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## BETTER ENVIRONMENT BETTER GROWTH

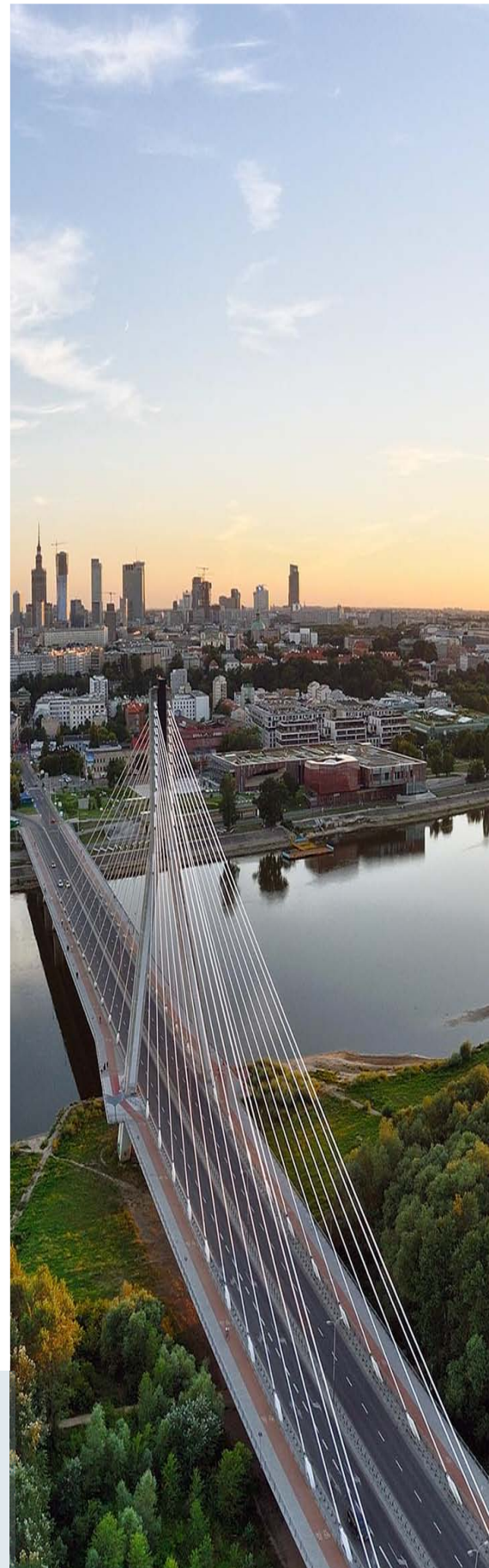
*Cases from Zhejiang's Green  
Development Pathway*

**Chinese Academy of Environmental Planning**

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# Foreword »

🌿 Editor in Chief: Prof. WANG Jinnan



**T**he Chinese Academy of Environmental Planning is a leading environmental think tank providing environmental decision-making services for the Chinese government, which was established in 2001. CAEP is actively adapting to the needs of the continuous development of environmental protection, expanding and refining its business advantages while developing its comprehensive business, the scientific research system of “environmental planning-environmental policy-environmental engineering-environmental risk” is preliminarily constructed, which lays a solid foundation for the establishment of the subject cluster of environmental planning. Since the establishment of the institute, it has undertaken more than 60 national major plans and more than 50 watershed and regional ecological and environmental protection planning studies, led the development of more than 120

major scientific and technological projects, scientific and technological research projects, and more than 70 national environmental policies Research and completed more than 60 international cooperation projects. A number of plans, assessment reports and environmental policies have been approved and adopted by the Chinese government, providing important technical support for the decision-making and management of relevant departments. According to the "2019 Global Go To Think Tank Index Report" compiled by the "Think Tank Research Project" (TTCSP) of the University of Pennsylvania, in the field of "Environmental Policy Research", our institute ranks 25th among the 100 think tanks in the world, and ranks first among all the selected Chinese environmental think tanks.

The Chinese environmental policy research working paper (ceprwp) is issued irregularly. It mainly publishes the research results of



our institute in the fields of environmental policy and environmental economics. It aims to build a bridge for international cooperation

and promote academic exchange with foreign experts and scholars in the field of ecological environment.



# Contents >>

<b>Executive Summary</b>	<b>1</b>
<b>1. Background: New Growth Agenda</b>	<b>5</b>
1.1 Zhejiang in China	7
1.2 Started from Zhejiang: Green is Gold - A Paradigm Shift from Concept to Practice	8
<b>2. Zhejiang’s Practice of “Green” and “Gold”</b>	<b>10</b>
2.1 The Great Balancing Act	10
2.2 Restoring Green from Gold	12
2.3 Transforming “Green” to “Gold”	13
<b>3. How Did Zhejiang Achieve This: Approach and Policy Tools</b>	<b>19</b>
3.1 New Development Concept and Paradigm Shift	19
3.2 Policies on Ecological Civilization Construction	19
3.3 Comprehensive Supporting System	22
3.4 Industrial Optimization/Upgrade	24
3.5 Market-Based Compensation and Incentive Mechanisms	25
<b>4. Summary, Opportunities and Challenges</b>	<b>27</b>
<b>References</b>	<b>29</b>
<b>Acknowledgements</b>	<b>31</b>
<b>Center of Eco-Environment Compensation at CAEP</b>	<b>32</b>







## EXECUTIVE SUMMARY

Environmental quality has worsened significantly with the growth of the world's second largest economy and triggered severe social challenges in China. 'Green is Gold', as a mindset to a paradigm shift of Zhejiang's development pathway, not at the cost of environment, was first proposed by Xi Jinping in 2005. Since 2012, the ideology has become an important development concept in China and a broad consensus of the whole people.

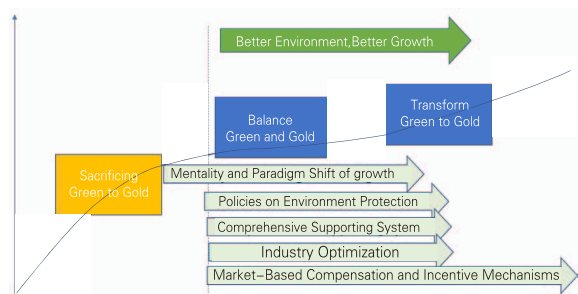
### Highlights

- A new sustainable growth path that decouples from resource consumption and environmental pollution is critical for achieving the goal of containing climate change.
- Zhejiang Province of China has been working under the principle of "Green is Gold" and has made parallel progress in developing economy and environment.
- This report provides implications on how to balance economic development and environmental protection by summarizing Zhejiang's practices and analyzing its policy approaches to achieve the green development.
- Zhejiang, on one hand, has taken active measures to reduce pollution and restore good environment; on the other hand, it develops green

economy by promoting circular economy, low-carbon economy, and eco-tourism.

- Five elements are important for Zhejiang's success: paradigm shift to sustainable development concept; environment protection policies; comprehensive supporting system including financial support, technical support, and responsibility system; industrial upgrade; and market-based compensation and incentive mechanisms.

■ **Figure 0-1. Sustainable Development Pathway from 'Green' to 'Gold'**



### Context

**There is a pressing demand of the world for a new growth agenda that does not depend on large resource consumption and pollution if we are to achieve the 2030 Agenda for Sustainable Development and the goals about climate change in the Paris Agreement.** Analysis reports and practical experiences show that it is possible to take



strong climate actions as well as achieve higher-quality economic development at the same time. Zhejiang Province of China realized the problem of “treatment after pollution” development path about two decades ago and started to explore a new path of balanced development. The now guiding ideology of “Green is Gold” was first proposed by Xi Jinping in 2005, when he was working in Zhejiang Province. Zhejiang has achieved great success on balanced development of economy and environment over the past years.

### About This Report

This paper examines the practices and policy tools of Zhejiang Province as an example of green development to give some suggestions on how to achieve parallel development of environment and economy.

**This report first describes Zhejiang’s great balance between an improved environment and rapid economic growth.** The air quality, water quality, soil quality, pollutant emission, and environmental risk control have been substantially improved in Zhejiang Province. The overall environment quality has satisfied corresponding regulation standards. In the meantime, Zhejiang has achieved rapid economic growth in the service industry. It highly promoted the development of circular economy, low-carbon economy, and eco-tourism that do not sacrifice environment for economy. Zhejiang’s development decouples from environment pollution and its Gross Economic-Ecologic Product (GEEP) index ranks high and grows fast in China.

**This report then analysed five strategies of Zhejiang to make this achievement.**

Most importantly, Zhejiang government and leadership realized the problem early and adopted the new green development ideology as the working guidance. Zhejiang has taken a series of actions to restore the “green” environment. On the way of transforming “green” to “gold”, Zhejiang government provides comprehensive support from financial support to technical support, and also institutional support of a responsibility system. An industrial upgrade was implemented to develop a green economy including circular economy, a low-carbon economy, and eco-tourism. Finally, innovations such as market-based compensation and incentive mechanisms were undertaken to explore the new development agenda.

This paper reflects joint efforts by Chinese Academy of Environmental Planning, Development Research Center of the State Council, and WRI, which are the team conducting the Assessment Report of Zhejiang Ecological Province Construction.

### Zhejiang’s Balance of “Green” and “Gold”

**Zhejiang has made efforts to restore “green” environment.** In Zhejiang’s early stage of development, environment pollution also came along with the rapid development of economy. However, under the leadership of the government and the efforts of the whole society, Zhejiang’s air quality and water environment, and prevention of soil



pollution have been improved, meanwhile, its environmental risk management capabilities, Ecosystem protection and restoration, and environmental governance have also been improved.

**Zhejiang achieved rapid economic growth, while controlling the level of pollution effectively.** The pollutant emissions and energy consumption have decreased in recent years in spite of continuous economic growth. By developing circular economy which includes circular agriculture, circular industry, and circular service industry, Zhejiang improves its recycling system of waste as well as its resource utilization efficiency. Zhejiang has also made progress in the low-carbon economy by optimizing industrial structure, promoting clean energy usage, and participating actively in the construction of national carbon emission trading market and low-carbon pilot zones. Eco-tourism in the “beautiful villages” is a direct benefit of great environment and now has become an important part of Zhejiang’s economy.

### **Approaches to The Balanced Development**

**Zhejiang government shifted to the new development concept.** Zhejiang government realized that a great environment amounts to valuable resources. Sticking to the idea of “Green is Gold”, they started to protect the environment and explored ways of transforming “Green” to “Gold”. The ideology and paradigm shift leads to the change in government policies, industry

practices, and people’s life.

### **Zhejiang government provides comprehensive support for developing a green economy:**

- Zhejiang government provides adequate financial support to environmental protection, energy saving, and ecological progress.
- Zhejiang government has taken the lead to establish a technological support system to encourage and support innovative breakthrough on environmental technologies.
- Zhejiang government adjusts the assessment system of leading cadres, and creates ecological assessment and responsibility investigation mechanism, which adapts to the positioning of the main functional areas and matches the critical concept of “Green is Gold”.

**Industrial upgrade is crucial to Zhejiang’s balanced development.** Zhejiang promotes the development of a circular economy, develops modern ecological circular agriculture. “Rural e-commerce,” “big data,” new energy development, and other high and new technologies accelerated the transformation of ecological advantages into economic advantages.

**Zhejiang wisely brings the market-based mechanisms into its green development, leveraging enterprises to phase out the outdated production mode through market forces.**





### Policy Implications

**Establish the correct guiding concept of the relationship between economic development and ecological progress.**

Economic development and ecological progress are not in contradiction. A good environment is indispensable to sustainable development.

**Develop ecological industry according to local conditions.** Different areas have different advantages in ecological resources and are suitable for different developing

strategies. While eco-agriculture and eco-tourism are suitable for villages and mountainous areas, urban areas can develop circular industries based on their advantage in manufacturing and service industries.

**Coordinate the development of urban and rural areas, and gain the support of the people.** Better environment and economic development improve the living conditions and income of people and therefore gain support from people, which in turn helps to further protect environment and develop a green economy.





## 1. BACKGROUND: NEW GROWTH AGENDA

How does the growth story of the 21<sup>st</sup> century differ from the traditional development model? Sustainable, inclusive, green, quality, and robust, are the best words to describe this paradigm shift. In 2014, a report Better Growth, Better Climate from the New Climate Economy Project, governed by Global Commission on Economy and Climate suggested that higher quality growth can be combined with strong climate actions. The 2030 Agenda for Sustainable Development and the landmark agreement signed in Paris in 2015 also sent pressing signals to both decision-makers and markets that economic growth pathways must change. We have already seen that some economies grow healthily and decouple their development from resources, pollutions, and even carbon emissions. As the second largest economy as well as the largest carbon emitter across the globe, China is taking active measures to contribute to the process.

In China's pathway to becoming the world's second largest economy, its environmental quality has experienced a deep U shape: worsening significantly when the economy started to grow, gradually getting protected and restored when daunting pollution raised people's concerns and limited further economic growth. The dilemma between

environment and development has also triggered severe social challenges in certain areas of the unevenly developed country. The need to realize a new type of growth instead of the "treatment after pollution" path was realized two decades ago. Sacrificing "Green" to "Gold" stopped and work on balancing between the two factors started. Today, "Green is Gold" is mainstreamed as a guideline in China on social and economic development.

This paper serves as a reference for documenting Zhejiang's experience achieving green growth and serves as an inspiration to other provinces in China as well as other developing countries. This paper reflects joint efforts by Chinese Academy of Environmental Planning, Development Research Center of the State Council, and World Resources Institute, which are the team conducting the Assessment Report of Zhejiang Ecological Province Construction. At the time window of policy research for the 14th Five-Year Plan, this practice focuses more on the economic development part of the mentioned Assessment Report. The research team sincerely hopes that green, low carbon and sustainable development can continue to be mainstreamed in the upcoming social and economic plan for the province and the country.





### Box 1: Ecological Progress and the “Green is Gold” Theory

Xi Jinping proposed the idea of “Green is Gold” for the first time in 2005 when he served as the Secretary of the Zhejiang Provincial Committee of CPC (Communist Party of China). Xi illustrated that development should not come at the cost of environment. He emphasized that respecting the environment is the basic aspect of development, and people should not rely on resource consumption in exchange for economic development, but instead should work on transforming the ecological and environmental advantages into the advantages in ecological industries, tourism and economics, deeming the transformation “Green” into “Gold”. After taking office as China’s top leader in 2012, Xi set “Green is Gold” as a key aspect of building a “beautiful China” to realize “Chinese Dream”.

Since late 2012, the government has incorporated ecological progress along with the economic, political, cultural and social progress into the five-sphere integrated plan for the cause of socialism with Chinese characteristics, making it an intrinsic element of the national guidelines. The 18<sup>th</sup> CPC National Congress listed “Beautiful China” as a goal of development for the first time, which would be a integrate green growth, solutions to severe environment problems, ecosystem conservation, and better environmental monitoring systems. Advanced concepts such as the “river chief” system, the “sponge city”, the “mountain-water-forest-farm-lake life community” are proposed and discussed heatedly. The “Green is Gold” theory has become a new trend of development in China and is showing its influence in several aspects of social and economic development.





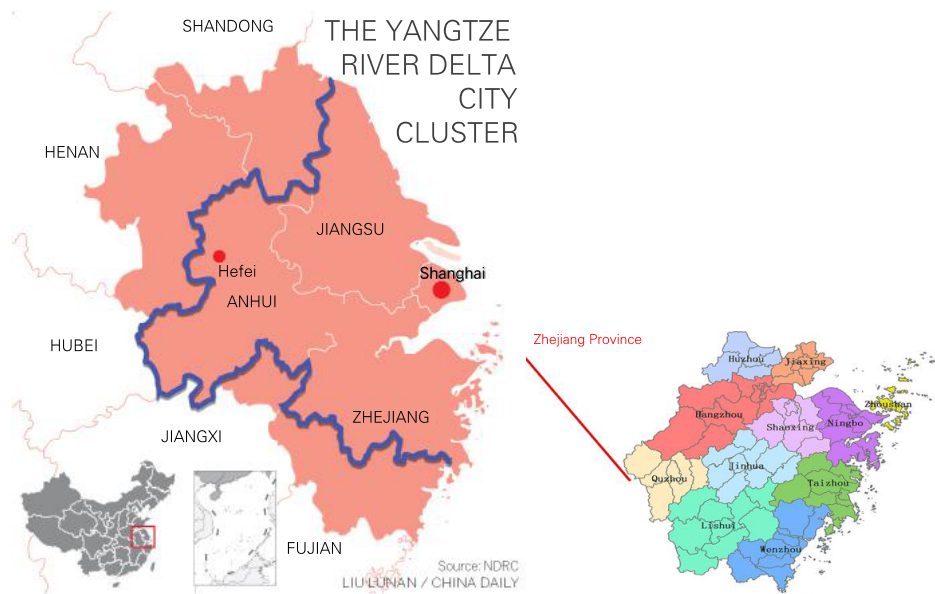


## 1.1 Zhejiang in China

Located in the middle and lower reaches of the Yangtze River with an area of 104,141 km<sup>2</sup>, Zhejiang has always been one of the richest provinces in Chinese history. With

a current population of 56.7 million, the province contributes 6% of China's GDP in 2018, ranking 4<sup>th</sup> largest economy in all Chinese provinces. (Zhejiang Statistics Bureau, 2018)

■ Figure 1-1. Zhejiang in China



Zhejiang is one of the earliest provinces to develop modern industry in China. However, at the time when the People's Republic of China was founded, Zhejiang was dominated by agriculture which made up 68.5% of its GDP. During 1949 – 1978, Zhejiang experienced twists and turns in its economy. By 1978, light industries, small-to-medium enterprises, and non-state sectors had become the key features of Zhejiang economy. Since the adoption of the Reform and Opening-up policy<sup>1</sup>, Zhejiang has been championing several waves of industrial transformation in China. By 1991, Zhejiang

had achieved the first stage of development by rural industrialization. Unleashed labor force from agriculture stimulated the growth of the light industry and the retail sectors, leading to the growth of Township enterprises and small-and medium-sized enterprises. During 1979 to 1991, industry output achieved an average yearly growth of 20%, and rural industry made up half of it. In 1992(Zhejiang Provincial Bureau of Statistics, 2008), the establishment of a market economy stimulated the second stage of development by releasing market potential. A solid foundation of light and

<sup>1</sup> *Reform and Opening Up* stands for a series of policies on constructing market economy, promoting trading, encouraging privatization and entrepreneurship, etc. started by Xiaoping Deng, the chief leader of PRC at that time, in the 3<sup>rd</sup> Plenary Session of the 11<sup>th</sup> Central Committee in 1978. Before 1978, Mainland China was a planned economy, where the party and the government controlled and allocated all resources and economic activities.



retail industries helped to establish industry clusters that enabled economies of scale in different parts of supply chains. Closer connection and cooperation with international capital and technologies contributed to the improvement of advanced business and industrial structures. An Export-oriented economy took root, and the tertiary industry began to flourish as a result.

The Internet and information industry and new manufacturing industry are well-known as the representative industries of Zhejiang. The industries have developed since 2002 when the government announced policies to encourage structural transformation of industries. This helped Zhejiang to achieve the third stage of development by transforming into a high-tech industries corridor. Hangzhou, the capital city of Zhejiang, has become the center of the internet and information industry. In 2018, Zhejiang scored a GDP of 5,620 billion RMB (849 billion USD) (National Bureau of Statistics, 2008), which is approximately equal to that of Turkey in 2018 with a rank of the 18<sup>th</sup> across the globe according to World Bank data. The total value added of high-tech industry made up 25% of GDP; the exports amounted to 2,118 billion RMB (320 billion USD), accounting for 12.8% of China's total export; and private companies contributed to 70% in the exports. With this transformation, Zhejiang has grown from a province with broken landscapes and scarce natural resources into a province ranking the 4<sup>th</sup> highest per capita GDP, per capita consumption level and the degree of marketization in China during the past 40 years (The People's Government of Zhejiang Province, 2).

According to the United Nations classification of the world's standard of living, Zhejiang is in a rich state (20%-30%) category. The State of Urban Population Development in the World and the UN report shows that the level of urbanization in Zhejiang was 23% lower than the world average in 1978 but about 10% higher currently.

## 1.2 Started from Zhejiang: Green is Gold - A Paradigm Shift from Concept to Practice

In Zhejiang's early stage of economic development, rapid growth came at the cost of environmental pollution and resource depletion. Before the *opening of China*, the market reform in 1978 that turned China's state-ownership and central-planning economy to a market-oriented economy, Zhejiang's high rate of population growth strained the surrounding environment. Air and water were highly polluted by industrial activities. Forest and other natural resources were over exploited. Some cities experienced the most severe water shortage in history. In 1981, Zhejiang Provincial Environmental Protection Bureau was established. In 1989, the Provincial Bureau announced eight environment management policies, on the environmental target responsibility, pollution emission permission, urban environment synthesis assessment and others. Five natural protection areas were also established. These actions significantly reduced smoke emission and noise level, and improved water conditions and forest coverage. Zhejiang has also promulgated several environment laws and regulations since 1996. In 2003, Zhejiang became the 5<sup>th</sup> pilot province of ecological



construction in China.

Since 2005 when the “Green is Gold” theory was first proposed, Zhejiang has been working on the goal and has achieved overall improvement in water quality, ambient air quality, ecological environment and organizations and policy systems. Nevertheless, problems still exist, such as

ocean pollution, acid rain, industrial pollution at a regional scale, as well as poorly managed utilization of land, etc. The Regulatory mechanism and pollution treatment capacity also need improvement. In its 13<sup>th</sup> Five-Year Plan on Ecological and Environmental Protection, Zhejiang set six main goals and methods to improve its environment. (UNEP, 2016)

 **Table 1-1. The goals and methods of advancing ecological progress in the 13<sup>th</sup> Five-Year Plan of Zhejiang (Zhejiang Environmental Protection Bureau, 2016)**

Goals	Methods
Improve air quality	<ul style="list-style-type: none"> <li>-Improve energy structure, and control fossil fuel usage</li> <li>-Adjust industrial layout and structure, and promote clean production</li> <li>-Strengthen emission treatment from industrial sources</li> <li>-Prevent pollutions from vehicles and ships</li> <li>-Solve problems of dust and smoke in cities</li> <li>-Control rural waste gas emissions</li> </ul>
Improve water environment	<ul style="list-style-type: none"> <li>-Guarantee safe drinking water</li> <li>-Strengthen the treatment and governance of watershed environment</li> <li>-Prevent and control industrial pollutions, and update industrial parks on waste water treatment</li> <li>-Improve environmental infrastructure construction in rural areas</li> <li>-Control pollutions in ports</li> </ul>
Prevent soil contamination	<ul style="list-style-type: none"> <li>-Strengthen prevention and control of heavy metal pollution</li> <li>-Strengthen full process supervision of hazardous wastes</li> <li>-Prevent and control agricultural soil contamination</li> <li>-Strengthen the control of environmental risks of contaminated sites</li> </ul>
Improve environmental risk management ability	<ul style="list-style-type: none"> <li>-Improve environmental emergency forecasting and response</li> <li>-Improve the abilities on environmental risks management in key areas</li> <li>-Enhance supervision on nuclear and radiation safety</li> </ul>
Ecosystem conservation and restoration	<ul style="list-style-type: none"> <li>-Enforce major function and environmental function zoning, limit the influences of production activities on ecosystem, the implementation of relevant requirements on ecological red lines</li> <li>-Implement ecological restoration and recovery, and control urban expansion</li> </ul>
Improve environmental governance	<ul style="list-style-type: none"> <li>-Improve the capacities on pollution prevention and control, including technological facilities, monitoring platform, environmental industries, R&amp;D on environmental science and technology</li> <li>-Strengthen the capacities on environmental governance in areas of monitoring network, emission inventory, enforcement of regulations, and information and database</li> </ul>

The practice note is organized in four sections, including this introduction. Section 2 demonstrates the relationship and balance between Zhejiang’s economic development and environment progress. Section 3 illustrates the efforts that Zhejiang has made to achieve

this and tries to analyse the path and method. The last section summarizes the report, with recommendations provided to policy makers, as well as the limitations to this practice note and the challenges in scaling up Zhejiang’s experiences.





## 2. ZHEJIANG'S PRACTICE OF "GREEN" AND "GOLD"

### 2.1. The Great Balancing Act

Zhejiang's economic development and environmental protection are both moving in the same direction. Meanwhile, there is a decoupling of economic growth from water, energy consumption, as well as from environmental pollutions. In 2005, the environmental inflection point appeared, with the further increase of per capita income, the ecological degradation slowed down, and the environmental quality gradually improved.

Zhejiang Province maintains one of the fastest rates of economic growth and the most robust overall competitiveness in China while maintaining the efficiency of energy, water, land, mineral, and other resource utilization, and the level of people's livelihood continues to be outstanding in the country. According to 2017 economic, environmental and social indicators, the Zhejiang Province, ranks in the top three of 15 ecological provinces in China, among which the per capita disposable income of residents ranks the first, the development level of GDP ranks the second, and the per capita GDP and pollution emission intensity ranks the third.

The conversion amount of environmental value to economic value (the Green - Gold conversion amount) is the ecological product supply and ecological cultural value provided by the ecological system. The Green-to-Gold conversion in Zhejiang is rapid, with a growth rate of 174.1% from 2005 to 2015, and the amount of Green-Gold in 2015 was

821.75 billion yuan.

The advantage of the environment and ecologic is transformed into the advantages of the tourism industry in Zhejiang, which illustrates the conversion of environmental value into economic value. Due to the influence of the natural conditions, the value of ecological products and services in the province is not very high compared with other provinces in the country, but the value created by ecological and cultural tourism is high, ranking the third among all provinces in the country. The volume of cultural services in the province increased by 392.8% in the past 10 years, with an average annual growth rate of 17.3%. During the 12<sup>th</sup> Five-Year Plan period, Zhejiang government has been adhering to the development concept of "Green is Gold", and vigorously advocates ecotourism, green tourism, civilized tourism, characteristic towns development.

The ecological environment cost in Zhejiang is decreasing and economic development is greener and healthier.

In 2015, the ecological and environmental cost of Zhejiang was lower than that in 2005. Such cost in 2015 was 122.97 billion yuan, decreased by 35.1% from 189.49 billion yuan in 2005. During the same time, Zhejiang GDP grew from 1347.36 billion yuan in 2005 to 4303.77 billion yuan in 2015, with the ecological and environmental cost accounting for 14.1% and 2.9%, in 2005 and 2015 respectively.

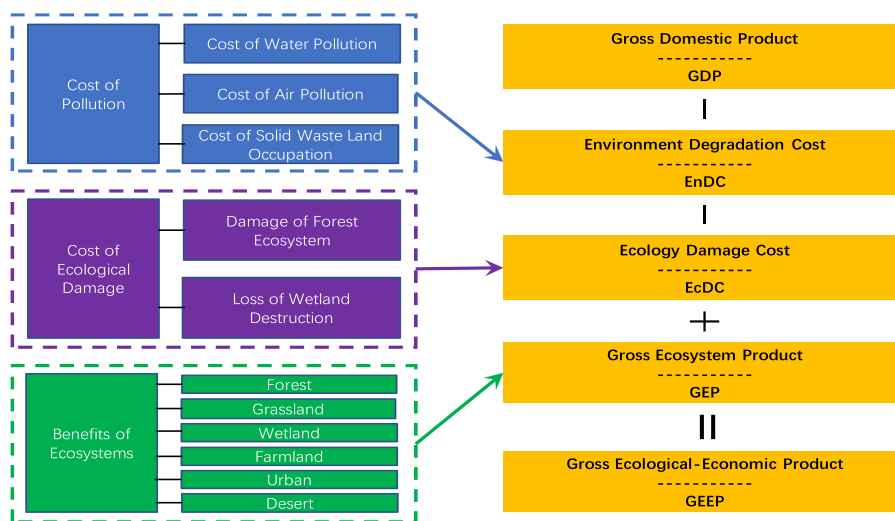


### Box 2: GEEP As A New Indicator

Gross Economic-Ecologic Product (GEEP) is based on the real economic system's gross domestic product, taking into account the damage to ecological system brought by economic production and the well-being of ecosystem to economic system. The GEEP considers both the economic value of human activities and the ecological well-being provided by the ecosystem to the economic system every year, and also considers the ecological and environmental cost of the human being for the economic system. Among them, the damage of the ecosystem and environment is mainly expressed by the damage cost and environmental degradation cost of the human activities to the ecosystem. The value of Gold is defined as  $GDP - EnDC - EcDC$ , and the value of Green is defined as  $GEP$ .

GEEP is a comprehensive index with a reduced and cost-effective economy. GEEP also considers the contribution of human activities and the ecological environment to the economic system and corrects the one-sided emphasis on economic growth only. This indicator unifies the Green and the Gold into a framework system, which is the integration of "the theory of Green and Gold". The GEEP accounting system is favourable to the provinces with large ecological areas and outstanding ecological function, and it is unfavourable to the area with a small ecological area and high ecological environment cost.

■ Figure 2-1. Computation of GEEP

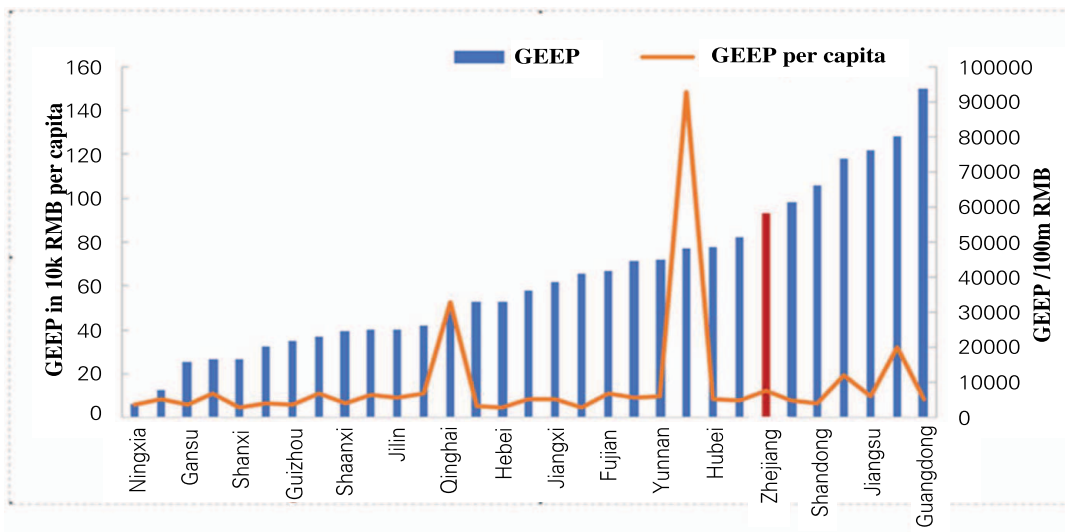




Zhejiang’s GEEP ranks high and grows fast, a proper balance is achieved between growth and green. The GEEP of Zhejiang Province increased by 131.2% during a decade. Zhejiang’s GDP ranked the fourth in 2015 and GEEP ranked the seventh in the country. The per capita GEEP ranked the fifth, the highest among all the major economic

provinces. With the rapid development of economy in Zhejiang Province, the quality of ecological environment has also been effectively improved, and the social and economic development has not realized an efficient way of green development at the expense of ecological degradation.

■ Figure 2-2. 2015 GEEP and GEEP per capita of China Provinces



### 2.2 Restoring Green from Gold

By integrating the central government’s and Zhejiang government’s targets in their 13<sup>th</sup> Five-Year Plan on Ecological and Environmental Protection, the following indicators are set as criteria for assessing ecological progress and goals to be achieved.

Zhejiang’s environment has improved over

the past 10 to 20 years. The government has controlled pollution in the air, water, and soil to improve environmental quality. At the same time, by increasing the disposal rate of municipal solid waste, increasing the forest coverage rate, establishing an ocean protection system, and promoting energy conservation and renewable energy development to ensure the sustainable development of the environment.



**Table 2-1. Ecological progress construction indicators in the 13<sup>th</sup> Five-Year Plan of Zhejiang (The State Council of China, 2016; Zhejiang Environmental Protection Bureau, 2016)**

	Indicators	Indicator type <sup>2</sup>
Air Quality	PM <sub>2.5</sub> concentration	National Mandatory
	Percentage of days meeting air quality standards	National Mandatory
	Percentage of days with extreme air pollution in urban areas	National Aspirational
Water Quality	Percentage of Grade I-III Surface Water	National Mandatory
	Percentage of surface water with quality inferior to Grade V	National Mandatory
	Percentage of drinking water source that meets the quality standard in cities at and above prefectural level	Provincial Aspirational
	Percentage of river basins with important functions that meet the quality standard	National Aspirational
	Percentage of underground water of extremely poor quality	National Aspirational
	Percentage of nearshore areas with marine water quality in and above Grade II	Provincial Aspirational
Soil Quality	Safe utilization rate of polluted arable land	National Mandatory
	Safe utilization rate of polluted land	
Pollutant Emission	COD	National Mandatory
	SO <sub>2</sub>	
	NO <sub>x</sub>	
	NH <sub>3</sub>	
Ecosystem	Percentage of continental natural coastline	National Aspirational
	Percentage of setting up ecological civilization pilot zones at and above provincial level	
Environmental Risk	Percentage of decreasing environmental emergencies in 5 years	Provincial Aspirational

## 2.3 Transforming “Green” to “Gold”

### 2.3.1 Structural Change of Economy as the Foundation

Zhejiang has now successfully transformed

from a province with limited resources into a province with quite an advanced economy. By taking the lead in promoting market-oriented reforms and an open economy, Zhejiang unleashed and enhanced social productivity

<sup>2</sup> Both mandatory indices and expectational indices are included in the 13<sup>th</sup> Five-Year Plan of ecological and environmental protection of both China and Zhejiang province. Some index is included in the national plan but not in the province plan and vice versa. This column shows where an index come from and their types.



and vitality. The GDP of Zhejiang was only 12.4 billion yuan in 1978, which accounted for 3.36% of China's total GDP. However, Zhejiang GDP in 2018 was 90.7 times that in 1978 at a constant price, and the average annual growth rate of Zhejiang GDP from 1978 to 2018 is 11.9% which is higher than the national average by 2.6%. After the early-period high-speed development, Zhejiang has maintained a relatively high and stable growth of over 7% since 2011 although in the context of structural shift.

The service industry has become the largest industry in the provincial economy, which improves industry structure and acts as an important foundation for the rapid economic growth of Zhejiang. Two structural changes took place in Zhejiang's development – the first was in 1978 when the province's economy started to change from agriculture-based to manufacturing-based, and the second started in 2014 when the service industry exceeded the second industry for the first time. The added value of the service industry keeps increasing, with the 2018 value 510.7 times of that in 1952 and 126.4 times of that in 1978 calculated at constant prices and average annual growth of 12.9% since 1979. The importance of service industry nowadays sets up a solid basis for decarbonization and resource conservation.

Within the industrial sector, Zhejiang continues to expand and upgrade high-added value and high-tech sectors. In 2018, the added value of high-tech manufacturing, equipment manufacturing, and strategic emerging industries were 189.0, 598.5, and

435.1 billion yuan, accounting for 12.8%, 40.7%, and 29.6% of above-scale industrial enterprises, respectively. Since 2016, Zhejiang has endeavoured to build a modern industrial system, with eight flagship sectors that each value hundreds of millions of RMB, or the “Trillion-Industries”, including digital economy, environmental protection, healthcare, fashion, and high-end equipment manufacturing, etc.

### 2.3.2 Zhejiang Model of Circular Economy

As a province with limited resources, Zhejiang takes the path of a circular economy to phase out outdated technologies and to achieve sustainable development. There are mainly four measures to promote a circular economy in China: Circular Production — to embed the principle of “reduce, reuse and recycle” into the whole production processes; Circular Systems of Industry, Agriculture and Services — to integrate the three economic sectors and optimize production processes; growth of Recycling Industry — to recycle and reuse waste, focusing on remanufacturing and renewable energy; and Green Consumption — to guide citizens towards smart, healthy and safe consumption.

The **resource utilization efficiency** in Zhejiang has scored the leading position in China. In 2017, Zhejiang's water consumption per unit of GDP was 34.7 cubic meters per 10,000 yuan (approximately \$1,400); the total production value of construction land was 262,000 yuan per mu (approximately \$60 per square meter); the effective utilization factor of farming





water reached 0.592. The recycling and re-utilization system of renewable resources such as minerals, industrial waste, agricultural waste and domestic waste are being continuously improved. The recycling rate of paper was 80%. 42% of steel, 46% of copper, 59% of aluminium, and 62% of zinc were recycled from scrap metals.

**Circular agriculture** in Zhejiang has made significant progress. By 2017, all of the 5,815 scaled farms in Zhejiang had installed intelligent control and prevention facilities, which were incorporated into local environmental protection regulatory programs. High-level utilization of livestock and poultry manure resources was achieved. 1.11 million tons of organic fertilizer and 8.61 million tons of biogas were used in 2017 with a highly comprehensive utilization rate of 97%. Fertilizers and pesticides have been used more appropriately. Soil tests for customized fertilizer were applied to 32 million mu of arable land, and unnecessary fertilizer usage was reduced by 22,700 tons. The integrated large-scale system on disaster and pest prevention and control were adopted to protect 7.78 million mu of land, and pesticide reduction technology was applied to 16.58 million mu of land. The use of highly effective and environment-friendly pesticide application achieved a usage rate of more than 85%, and pesticide usage decreased by 605 tons. 4,445 tons of pesticide waste packaging materials were recycled throughout the year as well. The overall utilization rate of straw reached 93.35%.

Zhejiang has made efforts to build the

**circular industry.** 20 national green factories, two national green industrial parks, and one national green supply chain management model enterprise were commissioned in 2017. 47,000 factories were either shut down or upgraded because of poor management and high pollution, and 2,690 enterprises with outdated or inefficient manufacturing capacities were also shut down. The clean production mechanisms are fully implemented, and energy conservation and emission reductions have been significantly enhanced, which makes the overall utilization rate of resources in Zhejiang one of the highest among all provinces in China. Now the capacity utilization rate achieves 80% in major traditional manufacturing industries. Major pollutants reduction targets are also being delivered, with 652 enterprises voluntarily and 436 mandatorily under the regulation of clean production. (Zhejiang Provincial Development and Reform Commission, 2018)

The **circular service sector** is developing fast. There were 661 legal entities working on environmental services in Zhejiang with total revenue of 37.2 billion yuan in 2017. The transportation industry is also making a green, circular, and low-carbon transformation. 440,000 tons of standard coal were saved and 300,000 tons of standard oil were replaced by the Zhejiang transportation industry in 2017, CO<sub>2</sub> emissions were reduced by 1.42 million tons. Zhejiang has been working hard to promote eco-tourism and green hotels. Star-rated hotels in the province have basically



adopted air-conditioning inverter equipment and technology, LED energy-saving lamps and other equipment to reduce energy consumption and are testing technologies such as solar power generation and heat recovery.

Zhejiang has been pioneering a **district circular economy**. 11 national pilot industrial parks for circular production have been established since 2012. They provide successful experience in green economic transformation for areas such as pharmaceutical and chemical production, printing and dyeing, fluorosilicon, synthetic leather, new energy, Internet + high-end manufacturing, and so on. Resource consumption and environmental pollution have been greatly reduced, while enterprises entering the parks have significantly increased their profits as well.

The **recycling and reusing system for urban and rural waste** is improving. The momentum of excessive growth of urban domestic waste was contained to 4.99% in 2017, and the disposal capacity of urban domestic waste improved by 12300 tons per day. The annual disposal capacity of hazardous waste increased by 1.08 million tons, and 139,000 tons of overdue storage of hazardous waste were cleaned up in 2017. Regulations on urban domestic waste classification were published and enacted to improve the domestic waste recycling system. In 2017, the Zhejiang government improved the centralized collection and disposal of rural domestic garbage in 2,689 villages, which basically realized the full coverage of

the centralized collection and treatment of rural domestic waste in the province.

### 2.3.3 Low Carbon Economy

In the past few years, Zhejiang has made progress in the low-carbon economy using optimizing industrial building, promoting clean energy usage, encouraging the low-carbon lifestyle, and participating actively in the construction of national carbon emission trading market and low-carbon pilot zone. In 2018, the value added by new industries, new businesses, and new models made up 25% of GDP. Zhejiang's per capita and unit area GEEP ranks first in China. The comprehensive score of green development and the degree of balanced development of urban and rural areas also rank the first in China. The level of Zhejiang's sustainable growth is in leading a position across the globe.

**Environment-friendly transportation** has contributed to Zhejiang's low-carbon development since the green transport logistics project came into force. Zhejiang is constructing the "Five-in-One" urban public transport system, i.e. bus, subway, bus rapid transit (BRT), public bicycle, and water bus. In 2016, the total number of newly updated buses in the province was 1,966, of which 1,635 were energy-saving and environment-friendly vehicles, accounting for 83.16% of the total. 1,207 public transport stations were newly constructed, and the public transport route totalled 1,732 km in mileage. By the end of 2018, Zhejiang owned 19,000 energy-saving city buses, making up 53% of total



urban buses. 200 new charging stations and 1,614 charging piles have been built, providing 2.71 million times of charging during the year, an increase of 197.8% compared to 2017, as well as a total power supply of 59.77 million kWh, an increase of 137.4%. The usage of electricity in Zhejiang ports and coastal areas exceeds 5 million kWh, which reduces carbon dioxide emission by more than 3,500 tons. (Zhejiang Environmental protection Bureau, 2019)

Zhejiang is building a **clean and environmentally friendly energy system**. The provincial government invested 70 billion yuan in key clean energy projects such as nuclear power stations and offshore wind power projects in 2017. By the end of October 2017, Zhejiang's accumulated grid-connected household roof photovoltaics were 15,800 households and the installed capacity totalled 890 MW, ranking the first in the country. The coal consumption reduction and replacement actions were fully implemented by promoting to substitute coal with electricity natural gas. The ultra-low emission retrofit and upgrade of eight sets of large coal-fired units (4.09 million kWh in total) has been completed. A total of 45,276 coal-fired boilers were eliminated, accounting for 98.7% of the total. 100% disuse was achieved in the non-burn zone.

The **energy conservation and environmental protection industry** of Zhejiang has been growing. The total output was over 900 billion yuan (approximately \$130 billion) in 2017, and the energy conservation and environmental protection manufacturing

industry above-scale achieved a growth rate of 11.4%. Industrial structure of this sector has been improving. The growth rates of new energy vehicles, urban rail vehicles, and solar battery industries were 57.6%, 33.0%, and 21.7%, respectively. Energy-efficient lighting products account for more than 1/3 of the country's production capacity. The production scale of environmental protection products ranks second in the country, and the output value of environmental protection service industry ranks fourth in the country.

### 2.3.4 Eco-tourism and Eco-products

As a new industry that comes along with green development and environmental governance, **village tourism** is becoming an important part of Zhejiang's economy. In 2018, 690 million tourists visited villages in Zhejiang, which meant that 58% of all the tourists to the province chose to visit the beautiful villages. The number of village tourism visits increased by 11.9% compared to 2017. The total revenue was 1000 billion yuan (approximately \$140 billion), which made up 5% of the whole tourism income of the province. The 22 thousand households, 1162 villages, and 2100 farms built as rural tourism sites have created 169,000 jobs directly and over 1 million employment opportunities indirectly. Zhejiang now has 24 tourism model counties, 8 sites of agricultural legacies, and 36 national beautiful villages.

In addition to rural tourism, Zhejiang also advocates **green tourism** in other tourist sites. Zhejiang combined the green tourism



hotel's benchmarking with energy conservation and emission reduction targets and promoted new energy, new technologies and new products in hotels. All of the star-rated hotels in Zhejiang have adopted air-conditioning inverter equipment, LED energy-saving lamps and other equipment to reduce energy consumption,

and are exploring new technologies such as solar power generation and heat recovery. The Zhejiang Hotel Industry Association has held green environmental protection technical training for two consecutive years to effectively strengthen the concept of safe, healthy and environmentally friendly green hotels.

### **Box 3. An example of the ecological economy -- Anji county**

At the end of the 20<sup>th</sup> century, Anji, one of the poorest counties in Zhejiang, vigorously developed industry to get rid of poverty and become better off. Despite the rapid growth of the economy in the short term, the local ecological environment was seriously damaged. How to realize the comprehensive development of the environment and economy became a difficult problem in Anji county.

In 2001, Anji County established an ecological development strategy and continuously explored the economic and social development at the minimum cost of resources and environment. On August 15, 2005, Mr. Xi, the Secretary of Zhejiang Provincial Committee of CPC at that time, put forward the narrative of the "Green is Gold" in the investigation of Yu-cun in Anji County.

After a decade's effort, the win-win of ecological protection and economic development has been realized. Anji obtained the "United Nations Human Settlements Award" and became a successful paradigm for beautiful village construction.

In the process of matching its ecological advantages to the forces of development, Anji insists on green development by greatly promoting environmentally friendly industries such as eco-agriculture and eco-tourism. In 2018, the GDP in Anji reached 40.4 billion yuan (\$5.7 billion) with an 8.3 % increase than previous year. The general fiscal revenue hit 8 billion yuan, and the year-on-year growth rate was 19%. Last year, Anji received more than 25 million tourist visits from home and abroad, generating revenue of 32.5 billion yuan. The value-added of the tourism industry accounted for 13.5% of the total GDP.

By building beautiful villages, the county has successfully found a way for the harmonious development of economy and ecology, rural and urban areas, farmers and urban residents, agriculture and other industries.



## 3. HOW DID ZHEJIANG ACHIEVE THIS: APPROACH AND POLICY TOOLS

### 3.1 New Development Concept and Paradigm Shift

The Zhejiang government set the foundation of the ecological and economic achievements by adopting a new development concept and the paradigm shift. Zhejiang government has stuck to the “Green is Gold” concept and guided the successful transformation and development of ecology, economy, and society. The paradigm shift of Zhejiang government has gone through three stages. First, Zhejiang government realized that the environment amounts to valuable resources. Environmental protection and restoration, besides economic growth, started to be taken into consideration. The second stage was that natural resources were put into an integrated ecological environment. The government learned that each element of the ecological

system interacts with each other and therefore cannot be considered separately. The third stage comes now when the good ecological environment is transformed into the industrial economy such as circular economy and eco-tourism. The ideology and paradigm shift leads to the change in government policies, industry practices, and people’s life.

### 3.2 Policies on Ecological Civilization Construction

#### 3.2.1 Policies on Environmental Protection

Zhejiang has been pioneering a series of innovative practices to restore a good ecological environment. It launched a bunch of initiatives to harness environmental issues. The following is a scratch of initiatives targeting different aspects for this goal:

Table 3-1. Environment initiatives in Zhejiang

Initiative	Policy target	Actions
River Chiefs	To solve water pollution and manage and enhance water environment	Appoint 61,000 river chiefs in total at the province, city, county, town, and village levels Implement Zhejiang River Chief Regulations since Oct 1, 2016 River chiefs are responsible for investigating water pollution and supervising the water environment management plan
Five-Water Campaign	To control sewage, prevent flooding, drain water, protect water supply and promote water saving and storage at the same time	Clean up the garbage rivers, black and odorous rivers Eliminate water bodies inferior to Grade V <sup>3</sup> Restore beautiful rivers and lakes
Three Renovate and One Remove	To improve environment, people’s living conditions, and social development	Renovate old residential areas, old industrial parks, and urban villages Remove illegal constructions
Three Improvements on the Four Sides Actions	To make areas near the roads, railways, rivers, and mountains to become clean, green and beautiful	Eliminate illegal billboards and buildings Control the emission of smoking along the roads and railways Hygiene cleaning up Change mining areas from wasteland to vegetation

<sup>3</sup> The Chinese authority divides water quality into 5 categories. Inferior to Grade V water body is those with water quality failing to meet the Grade V standards, which is only suitable for agriculture and general landscape uses.





In 2013, Zhejiang Provincial Committee of CPC made the strategic decision of initiating the "Five-Water Campaign" and setting up the Provincial Water Management Office which operates independently. The garbage rivers and black and odorous rivers that have been cleaned up so far respectively reached 6,500 km and 5,100 km. In 2016, surface water bodies of Grade I - III<sup>4</sup> accounted for 77.4% of the total water bodies in the province, 13.6% higher than that in 2013; and 2.7% surface water bodies featured water quality Inferior to Grade V, 9.5% lower than that in 2013.

Zhejiang improved energy conservation laws, regulations, and standards. It revised the measures for the implementation of the Energy Conservation Law in Zhejiang Province. The Zhejiang government issued the local implementation plan for resource conservation, and 44 mandatory energy

consumption quota standards were formulated and implemented. (Zhejiang Environmental Protection Bureau, 2018)

Zhejiang strengthened the control of soil environment, compiled the Zhejiang version of the Action Plan for the Prevention and Control of Soil Contamination, highlighting the supervision of the whole disposal process on hazardous waste, the comprehensive prevention and control of heavy metal pollution and the investigation of contaminated sites. In 2017, Zhejiang Province issued the Plan for Reducing Major Heavy Metal Pollutants of Zhejiang Province (2017-2020), proposing the principles of source control, total replacement, accurate emission reduction, and fine management, and set the overall target of reducing the discharge of heavy metals by 10% by 2020 compared to 2013.

#### Box 4. River Chief System

The river chiefs are government officials at the provincial, city, county, and township levels, and heads of provincial regions who are responsible for the assigned rivers and lakes in the region. The responsibilities of the river chiefs include water resource protection, pollution prevention and control, and ecological restoration. Their duties will be assessed and they will be held accountable for environmental damage in the water bodies they oversee.

Under the river chief system, officials are faced with pressure because the protection of water bodies is related to the evaluation of their overall performance. In this case, the administrative capacity of the local governments will be effectively mobilized to carry out environmental supervision

<sup>4</sup> In China's 'Environmental Quality Standards for Surface Water' (GB3838-2002), surface water bodies can be graded into 5 classes. Grade I stands for source water and is drinkable after simple filtration; grade II stands for centralized drinking water and habitat for rare aquatic animals; grade III stands for habitat for centralized drinking water and normal aquatic animals; grade IV stands for normal industrial water and entertainment water; grade V stands for normal agricultural water and landscape water.



responsibilities. Besides, the river chief system can make up for the shortage of administrative authority, technical means, staffing faced by the environment department in carrying out the water environment management, so that water pollution can be effectively controlled.

In 2003, Changxing County, Zhejiang Province, took the lead in implementing the river chief system in China. In 2013, the Zhejiang government officially started to strengthen the river chief system in the whole province. In 2017, Zhejiang promulgated its first regulation on provincial river chief system, i.e. the Regulation of Zhejiang Province on River Chief System, which is also the first special regulation of the river chief system at the local level in China. A total of two provincial senior river chiefs, six provincial river chiefs, 272 municipal river chiefs, 2,786 county river chiefs, 19,320 township river chiefs, and 35,091 village river chiefs—and more than 57,000 river chiefs at all levels have been appointed in Zhejiang Province. As of the end of 2018, there had been almost 1.3 million river and lake chiefs across the country. Among them, 60 are Party chiefs or governors of provincial regions.

As the forerunner of exploring the river chief system, Zhejiang is serving as a model to other regions to implement the river chief system. China has promoted its river and lake chief system across the country as scheduled and the system has played a key role in helping improve water quality in many regions.





### 3.2.2 Policies on Resources Protection

In addition to controlling pollution and restore a good environment, the protection and efficient utilization of natural resources are important for Eco-civilization and sustainable development. Zhejiang has taken several reforms in natural resources management to better protect and allocate natural resources such as land resources, mineral resources, forest resources, and marine resources.

Zhejiang government attaches great importance to land use planning. In 1999 June, the State Council approved General Land Use Planning of Zhejiang Province (1997-2010), which was the first provincial land use planning approved in China. This overall plan set constraints for land supply and guide reasonable land demand. The long-term consistent and scientific land use planning help Zhejiang province make the most of limited land resource. A series of arable land protection projects increased the available area as well as improved and quality of arable land. Zhejiang government also published policies and launched pilot projects on redeveloping inefficient land in 2014.

Zhejiang was the first province to make plans for mineral resource management in China. Zhejiang Province Mineral Resources General Plan was completed in 2002, which means that the province's mineral resources planning system was initially established. China's first mining right transferred by auction in Haiyan County occurred on Dec

25, 2000. This auction changed the resource allocation of free mining rights, which was an important step forward promoting the construction of mining rights markets. Bare mines are turned into green hills, and some mine parks are constructed to show the mining history and technologies in China.

Zhejiang has set up 17 marine nature reserves, which are important to protect territorial sea security, fishes, birds, and plants. Regulations of Zhoushan National Marine Special Protection Zone took into effect in 2017. It is the first local regulation for national marine special protected areas in China and is the first to invent a fishing license. It provides a more complete law system for combating illegal acts that damage the marine environment.

## 3.3 Comprehensive Supporting System

### 3.3.1 Financial Support

**To establish a comprehensive supporting system for ecological and economic development, the Zhejiang government provides adequate financial support to environmental protection, energy saving, and ecological progress.** It requires that the growth rate of the finance budget on ecology be higher than that of economy. The provincial government expenditure on energy saving and environmental protection was 270.83 million yuan in 2018.<sup>5</sup> The expenditure on agriculture, forestry, and water resources was 3.33 billion yuan in 2018. The finance budget for energy saving

<sup>5</sup> The number was lower than budget because the subsidy for energy conservation and emission reduction from the central government was less than the estimated amount at the beginning of the year due to the adjustment of the fund clearing period.



and environmental protection in 2019 is 381.53 billion yuan, 40.9% higher than previous year. The increase is mainly for subsidies on photovoltaic power generation. And the finance budget for agriculture, forestry, and water resources are 4.17 billion yuan, 25.5% higher than last year.

Zhejiang was among the first provinces to develop green finance. Green financial products such as green credit, securities, bonds, futures, and insurance have been invented and improved. The balance of green credit in Zhejiang reached 744.3 billion yuan in July 2017, accounting for more than 9% of all loans in the province, and the quality of assets was excellent. Green finance further injects energy into the development of eco-friendly projects and enterprises.

### 3.3.2 Technological Support System

Zhejiang Department of Ecology and Environment shoulders an important duty on environmental science and technologies related work. A series of measures have been taken to establish a technological support system to encourage and support innovative breakthroughs in environmental technologies. In 2009, the Zhejiang Environmental Protection Public Science and Technology Innovation Service Platform was established by the Academy of Environmental Sciences of Zhejiang in cooperation with many academic institutions, to integrate resources, provide technological services, promote the application of research results, and to establish rules and standards for innovative services.

**By combining production and research, this environmental protection technology innovation service system has effectively improved the transformation and application of environmental technologies in Zhejiang.** Overall, Zhejiang has established 153 distinctive industry bases, 10 productivity improvement centers, 72 regional innovation service centers, 18 agricultural science and technology parks, and 38 sustainable development experimental parks. Zhejiang government also released *White Book on Zhejiang Environmental Technologies*, aiming at comprehensively reviewing the past and guiding the future development of environmental protection technologies.

**The Zhejiang government has put much effort into the research and application of related technologies in circular economy.** Zhejiang organized key technological research in the emission control of coal-fired power plants, solid waste disposal, treatment of industrial organic waste gases, agricultural machinery, and automobile emission control, pollution monitoring, and early warning systems. **In order to facilitate technological research of circular economy and low carbon economy technologies, Zhejiang government invests in human resource training and introduces high-level talents.** Zhejiang government encourages academic research and cultivates innovation leaders of circular economy and low carbon economy technologies.

### 3.3.3 Responsibility System





**The Zhejiang government adjusted the assessment system of responsible officers – a system to assess their leadership and due diligence – by adding a set of ecological assessment and responsibility investigation mechanism.** The assessment of the performance of officers used to solely focus on economic growth, ignoring the cost of environment. Zhejiang actively explores a comprehensive **evaluation mechanism** for the leadership team members of the Party and the Government, which adapts to the main function zoning in line with the key concept of “Green is Gold.” Zhejiang has promoted the natural resource assets accounting result as an important reference for the outgoing-office audit of leading cadres in some cities and counties such as Huzhou City.

Zhejiang brought energy saving and consumption reduction into the comprehensive evaluation and assessment of local economic and social development, established the responsibility system for energy saving targets, set up a leading group for energy conservation and emission reduction, formulated and introduced the implementation plan of the energy consumption assessment system per unit GDP in Zhejiang Province, and the interim measures for rewards and punishments for the assessment of energy conservation targets in Zhejiang Province. The system of quarterly accounting and circulation on the performance of energy consumption per unit of GDP should be implemented, and governments at all levels should bear the overall responsibility for energy conservation

in their respective jurisdictions.

Zhejiang also strengthened the link between administrative law enforcement and judicial supervision on environmental protection and has taken the lead in enhancing environmental protection in the whole country. The public security bureau, procuratorate, and court departments at the provincial level have all set up liaison offices in the provincial environmental protection department, and all cities and counties in the province have achieved full coverage of environmental protection public security liaison rooms or police rooms.

### 3.3.4 Human Resource Utilization

Zhejiang also implemented supportive policies on training human resources and human capital redevelopment. Projects have been launched to improve job competency for farmers. In 2018, 5.3 million farmers were trained with new agriculture skills, 0.5 million were trained with other professional skills and 86% of them found other jobs successfully. Publicization about eco-province construction has also been adopted to involve public participation. Educational events have been organized to raise knowledge and awareness for the public, such as encouraging citizens to use public transportation, control food waste, etc. Media are encouraged to report progress and challenges on environmental protection to form public supervision.

## 3.4 Industrial Optimization/Upgrade



**Zhejiang promotes the development of a circular economy.** It vigorously promotes the comprehensive utilization of resources, constructs a green manufacturing system, and promotes the production process of "resource efficiency, low carbon energy, clean process, and waste circulation." The focus is on cultivating green factories, green parks, and green manufacturing service organizations, promoting green design and green product development, and establishing a green supply chain.

**The government develops modern ecological circular agriculture.** Zhejiang Province and the Ministry of Agriculture jointly carried out the construction of pilot provinces for the development of modern ecological agriculture, focusing on the realization of industrial cycle and waste recycling. It focuses on the comprehensive utilization of livestock waste and crop straw, the efficiency of chemical fertilizer reduction and pesticide reduction, agricultural water-saving, intelligent information to support the construction of six systems, the construction of pilot zones on green development, and the continuous improvement of the hierarchical recycling system of "small cycle in main entities, circulation in industrial parks and big cycle at the county level."

**Zhejiang vigorously promotes "rural e-commerce," "big data," new energy development, and other high-end and new technologies.** In 2016, the online retail of agricultural products was 39.619 billion yuan (the first in the country), more than 10000 enterprises were stationed, and the sales

volume exceeded 8 billion yuan. Zhejiang built 506 "Taobao villages" and 51 "Taobao towns." The total sales volume of "Taobao Villages" exceeded 31 billion yuan, which directly led to the employment of 200000 people. Through the internet and other high-end and new technologies, the market sales channels of eco-friendly products were further broadened, and the transformation of ecological advantages into economic advantages was accelerated.

### 3.5 Market-Based Compensation and Incentive Mechanisms

Zhejiang brings market-based mechanisms into its green development, leveraging enterprises to phase out the outdated production mode through market forces. For example, by introducing a differentiated electricity price, the electricity bill of inefficient enterprises can be increased by 0.3 yuan / kilowatt. Plus, the government has also established the first national trading system on emission permission to provide incentives for enterprises to adopt pollution control measures. It gives environment-friendly businesses the space for profit brought by the trading system.

#### 3.5.1 Carbon emission trading market

Zhejiang Province issued the "Plan on Constructing the Carbon Emission Market of Zhejiang Province," in order to achieve low-carbon development in line with the goal and to promote the establishment of a trading market on carbon emissions. Zhejiang comprehensively promoted the compilation of greenhouse gas inventories in cities and



counties, as well as revised the guidelines for the preparation of greenhouse gas inventories. The counties and cities in Zhejiang are also actively promoting work related to carbon emission rights. In September 2017, China Green Carbon Foundation and Kaihua County Government formally signed a cooperation agreement to initiate a new way for the conversion of ecological resources into economic resources through the Platform of “Carbon Sink: Green to Gold”.

### 3.5.2 Ecological Compensation Mechanism

The ecological compensation mechanism means that the government transfers payment for ecological compensation to the place where the eco-friendly product is provided. Zhejiang took the lead in introducing the ecological compensation system in 2005, explored the paid use system of land, forest, water, mineral resources, and sea areas, and carried out the paid use system of emission rights, water rights trading system, the right of using energy, and other resources paid use system in the country.

Zhejiang has had an ecological compensation system in place for a long time and offers useful practices and innovative experiences. For example, explore different ecological compensation methods, introduce a market-oriented ecological compensation system, and establish a variety of financing channels and mechanisms.

### 3.5.3 Resource and Environmental Tax Reform

The sewage charge system in Zhejiang Province has been continuously adjusted and improved for more than ten years. Since November 2005, Zhejiang Province has formally implemented the sewage charge system. Since April 1, 2018, Zhejiang Province began to collect environmental protection tax according to the Environmental Protection Tax Law, generally translating the original sewage charge standard into tax rates, which apply to the discharge of air pollutants, four kinds of heavy metal pollutants, water pollutants and five kinds of heavy metal pollutants.







## 4. SUMMARY, OPPORTUNITIES AND CHALLENGES

Bearing the principle that “Green is Gold”, Zhejiang has been a model of balancing ecological progress and economic development. The average annual growth rate of Zhejiang GDP is 12.1% from 1978 to 2017, 2.6% higher than the country average. Zhejiang has maintained GDP growth at around 7% since 2011. However, Zhejiang did not follow the old path of sacrificing environment for economic development. It has significantly improved ecological environment while it continues to grow the economy. Pollution is under control, low-emission and energy-saving practices are implemented, and Zhejiang is getting more and more beautiful. The actions of Zhejiang provide some implications on how to develop economy and protect environment simultaneously.

First of all, it is important to establish a guiding concept of the relationship between economic development and ecological progress. Economic development is not superior to ecological progress. They are both important to people’s welfare and the entire society. A good environment is indispensable to sustainable development. Economic development and ecological progress are not in contradiction as well. Zhejiang’s practice and achievements show that they can complement each other and develop together. A better environment is not only a better living condition for residents but also provides better opportunities for economic development such as eco-tourism. New

technologies and economic models such as circular economy make it possible to develop economy in an environmentally friendly way. By integrating economy and environment into development, economic development and ecological progress can be achieved simultaneously. The subnational governments should adopt the new development concept and use it to guide green development.

Secondly, ecological industry should be developed according to local conditions. Different areas have exclusive advantages in ecological resources and are suitable for different development strategies. The advantage of towns and villages in mountainous areas such as Anji is the view of mountains and rivers. Protecting environment, constructing “beautiful villages”, and developing eco-tourism have proven to be a successful path to economic and ecological development. In addition to eco-tourism, eco-agriculture is important in improving the environment, and sustainable agriculture products also provide an opportunity to increase farmers’ income. Urban areas can develop circular industry based on their advantage in manufacturing and service industries. Promoting a circular economy helps with industrial upgrade, which contributes to better economic and ecological development.

Thirdly, it is important to the development of urban and rural areas must be coordinated, and focus paid to gain the support of



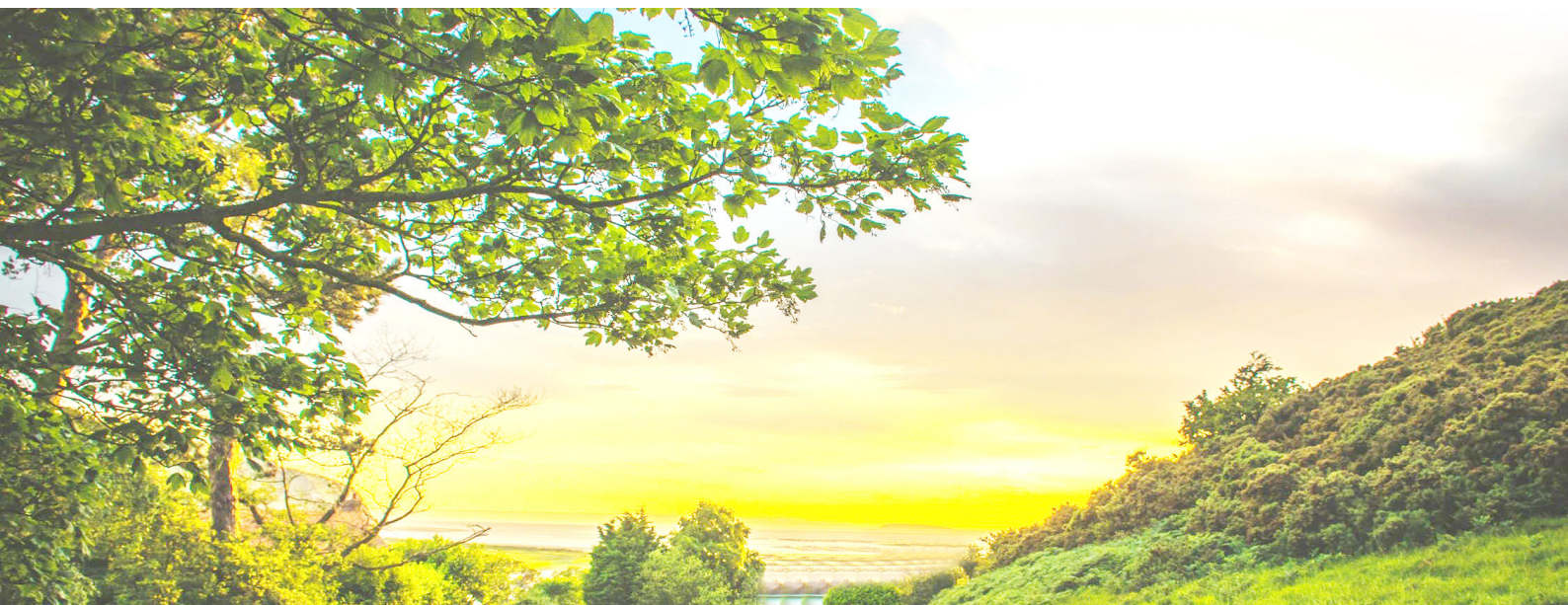


the public. New rural construction and urbanization should be coordinated together with ecological progress. Eco-agriculture, agricultural product processing, leisure agriculture, and rural cultural industry agglomerations can be promoted through a unified industry development plan, which helps to narrow the gap between urban and rural areas. As Xi Jinping points out, “a good ecological environment is the public product with the greatest fairness, and it is the most popular welfare for the people.” By improving the living conditions and income of people, Zhejiang gains support from the people. Everyone’s awareness of protecting environment, wisdom, and participation contribute a lot to the success of “Beautiful Zhejiang”.

The path that Zhejiang took has brought opportunities to the province as well as to the Yangtze river delta. It not only integrated and coordinated industry to promote industrial transformation and upgrading in the Yangtze River delta but also help establish a whole set of ideology of eco-civilization and provided a mature and effective model and mechanism at

all different levels for other provinces, cities, towns and regions to copy. Though challenges still exist. Acid rain frequency is still high, and offshore water quality is still unsatisfying compared with national level. Regional development is still unbalanced, with an unsustainable industry structure, insufficient technological and financial support in certain areas. Ideologies and legal frameworks of sustainable growth still need to be established in local governments and companies, and market participation rate and administrative efficiency could also be promoted. More communication and cooperation interprovincially and internationally are expected, which could form synergy in terms of industrial integration and regional collaboration.

Hopefully, the experience of Zhejiang’s ecological and economic development, the policies and technologies that Zhejiang developed, and the model of transforming “green” to “gold” can help more areas achieve the balanced development of economy and ecological environment.





## REFERENCES:

- 1 Huzhou Municipal People's Government. 2017. Research on the Transformation Path of "Two Mountains" in Anji County. <http://nb.huzhou.gov.cn/dcyj/20170213/i688054.html>.
- 2 Ministry of Ecology and Environment of the People's Republic of China. 2019. China Environmental Statistics Annual Report. [http://www.mee.gov.cn/gzfw\\_13107/hjtj/hjtjnb/](http://www.mee.gov.cn/gzfw_13107/hjtj/hjtjnb/).
- 3 National Bureau of Statistics. 2008. An Analysis of the Sustainable Development of Zhejiang's Population, Resources and Environment. [http://www.stats.gov.cn/ztjc/ztfx/dfxx/200812/t20081203\\_34525.html](http://www.stats.gov.cn/ztjc/ztfx/dfxx/200812/t20081203_34525.html)
- 4 National Bureau of Statistics. 2002-2018. Annual statistics in Zhejiang Province. <http://data.stats.gov.cn/easyquery.htm?cn=E0103>
- 5 National Bureau of Statistics. 2008. Review of The Development of Zhejiang's Industrialization in the 30 Years of Reform and Opening-up. [http://www.stats.gov.cn/ztjc/ztfx/dfxx/200812/t20081208\\_34562.html](http://www.stats.gov.cn/ztjc/ztfx/dfxx/200812/t20081208_34562.html).
- 6 Ministry of Ecology and Environment of the People's Republic of China. 2011. The Assessment result of The 12<sup>th</sup> Five-Year Plan for the Comprehensive Prevention and Control of heavy Metal pollution.
- 7 The State Council of China. 2016. Thirteenth Five-Year Plan" for Ecological Environmental protection. [http://www.gov.cn/zhengce/content/2016-12/05/content\\_5143290.htm](http://www.gov.cn/zhengce/content/2016-12/05/content_5143290.htm).
- 8 UNEP. 2016. Green is Gold: The Strategy and Actions of china's Ecological Civilization.
- 9 Zhejiang Bureau of Statistics. 2019. Zhejiang Natural Resources and Statistical Yearbook on Environment 2018. <http://data.cnki.net/trade/Yearbook/Single/N2019030126?z=Z008>.
- 10 Zhejiang Bureau of Statistics. Zhejiang Statistical Yearbooks 2002-2017. <http://tjj.zj.gov.cn/col/col1525563/index.html>.
- 11 Zhejiang Environmental protection Bureau. 2018. Air quality inspection data. <http://www.zjepb.gov.cn/>.
- 12 Zhejiang Environmental protection Bureau. Environment Status Bulletins. <http://www.zjepb.gov.cn/col/col1201912/index.html>.
- 13 Zhejiang Environmental protection Bureau. 2019. Zhejiang Low Carbon Development Report 2018.
- 14 Zhejiang Environmental protection Bureau. 2016. Thirteenth Five-Year Plan" for Ecological Environmental protection of Zhejiang Province. [http://zjjcmspublic.oss-cn-hangzhou.aliyuncs.com/jcms\\_files/jcms1/web1756/site/attach/-1/1711271853483971455.pdf](http://zjjcmspublic.oss-cn-hangzhou.aliyuncs.com/jcms_files/jcms1/web1756/site/attach/-1/1711271853483971455.pdf).
- 15 Zhejiang Environmental protection Bureau. Zhejiang Ecological Environment Status Bulletins 2002-2017. [http://www.zjepb.gov.cn/art/2018/6/4/art\\_1201912\\_18444489.html](http://www.zjepb.gov.cn/art/2018/6/4/art_1201912_18444489.html).





- 16 Zhejiang Environmental Protection Bureau. 2011. Zhejiang environmental quality report 2010.
- 17 Zhejiang Environmental Protection Bureau. 2016. Zhejiang environmental quality report 2015.
- 18 Zhejiang Ministry of Water Resources. 2017. Water Resources Bulletin. <http://www.zjwater.gov.cn/col/col1567264/index.html>.
- 19 Zhejiang Provincial Bureau of Statistics. 2019. Zhejiang Economic and Social Development Report 2018. [http://tjj.zj.gov.cn/art/2019/1/28/art\\_1562012\\_30126294.html](http://tjj.zj.gov.cn/art/2019/1/28/art_1562012_30126294.html).
- 20 Zhejiang Provincial Department of Agriculture. 2018. Open Data. <http://www.zjagri.gov.cn/index.html>.
- 21 Zhejiang Provincial Development and Reform Commission. 2018. 2017 Zhejiang Circular Economy Report. [http://www.lanxi.gov.cn/zwgk/zdlyxxgk/zdxm/201808/t20180831\\_2637982.html](http://www.lanxi.gov.cn/zwgk/zdlyxxgk/zdxm/201808/t20180831_2637982.html).
- 22 Zhejiang Provincial Development and Reform Commission. 2012. The 12<sup>th</sup> Five-Year Plan of the Facility for Harmless Treatment of Municipal Domestic Waste in Zhejiang Province.
- 23 Zhejiang Provincial Development and Reform Commission. 2017. The 12<sup>th</sup> Five-Year Plan of the Facility for Harmless Treatment of Municipal Domestic Waste in Zhejiang Province.





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