imported crop land Footprint	% of Item Footprint Exported to partner country
Brazil	Soybean oil	2.8%	65%
	Sugar Raw Centrifugal	0.3%	60%
	Soybeans	54%	34%
	Maize	3%	18%
	Fruit Prp Nes	0.4%	13
Indonesia	Cocoa beans	0.2%	52%
	Cake of Palm Kernel	0.1%	34%
	Cocoapowder & Cake	0.4%	20%
	Coffee, green	0.2%	18%
	Coconuts	0.1%	7%
Russian Federation	Nuts, nes	0.1%	4%
	Chocolate Prsnes	0.2%	0.5%
	Flour of Wheat	0.2%	0.5%
	Beer of Barley	0.1%	0.5%
	Wheat	2%	0.4%
Gabon	Cotton lint	7%	0.1%

Table C Imported biocapacity of crop land products.

Top 5 contributing items to EF imports of cropland from Brazil, Russian Federation, Indonesia and Gabon in 2010.

Data source: Global Footprint Network

Partner country	Item	% of China's exported crop land Footprint	% of Item Footprint exported from partner country
Brazil	Cocoapowder&Cake	2%	13%
	Beans, dry	19%	7%
	Garlic	1.2%	7%
	Vegetables Dehydrated	1.3%	4%
	Triticale	0.1%	4%
Indonesia	Garlic	1.2%	25%
	Broad beans, horse beans, dry	0.2%	15%
	Apples	1.2%	13%
	Millet	0.2%	9%
	Carrots and turnips	0.2%	7%
Russian Federation	Appleslu	1.2%	15%
	Onions, dry	0.5%	15%
	Cabbages and other brassicas	0.2%	11%
	Carrots and turnips	0.2%	8%
	Grapes	0.3%	8%
Gabon	Garlic	1%	0.1%
	Tea	3%	0.1%
	Pastry	0.7%	0.1%
	Soybean oil	0.9%	0.1%

Table D Exported biocapacity of crop land products.

Top 5 contributing items to EF exports of cropland from Brazil, Russian Federation, Indonesia and Gabon in 2010.

Data source: Global Footprint Network

Partner country	Item	% of China's imported forest land Footprint	% of Item Footprint imported from partner country
Brazil	Chemical Wood Pulp	33%	22%
	Printing+Writing Paper	5%	3%
	Sawnwood (NC)	4%	2%
	Other Paper+Paperboard	7%	2%
	Particle Board	0.9%	2%
	Printing+Writing Paper	5%	14%
Indonesia	Chemical Wood Pulp	33%	13%
	Other Paper+Paperboard	7%	8%
	Plywood	2%	6%
	Newsprint	1%	4%
	Ind Rwd Wir (NC) Other	1%	45%
	Ind Rwd Wir (C)	23%	42%
Russian Federation	Sawnwood (C)	8%	37%
	Chemical Wood Pulp	33%	10%
	Sawnwood (NC)	4%	10%
	Ind Rwd Wir (NC) Other	2%	16%
	Ind Rwd Wir (NC) Tropica	6%	3.0%
	Sawnwood (NC)	4%	0.4%
Gabon	Ind Rwd Wir (NC) Other	2%	16%
	Ind Rwd Wir (NC) Tropica	6%	3.0%
	Sawnwood (NC)	4%	0.4%
	Sawnwood (NC)	4%	0.4%

Table E Imported biocapacity of forest land products.

Top 5 contributing items to EF imports of cropland from Brazil, Russian Federation, Indonesia and Gabon in 2010.

Data source: Global Footprint Network

Partner country	Item	% of China's exported forest land Footprint	% of Item Footprint exported to partner country
Brazil	Other Paper+Paperboard	24%	2%
	Printing+Writing Paper	32%	2%
	MDF	12%	0.7%
	Veneer Sheets	0.6%	0.2%
	Newsprint	1%	0.1%
Indonesia	Chemical Wood Pulp	0.7%	9%
	Veneer Sheets	0.6%	4%
	Plywood	23%	1%
	Other Paper+Paperboard	24%	1%
	Printing+Writing Paper	32%	0.9%
Russian Fed-eration	Particle Board	0.8%	20%
	MDF	12%	6%
	Veneer Sheets	0.6%	3%
	Other Paper+Paperboard	24%	1%
	Printing+Writing Paper	32%	1%
Gabon	Plywood	23.4%	0.00%

Table F Exported biocapacity of forest land products.

Top 5 contributing items to EF exports of cropland from Brazil, Russian Federation, Indonesia and Gabon in 2010.

Data source: Global Footprint Network

Partner country	Item	% of China's imported grazing land Footprint	% of Item Footprint imported from partner country
Brazil	Offals of Cattle, Edible	7%	63%
	Meat-CattleBoneless(Beef&Veal)	18%	27%
	Cattle meat	0.3%	8%
	Processed Cheese	0.7%	4%
	Preparations of Beef Meat	1.8%	4%
Indonesia	Cow milk, whole, fresh	0.2%	8%
	Milk Whole Cond	0.2%	2%
	Processed Cheese	0.7%	0.4%
	Cheese of Whole Cow Milk	0.8%	0.1%
Russian Federation	Milk Whole Dried	20%	0.1%
	Milk Whole Dried	20%	0.1%
	Hides Wet Salted Cattle	18%	0.1%
Gabon			

Table G Imported biocapacity of grazing land products.

Top 5 contributing items to EF imports of grazing land from Brazil, Russian Federation, Indonesia and Gabon in 2010.

Data source: Global Footprint Network

Partner country	Item	% of China's exported grazing land Footprint	% of Item Footprint exported from partner country
Brazil	Offals of Cattle, Edible	14%	0.1%
	Ice Cream and Edible Ice	0.3%	0.1%
Indonesia	Hides Wet Salted Cattle	11%	0.1%
Russian Federation	Ice Cream and Edible Ice	0.3%	1.2%
Gabon	Preparations of Beef Meat	7%	0.1%

Table H Exported biocapacity of grazing land products.

Top 5 contributing items to EF exports of cropland from Brazil, Russian Federation, Indonesia and Gabon in 2010.

Data source: Global Footprint Network

APPENDIX D REFERENCES

1. Ben Collen, Jonathan Loh, Sarah Whitmee, Louise McRae, Rajan Ammin and Jonathan E. M. Baillie. 2009. Monitoring change in vertebrate abundance: the living Planet Index. *Conservation Biology* 23(2), 317-327.
2. Julia Latham, Ben Collen, Louise McRae, Jonathan Loh. 2008. *The Living Planet Index for Migratory Species: an index of change in population abundance*. Final Report for the Convention on the Conservation of Migratory Species.
3. Loh, J., Green, R.E., Ricketts, T., Lamoreux, J., Jenkins, M., Kapos, V., and Randers, J. 2005. The Living Planet Index: using species population time series to track trends in biodiversity. *Phil. Trans. R. Soc. B.* 360: 289–295.
4. Louise McRae, Christoph Zöckler, Michael Gill, Jonathan Loh, Julia Latham, Nicola Harrison, Jenny Martin and Ben Collen. 2010. *Arctic Species Trend Index 2010: Tracking Trends in Arctic Wildlife*.
5. Mu Xiaodong, Liu Huiping, Xue Xiaojuan. 2012. Research on 1984-2006 Urban Expansion in Beijing Based on Remote Sensing Monitoring, *Journal of Beijing Normal University (Science Edition)*, 2012, 48 (1): 81-85
6. Rockström, J., W. Steffen, K. Noone, Å. Persson, F. S. Chapin, III, E. Lambin, T. M. Lenton, M. Scheffer, C. Folke, H. Schellnhuber, B. Nykvist, C. A. De Wit, T. Hughes, S. van der Leeuw, H. Rodhe, S. Sörlin, P. K. Snyder, R. Costanza, U. Svedin, M. Falkenmark, L. Karlberg, R. W. Corell, V. J. Fabry, J. Hansen, B. Walker, D. Liverman, K. Richardson, P. Crutzen, and J. Foley. 2009. Planetary boundaries: exploring the safe operating space for humanity. *Ecology and Society* 14(2): 32. [online] URL: <http://www.ecologyandsociety.org/vol14/iss2/art32/>
7. UNDP. 2014. *Human Development Report 2014. Technical note 1. Human Development Index*
8. WWF, 2014. *Living Planet Report 2014: species and spaces, people and places*. WWF Gland, Switzerland,
9. Xie Gaodi, Chen Wenhui, Cao Shuyan, *Physical Quantity Computation of Metropolitans' Ecological Footprint Consumption*, 2014
10. Xie Gaodi, Chen Wenhui, Cao Shuyan, *Research on Distance of Cross-district Biocapacity Occupation in Beijing*, 2014

With Special thanks for review and contributions from:

Xu Qinghua, Song Yonghui, Qiao Runling, Li Junsheng, Wang Qi, Hu Tao, Zhou Guomei, Chen Boping, Yu Hai, Zhang Xiaoyu, Li nan, Lu Yiyi, Chen Wenhui, Wang Hao, Wu Benyang, Li Shengwen, Wang Liuyuan, Sun Jie, Song Xiaoli

Special thanks to WWF-Netherlands for financial support.

Reproduction of this publication for educational or other non-commercial purposes is authorized without prior written permission from the copyright holder. However, WWF does request advance written notification and appropriate acknowledgement. Reproduction of this publication for resale or other commercial purposes is prohibited without prior written permission of the copyright holder.

The designation of geographical entities in this report, and the presentation of the material, do not imply the expression of any opinion whatsoever on the part of WWF concerning the legal status of any country, territory, or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Front cover image: © WWF

Water

Promote integrated river basin management, build multi-stakeholder water resource management mechanisms and sustainably manage freshwater ecosystems.

Ecological Footprint and Biocapacity

China's per capita Ecological Footprint, although lower than world average level, has already surpassed global per capita biocapacity and is over two times its own biocapacity.

Biodiversity

Establish Variation Trend Index of Chinese Vertebrates to provide reference to conservation policy making.

Green Development

Conserve natural capital, consume wisely, produce better and redirect financial flows.

100%
RECYCLED



Why we are here.

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

www.wwfchina.org