

# The National Eleventh Five-year Plan for Environmental Protection (2006-2010)

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The current plan is formulated on the basis of the Outline of the 11th Five-Year Plan for the Development of National Economy and Social Development and the Decision of the State Council on the Implementation of the Scientific Outlook on Development and Strengthening Environmental Protection [No.39 document of the State Council (2005)]. The current plan is an important part of the national 11th Five-Year Plan system and aims at expounding the objectives, tasks investment focuses and key policy measures in the field of environmental protection during the 11th Five-Year Plan period, identifying the responsibility and tasks of people's government and environmental protection departments at all levels, guiding and mobilizing the participation of enterprises and civil society and striving for environment-friendly society.

## I. Environmental Situation

### (I) Development of Environmental Protection during the 10th Five-Year Plan Period

CCCCPC and the State Council attach great importance to environmental protection. They take the improvement of environmental quality as an important component for the implementation of the scientific outlook on development and development of socialist harmonious society. Regarding environmental protection as an important means for macro economic regulation, the Chinese Government has taken a series of key policy measures. Each province, autonomous region and municipality has made increasing efforts in environmental protection, phased out a range of out-of-date productivity with high consumption of resources and heavy pollution, accelerated pollution control and construction of urban environmental infrastructure with continuous progress of environmental control and ecological conservation of key regions, river basins and cities. The authority has taken a series of countermeasures for climate change with the introduction of market-based mechanism in the field of environmental protection. The overall investment of the whole society in environmental protection doubled that of the "9th Five-Year Plan" period, exceeding 1% GDP for the first time. As a result, environmental governing capacity and law enforcement capacity have been improved. Public environmental awareness and participation enjoy dramatic improvement with increasing understanding about environmental protection pattern or development of the country. With rapid economic growth and development of heavy and chemical industries, there are some reductions of total emissions of some key pollutants. The aggravated trend of environmental pollution and ecological destruction is mitigated with certain improvement of the environmental quality of some regions and cities. Nuclear and radiation security has been ensured.

### (II) Environmental Situation Still Grave

Environmental situation is still grave in China though with some positive development. The environmental protection targets of the "10th Five-Year Plan" period had not been met with 27.8% increase of SO<sub>2</sub> emissions and 2.1% reduction of COD as compared with that of 2000, while the targets should be 10% reduction. Key river basins and regions like the Huaihe, Haihe, Liaohe, Taihu, Chaohu and Dianchi (hereinafter referred to as the "Three Rivers and lakes") have met only 60% of the targets on pollution control. The emissions of major pollutants far exceed environmental capacity with serious environmental pollution. Among all surface water

monitoring sections under key national environmental monitoring program, 26% fails to meet Grade V national surface water quality standard; 62% could not meet Grade III water quality standard. 90% of urban river sections are subject to pollution at different degrees; 75% lakes are subject to eutrophication. The quality of 30% drinking water source areas of key cities cannot meet Grade III standard. The quality of coastal marine environment is at risk. The air quality of 46% cities with administrative districts cannot meet Grade II national air quality standard. The number of days with haze in some big and medium sized cities has some increase and acid rain pollution is not alleviated.

A total of 1.61 million km<sup>2</sup> are under water erosion across China; 1.74 million km<sup>2</sup> are under desertification and over 90% of natural grassland subject to degradation. The aquatic eco systems of many rivers have serious malfunction with loss of biodiversity and big economic loss due to invasion of alien species. The eco functions of some important eco function areas have been degraded. There is striking rural environmental problems with increasing soil pollution. Environmental pollution caused by such factors as hazardous waste, vehicle emissions and POPs is on the rise. China is facing grim situation in addressing climate change with hard tasks. Environmental problems at different stages of industrialization process of developed countries over the past several hundred years concentrate in China, indicating that China is at the stage with frequent pollution accidents and pre-eminent contradictions.

There is no breakthrough in some in-depth environmental issues that should have been addressed during the "10th Five-Year Plan" period. There is no fundamental change in the inappropriate industrial structure and extensive economic growth mode. There are also such problems as environmental protection lagging behind economic growth, poor or inflexible mechanism, insufficient input and capacity. The phenomena of no strict observation of laws, little punishment to lawbreakers, poor law enforcement and supervision are still very common.

It is expected that the population of China will grow at 4% during the "11th Five-Year Plan" period with accelerated urbanization and over 40% growth of GDP. The contradiction between socio-economic development and resources and environment constraint becomes increasingly evident. International environmental protection pressure will grow and environmental protection of China is facing graver challenges.

<b>Box 1 Achievement of meeting major targets under the "10<sup>th</sup> Five-Year Plan for National Environmental Protection"</b>					
No.	Indicator	2000	Anticipated target for 2005	2005	Change during the "10 <sup>th</sup> Five-Year Plan" period
1	SO <sub>2</sub> emissions (10000t)	1995	1800	2549	27.8%
2	Emission of smoke and dust (10000 t)	1165	1100	1183	1.5%
3	Industrial dust (10000 t)	1092	900	911	-16.6%
4	COD (10000 t)	1445	1300	1414	-2.1%

5	Industrial solid waste (10000 t)	3186	2900	1655	-48.1%
6	Reuse rate of industrial water (%)	/	60	75	/
7	Industrial SO <sub>2</sub> (10000 t)	1613	1450	2168	34.5%
8	Emission of industrial smoke and dust (10000 t)	953	850	949	-0.5%
9	Industrial COD (10000 t)	705	650	555	-21.3%
10	Comprehensive use rate of industrial solid waste (%)	51.8	50	56.1	4.3 percentage points
11	Percent of urban air quality of cities with administrative districts meeting Grade II national standard (%)	36.5	50	54	17.5 percentage points
12	Urban sewage treatment rate (%)	34.3	45 (domestic)	52.0	17.7 percentage points
13	Green coverage of urban built areas (%)	28.1	35	33	4.9 percentage points
14	Percentage of nature reserves (%)	9.9	13	15	5.1 percentage points

### (III) Environmental Protection Work Entering New Stage

CCCCPC and the State Council put environmental protection at a more important strategic position. This provides a foundation for environmental protection work aiming at implementing the scientific outlook on development and development of a socialist harmonious society. Environmental protection is facing unprecedented opportunities. The shift of economic growth mode and accelerated economic restructuring will provide a good foundation for addressing structural and regional environmental pollution and ecological destruction. Increasing national strength provides a strong physical and technical support to environmental protection. Deepening reform of economic system and administrative institutions creates a good condition for the innovations in environmental protection work mechanism. Wide spread increase of public environmental awareness is a driving force for environmental protection. There is a big change in the relationship between the environment and development. Environmental protection has become a key task for modern development. Environmental capacity becomes an important base for the design of regional layout. Environmental management becomes an important tool for structural adjustment. Environmental standard becomes an important market access and environmental cost becomes an important factor for the pricing mechanism. All these major changes mark that environmental protection in China is entering the stage where it optimizes economic growth. So we have both challenges and opportunities, difficulties and hopes.

### II. Philosophy, Basic Principle and Plan Objectives

To do well environmental protection work during the "11th Five-Year Plan" period, the key is to speed up the achievement of historical transformations. The first is the transformation from focusing on economic growth ignoring environmental protection into putting equal emphasis on the both. The authority takes the enhancement of environmental protection as an important tool to adjust economic structure and shift economic growth mode and seek development under environmental protection. The second is the

transformation from environmental protection lagging behind economic growth into the synchronization of environmental protection and economic development. That is, we will not leave any new environmental problems while solving old environmental problems as many as possible, thus changing the situation of "pollution followed by treatment, or destruction going along with environmental control. The third is the transformation from mainly employing administrative methods to protect the environment into comprehensive application of legal, economic, technical and necessary administrative methods to address environmental problems. The authority will voluntarily follow economic law and natural law in order to raise the level of environmental protection work.

#### (I) Philosophy

Guided by Deng Xiaoping Theory and the "Three representations", we will carry out the scientific outlook on development in an all round way, adhere to the basic national policy on environmental protection and implement the strategy on sustainable development. Adhering to the principle of prevention first, we will comprehensively control pollution with overall promotion and breakthrough in focus areas and strive for addressing pre-eminent environmental problems threatening public health. We will persist in innovating institutions and systems, depend on scientific & technological progresses, enhance environmental legal framework and mobilize the initiatives of all forces of our society. With long-term unremitting efforts, we will improve eco environment, dramatically raise resource efficiency, strengthen our capacity in sustainable development and develop an environment-friendly society where man live in harmony with nature.

#### (II) Basic Principle

---Coordinated development with mutual benefits and win-win situation. We will address the relations between environmental protection and economic development and social progress. We will protect the environment during the development and promote development during environmental protection. We will adhere to conserved development, safe development, clean development and scientific development with sustainability.

---Strengthen the rule of law with comprehensive control. We will adhere to administration according to law, continuously improve environmental laws & regulations and strictly enforce these laws & regulations. We will adhere to integrated decision making on environmental protection and development and the principle on scientific planning focusing on prevention. We will prevent and control pollution and ecological destruction from the sources. We will employ comprehensive means such as laws, economic and technical as well as necessary administrative methods to address environmental problems.

---No new debts and pay back old debts as many as possible. We will strictly control the total emissions of pollutants. All new and expansion projects must meet the requirements for environmental protection with increased output but pollution. We will strive for more output with less pollution and actively address the environmental problems left in the past.

---Depend on science & technology with innovation in mechanism. We will vigorously develop environmental science and technology and facilitate the addressing of environmental problems by technical innovation. We will set up a diversified input mechanism from the government, industry and social groups and commercialized mechanism for some pollution treatment facilities. We will improve environmental protection institutions and establish a unified, coordinated and efficient environmental supervision

system.

---Classified guidance and focused work. According to local conditions, we will develop a plan for each region and make overall arrangement for urban and rural development and address environmental problems that constrain economic development and with strong public complaints stage by stage. We will improve the environmental quality of key river basins, regions, sea areas and cities.

### (III) Objectives and Targets

It is expected that by the year 2010, SO<sub>2</sub> and COD emissions will be under control, environmental quality of key regions and cities will enjoy some improvement, ecological environmental degradation trend will be basically curbed and people will live in safe environment in terms of nuclear and radiation.

<b>Box 2 Major environmental protection indicators during the "11<sup>th</sup> Five Year Plan" period</b>				
	Indicator	2005	2010	Increase & reduction during the "11 <sup>th</sup> Five-Year Plan" period
1	COD (10000 t)	1414	1270	-10%
2	SO <sub>2</sub> (10000 t)	2549	2295	-10%
3	Percentage of the water sections under national monitoring program failing to meet Grade V National Surface Water Quality Standard (%)	26.1	<22	-4.1 percentage points
4	Percentage of the water sections (of 7 big waters of China) under national monitoring program meeting Grade III National Surface Water Quality Standard (%)	41	>43	2 percentage points
5	Number of days in which urban air quality of key cities is superior to Grade II National Air Quality Standard exceeding 292 days (%)	69.4	75	5.6 percentage points

### III. Key Areas and Main Tasks

Centering on achieving the target of controlling the total emissions of major pollutants, which is identified in the "11th Five-Year Plan" period, we will take the prevention and control of pollution as the top priority and ensuring safe drinking water for urban and rural people as the key task. With overall promotion and breakthrough in focal areas, we will practically address the pre-eminent environmental problems threatening public health and affecting sustainable economic and social development.

#### (I) Reduce COD emission and improve the quality of water environment

With 10% reduction of COD emission as the starting point, we will in the first place protect drinking water source areas, speed up the control of pollution in key river basins and facilitate the prevention and control of water pollution and conservation of water resources in an all round way.

##### 1. Ensure the achievement of COD reduction target

We will accelerate the construction of urban sewage treatment facilities and development of recycling & reuse projects. It is expected that by 2010, all cities in China must have sewage treatment facilities with at least 70% of urban sewage being treated. Total capacity in urban sewage treatment across China will reach 100 million t per day. The construction of urban sewage treatment plants must adhere to the principle of concentration with proper distribution. Based on local conditions, we must optimize the layout and vigorously promote technical progress and extend appropriate advanced technologies. The construction of sewage treatment facilities must take account both the treatment plant and supporting network with priority given to the development of relevant pipelines. Overall arrangements must be made for water supply, consumption, conservation and recycling & reuse of waste water. We will focus on the disposal of the sludge from sewage treatment facilities so that it is stabilized and impose no hazard to the environment. We will strengthen the monitoring and supervision of sewage treatment plants. All such plants will install on-line monitoring devices so that real time monitoring on the operation and discharge of sewage treatment facilities will be realized. We will continuously raise the capacity in collecting urban sewage and efficiency of sewage treatment facilities. We will ensure the actual treatment load of sewage treatment facilities after operation, that is, no less than 60% of the designed capacity within one year and no less than 75% of the designed capacity within 3 years.

We will enhance the treatment of industrial effluent. We will strictly carry out the discharge standard for water pollutants and the total amount control system, accelerate the application of pollutant discharge license system. We will focus on the up-to-the-standard discharge and total discharge reduction of industrial COD of industrial effluent of major enterprises under national pollution control program, who account for 65% of the total industrial waste water of China. We will accelerate the phasing out of heavy polluting enterprises not in line with national industrial policy such as the small paper-making, small chemical, small tannery, small printing & dyeing and small brewery. We will further strengthen water saving in industries, develop limit for effluent discharge standard for high water consumption industries and raise reuse rate of industrial water. Focusing on such industries as paper making, brewery, chemicals, textile and printing & dyeing, we will make more effort in the control of pollution and technical reform. In key industries such as iron & steel, power, chemicals and coal, we will replicate the practice of recycling and reuse of waste water to achieve minimum or zero discharge of waste water. In addition, the quality and amount of industrial effluent flowing into urban and township drainage systems will be strictly monitored in accordance with relevant standard. Efforts will be made to ensure safe operation of sewage treatment plants.

## 2. Ensure safety of drinking water sources

All direct waste water outlets in Grade I protected areas for drinking water source will be banned. We will finish the zoning and adjustment of surface-water drinking water source areas, identify the grade of protected areas and their boundary, set up warning signs and close all direct pollutant discharge outlets within Grade II protected areas. We will carry out general investigations on environmental situation of all drinking water source areas, develop the plan for ensuring drinking water safety and management measures as well as environmental protection plan for drinking water source areas. We will strengthen the soil & water conservation, control non-point pollution in the protected areas for drinking water sources. We will strictly restrict the development of heavy polluting enterprises such as the chemicals, paper making, printing & dyeing upstream the protected areas for drinking water sources. We will carry out investigations on the pollution of groundwater resources, formulate the plan for the protection of groundwater drinking water source areas and prevent and control groundwater pollution. We will focus on the study, prevention and

control of POPs in waters.

We will improve early warning system for the safety of drinking water sources and develop emergency response program for sudden pollution accidents. We will improve the monitoring and management system for drinking water source areas and carry out comprehensive analysis of the quality of the water of concentrated drinking water source areas at least once a year with the disclosure of water environment information on time.

3. Facilitate the prevention and control of water pollution of key river basins

We will make unremitting efforts in promoting the prevention and control of water pollution of such waters as the "three rivers three lakes", Songhua River, Three Gorges areas and its upstream region, the source area of South-North Water Diversion Project and along the line, Xiaolangdi Reservoir and its upper reaches of the Yellow River. We will also strengthen the prevention and control of water pollution of the mid and downstream of the Yangtze River, Pearl River and important trans-boundary rivers. We will carry out target responsibility system for watershed pollution control and water quality examination system for trans-province boundary waters, and speed up the establishment of eco compensation mechanism. We will increase the input through multiple channels and accelerate the construction of control projects. We will make an overall arrangement for the development, use and conservation of watershed water resources and make integrated plan for domestic, production and ecological consumption of water and ensure necessary ecological flow of rivers. According to the principle of combined efforts of military and local authority, we will continue our efforts in the prevention and control of waste water and garbage of military units in key river basins and regions and improve environmental quality of army camps. We will strengthen international cooperation and do well environmental monitoring and control of the water quality of trans-boundary rivers like the Heilong River, Yalu River and Yili River.

Focusing on chemical enterprises along rivers, China will investigate all industrial pollution sources that discharge toxic or hazardous substances in an all round way, set up regular reporting system for monitored water quality, urge relevant enterprises to improve pollution control facilities and accident prevention measures in order to avoid hidden pollution accidents if any.

(II) Reduce SO<sub>2</sub> emissions to prevent and control air pollution

Focusing on the construction of desulphurization facilities of thermal power plants, China will achieve the target of 10% reduction of SO<sub>2</sub> emissions to curb the development of acid rain. With comprehensive prevention and control of air pollution of 113 key cities for environmental protection or urban cluster as the focus, China will strive for the improvement of urban and regional air quality.

Box 3    Name of key cities for environmental protection (113)
Municipality: Beijing, Tianjin, Shanghai and Chongqing
Provincial capitals: Shijiazhuang, Taiyuan, Hohhot, Shenyang, Changchun, Harbin, Nanjing, Hangzhou, Hefei, Fuzhou, Nanchang, Jinan, Zhengzhou, Wuhan, Changsha, Guangzhou, Nanning, Haikou, Chengdu, Guiyang, Kunming, Lhasa, Xi'an, Lanzhou, Xining, Yinchuan and Urumqi.
Cities under separate plan of the State Council: Dalian, Qingdao, Ningbo, Xiamen and Shenzhen
Other cities: Qinhuangdao, Tangshan, Baoding, Handan, Changzhi, Linfen, Yangquan, Datong, Baotou, Chifeng, Anshan, Wushun, Renxi, Linzhou, Jilin, Mudanjiang, Qiqihar, Daping, Suzhou, Nantong, Lianyungang, Wuxi

Changzhou, Yangzhou, Xuzhou, Wenzhou, Jiaxing, Shaoxing, Taizhou, Huzhou, Ma'anshan, Wuhu, Quanzhou, Jiujiang, Yantai, Zibo, Tai'an, Weihai, Zaozhuang, Jining, Weifang, Rizhao, Luoyang, Anyang, Jiaozuo, Kaifeng, Pingdingshan, Jingzhou, Yichang, Yueyang, Xiangtan, Zhangjiajie, Zhuzhou, Changde, Zhenjiang, Zhuhai, Shantou, Foshan, Zhongshan, Shaoguan, Guilin, Beihai, Sanya, Liuzhou, Mianyang, Panzhihua, Luzhou, Yibin, Zunyi, Qujing, Xianyang, Yan'an, Baoji, Tongchuan, Jinchang, Shizuishan and Karamay.

### 1. Ensure achieving SO<sub>2</sub> emission reduction target

Carry out desulphurization project in coal fueled power plants. China will carry out the plan for the prevention and control of acid rain and SO<sub>2</sub> pollution, focusing on the control of SO<sub>2</sub> and NO<sub>x</sub> emissions from elevated sources. Any coal fueled power plants failing to meet national SO<sub>2</sub> emission standards or total emission limit must install fume desulphurization devices. China will accelerate the construction of desulphurization facilities for existing thermal generation sets during the "11th Five-Year Plan" period with the capacity of existing in-service thermal generation sets with desulphurization facilities reaching 213 million kW. All new (expanded) coal-fueled power plants except the extreme-low-sulfur-coal pithead power plants meeting national requirements must construct desulphurization facilities when constructing the principal part of the plant and set aside site for nitrogen removal. In big and medium sized cities and their suburb, the construction of new (expansion) coal fueled power plants other than co-generation plants will be under strict control.

### 2. Comprehensively improve urban air quality

The prevention and control of particulate pollution, in particular the inhalable particulates will be the focus for urban air pollution control. China will speed up the adjustment and relocation of urban industrial pollution sources, make concentrated control of low emission sources and emphasize the addressing of fume pollution. More efforts will be made to strengthen environmental management of construction sites and road transportation to effectively reduce flying dust. China will raise the percentage of clean energy in urban energy mix and energy efficiency and vigorously carry out energy saving activities. Based on local conditions, China will develop co-generation and concentrated heat supply whose capacity is determined by thermal energy. In cities, areas banning the combustion of high polluting fuels will be identified.

China will make an overall plan for the prevention and control of regional air pollution of urban clusters of such areas as the Yangtze River delta, Pearl River delta, Beijing-Tianjin-Hebei Province. Cities with appropriate conditions shall carry out the studies on combined pollution caused by NO<sub>x</sub> and POPs as well as haze weather. They shall gradually carry out the monitoring on pollutants including ozone and PM<sub>2.5</sub> (inhalable particulate with diameter less than 2.5 μm) and set up an early warning system for smog pollution.

### 3. Enhance the prevention and control of industrial waste gases

Focusing on major pollution sources accounting for over 65% industrial SO<sub>2</sub> emissions, which are under national monitoring program, China will strictly carry out air pollutant emission standard and the total emission control system and accelerate the emission license system. Efforts will be made to promote all industrial air pollution sources meeting emission standard with increased output but pollution. Industrial furnaces and kilns should employ clean combustion technology. Focusing on the control of fine particulates, China will strictly control the emissions of soot (dust) and SO<sub>2</sub>. With a new round of dust removal efforts, high-



efficiency cloth dust removal facilities will be widely applied. China will continue its effective efforts in the control of air pollution sources in such industries as coal, iron & steel, non-ferrous metals, petrochemicals and building materials and carry out automatic monitoring on key industrial air pollution sources. China will vigorously promote the development of coal washing projects and extend clean coal combustion technology. It will continue the studies on the control of NO<sub>x</sub>, speed up the development and demonstration of NO<sub>x</sub> control technologies, mainstream NO<sub>x</sub> into pollution source monitoring and statistics in order to create conditions for the implementation of total emission control.

#### 4. Strengthen the prevention and control of vehicle emission pollution

Big and mega-cities should take the prevention and control of vehicle emission pollution as an important component for improving urban environmental quality. China will further raise the control level for vehicle emissions and standardize environmental annual inspection on in-service vehicles. Efforts will be made to improve fuel quality and efficiency. China will make more efforts to develop and employ energy saving vehicles using clean fuel in order to lower pollutant emissions from vehicles.

#### 5. Intensify noise pollution control

China will enhance the supervision and administration of the noise from construction sites, industrial production and everyday life and address noise pollution in time. Measures like restraining hooting in downtown area and noise reduction approach will be applied to control traffic noise. Quiet residential communities will be created in big and medium sized cities.

#### 6. Control the emissions of greenhouse gases

China will beef up the policy guidance for conservation and efficient use of energy; make more efforts in energy saving administration according to law; accelerate the development, demonstration and extension of energy saving technologies; make full use of market-based energy saving mechanism in order to reduce the emissions of greenhouse gases (GHGs). China will vigorously develop renewable energy, actively promote the development of nuclear power plants, accelerate the development & utilization of coal field gas to optimize energy mix. China will strengthen industrial policies in such industries as metallurgy, building materials and chemicals to raise efficiency and control GHG emissions in industrial production process. China will make more efforts in the development of biogas projects in rural areas and recycling & reuse of the biogas from urban landfill facilities in order to control the growth of methane emissions. China will continue its efforts in the development of key ecological projects such as reafforestation and the conservation of natural forest resources in order to raise forest coverage, carbon sink and enhance the adaptation capacity. China will enhance the monitoring and statistic analysis on the emissions of GHGs.

#### (III) Control solid waste pollution and promote recycling and reuse of solid waste

Following the 3 R (reduce, recycle and reuse), China will take the prevention and control of solid waste pollution as a priority area for safeguarding public health, ensuring environmental safety, developing circular economy and building a resource saving and environment-friendly society.

### 1. Carry out projects to dispose hazardous waste and medical waste

China will accelerate the implementation of the plan for the construction of disposal facilities for hazardous waste and medical waste; improve the charging standard and method for concentrated disposal of hazardous waste; establish the whole-process environmental supervision and administration system for the collection, transportation and disposal of hazardous waste and medical waste in order to basically achieve safe disposal of hazardous waste and medical waste. In addition, China will complete environment-friendly disposal of chromium slag stockpiles left in the past.

### 2. Carry out innocuous disposal of domestic garbage

China will carry out the plan for the construction of innocuous disposal of urban domestic garbage with the addition of new innocuous disposal capacity of 2410000 t/d, thus at least 60% urban domestic garbage under innocuous disposal. China will promote classified garbage system and strengthen environmental supervision on garbage disposal. China attaches importance to the treatment of landfill leachate. It will gradually control the pollution and restore ecological system of existing simple landfill facilities in order to eliminate hidden pollution problems.

### 3. Promote comprehensive utilization of solid waste

China will focus on the promotion of comprehensive utilization of large-volume industrial solid waste such as gangue, fly-ash, metallurgical slag & chemical residual and tailings. It is expected that by 2010, at least 60% of all industrial solid waste will be used. China will promote the comprehensive utilization of such waste as building reject, straw and livestock & fowl waste. It will set up the producer extended responsibility system, improve the recycling and reuse system and achieve scaled and innocuous reuse of waste electric & electronic products. It will carry out strict supervision and administration on the enterprises that import and process imported waste to prevent secondary pollution. In addition, it will strictly crack down illegal import and export of solid waste.

## (IV) Protect ecological environment, improve security level for eco safety

Aiming at promoting the harmony between man and nature and based on the zoning of ecological function areas, China will focus on the control of inappropriate resource development activities, adhere to the principle of conservation as top priority dominated by natural rehabilitation and strive for basic curbing of the degradation trend of ecological environment.

### 1. Develop national zoning for ecological function areas

Based on the investigation on current status of national ecological environment, the authority will develop national zoning for ecological function areas in accordance with eco environment sensitivity and the importance of ecological functions. It will identify the dominant ecological functions of different regions in a scientific way, determine key ecological function protected areas important & significant to national ecological safety, guide ecological conservation work, provide scientific basis for the implementation of classified environmental protection management and integrate it with the plan for national key function areas zoning.

## 2. Initiate activities for the conservation of key ecological function areas

Identify the scope, dominant functions and development orientation of key ecological function protected areas, China will explore the establishment of assessment indicator system, administrative mechanism, performance evaluation mechanism and ecological compensation mechanism of ecological function protected areas in line with the requirements for restriction of development zones. Efforts will be made to raise the capacity in the management and conservation of key ecological function protected areas.

## 3. Improve the development quality for nature reserves

China will further improve its nature reserves system and develop a complete nature reserves network that accommodate over 95% typical natural eco system types, wildlife species under national conservation program and important natural relics. It will realize the shift from focusing on the amount of nature reserves into focusing on their quality, and improve the administration, protection and development capacity for nature reserves. It will develop the standard for standardized development of nature reserves and keep on promoting the development of nature reserves according to relevant plans. It is expected that over 90% nature reserves will have complete administrative institutions. In general, China will primarily set up a national monitoring network and comprehensive information platform for nature reserves.

## 4. Strengthen the conservation and safety management of species resources

China will carry out investigations on species resources and set up database, germplasm pool and genetic pools for species resources. It will construct on-site, off-site and destination site protection facilities for such resources. It will establish inspection system for import & export of species resources and enhance the monitoring, security and emergency response mechanisms for ecological impacts of alien invasive species and genetic modification organisms. China will carry out the publicity and education for the conservation of species resources and raise public awareness in species resources.

## 5. Intensify environmental supervision on development and construction activities

Adhering to the principle of "protection first with well-planned development", China will make good plan for key projects such as the water resource development of watersheds like the upper reach of the Yangtze River, development of energy & mineral resources of the loess plateau and development of black soil in northeast China as well as environmental impact assessment of these projects in order to effectively control soil and water erosion during the development. China will put more efforts in law enforcement in ecological conservation and crack down any infringements that damage or destruct ecological environment.

China will accelerate the establishment of the deposit system for mine site rehabilitation to facilitate environmental control of mine sites and promote ecological restoration of new & old mines as well as mineral resource depletion cities. It will strengthen environmental protection in tourist development activities, enhance inspection on environmental pollution and ecological destruction of tourist areas, in particular environmental supervision on tourist development projects in ecological sensitive areas. It will carry out trial or demonstration projects on eco tourism.

## (V) Control Rural Environment, Promote the Development of Socialist New Countryside

According to the requirement "Production growth, well-to-do life, enjoyable social atmosphere, clean village with democratic management" for the development of socialist new countryside, China will carry out the environmental protection action plan for Xiaokang countryside, China will take such measures as comprehensive control of rural environment, strengthening of the prevention and control of soil pollution, control agricultural non-point pollution, development of ecological agriculture and optimization of agricultural growth mode.

### 1. Focus on the prevention and control of soil pollution

China will carry out national census on soil pollution, set up soil environment quality assessment and monitoring system and have demonstration project on remedy of polluted soil. Relocating enterprises must remedy the contaminated soil at the original site and carry out comprehensive treatment for arable land where POPs and heavy metal pollutants exceeding national standard. Those arable land with heavy pollution hard to remedy should adjust its use according to law. The irrigation by polluted (sewage) water on main grain and vegetable bases must be avoided. More efforts are needed for environmental management of the arable land used for growing vegetables consumed by urban residents.

### 2. Conduct comprehensive environmental control in rural areas

Promote the development of the plan for comprehensive environmental control in rural areas. China will carry out such activities as improve water and sanitation (lavatory) in rural areas to improve environmental sanitation conditions of countryside. All domestic garbage will be stored at fixed site with unified collection, regular cleaning and concentrated disposal. China will adopt separate or relatively concentrated treatment with the help of biotechnology or wetland treatment approach to promote sewage treatment in villages & towns according to local conditions. Combined with the reform of old villages and construction of new ones, China will improve the outlook and environment of villages. It will finish comprehensive environmental control of 10,000 administrative villages and develop 2000 environment-beautifully villages and towns. China will put more efforts in the supervision and control of enterprise's pollution in rural areas and ban the movement of industrial solid waste, hazardous waste, urban garbage and other pollutants into countryside.

### 3. Prevention and control of rural non-point pollution

Carry out comprehensive environmental control of small watersheds and control soil and water erosion. China will carry out trial and demonstration work on comprehensive control of rural non-point pollution sources; replicate scientific application of pesticides and fertilizers to improve their efficiency. China will facilitate the construction of the production bases for green food and organic food and vigorously promote water saving agriculture and ecological agriculture. It will promote the conservation and comprehensive use of agricultural resources and strive for the development of agricultural circular economy. With the construction of biogas as the entry point, China will make appropriate use of straw resources, strengthen comprehensive use and treatment of the sewage and animal waste from concentrated livestock and fowl farms to enable more rural household use biogas.

(VI) Strengthen marine environmental protection, focus on the prevention and control of pollution as well as ecological damage of coastal sea waters

Focusing on reducing the emissions of land-based pollution sources and the control of marine pollution of major sea areas as the entry point, China will strengthen marine ecological conservation, improve emergency response capacity to marine environmental disasters and improve the service functions of marine eco systems.

#### 1. Strive for reducing pollution amount from land-based activities

China will strengthen the control and management of industrial pollution sources with direct discharge into seas and make sure their discharge meeting emission standard. China will speed up the construction of sewage treatment plants and landfill facilities in coastal cities. More efforts will be made to treat sludge and garbage leachate to prevent secondary pollution. In addition, it will continue its ban on phosphorus agricultural chemicals in coastal regions.

#### 2. Accelerate pollution control of key sea areas

China will carry out the Blue Sea Initiative in the Bohai Sea to strive for remarkable improvement of the water quality. It will speed up the development and implementation of the plan for pollution control of the Yangtze River estuary and neighboring sea waters and the Pearl River estuary and neighboring sea waters. The pollution control of major sea areas will drive the work of marine environmental protection.

#### 3. Prevention and control of port and ship pollution

China will develop and implement technical policies and treatment plan for the control of ship pollution. It will present technical requirements and deadline for installation of sewage treatment facilities and garbage recycling device for various ships. It is expected that by 2010, all big and medium sized ports will construct recycling and transfer facilities for ship oil, chemicals, garbage, and sewage. The construction of sewage and garbage treatment facilities of ports and ships should be mainstreamed into the development plan for urban sewage and garbage treatment facilities. China will also strengthen the supervision and management on waste dumping into seas.

#### 4. Protect marine ecological environment

Focusing on coastal sea areas, China will strengthen environmental remedy and protection of marine ecological environment. It will strictly protect and rationally employ coastal line and tidal land resources, prohibit inappropriate development activities and prevent the pollution by tidal land and marine aquaculture. It will facilitate the development of coastal shelter forests; restore and conserve typical marine ecological systems such as coastal wet lands, mangroves and coral reefs, and develop a number of marine nature reserves. It will carry out general investigations on biodiversity of key sea areas, identify the invasion of alien species and carry out strict management on the introduced alien marine biological species.

## 5. Prevent and control marine environmental disasters

China will set up inter-department marine oil spill monitoring and emergency response system and raise the capacity in emergency response to and handling of marine oil spill accidents. All relevant departments in relation to marine resources and all coastal cities and ports should develop oil spill emergency program. It will improve red tide monitoring system, raise early warning capacity, standardize red tide information management, set up red tide disaster emergency response mechanism and try its best to minimize the loss caused by red tide.

## (VII) Strictly supervise and management, ensure nuclear and radiation environmental safety

Focusing on the supervision and management of the safety of nuclear facilities and radioactive sources, China will enhance the treatment and disposal capacity for radioactive wastes, comprehensively enhance safety management of nuclear and radiation safety and ensure a safe nuclear and radiation environment.

### 1. Improve the quality for the construction of nuclear facilities and operation safety level

China will develop safety evaluation technology for new generation of nuclear power plants and improve safety monitoring methods, and raise the effectiveness of the supervision and management on the reform and operation of nuclear power plants. China will improve the legislation on the management of civil nuclear safety equipment, further strengthen the administration on such activities as the design, manufacture and installation of civil nuclear safety equipment and improve the quality of the equipment manufactured in China based on foreign technology.

### 2. Improve the management of radioactive isotopes and radiation devices

China will further strengthen the safety permit and supervision on the production, use, marketing, import and export of radioactive isotopes and radiation devices, and finish the renewal of radiation safety license. China will set up a national radioactive source information management system that tracks the whole-life cycle of radioactive sources. In doing so, it will achieve safe collection and storage of waste radioactive sources.

### 3. Accelerate the control of radioactive pollution

China will develop safe decommissioning policy for nuclear facilities. China will accelerate the construction of near-ground disposal sites for medium and low level radioactive waste. It will finish the construction of national and provincial radioactive waste storage sites, and facilitate the treatment of radioactive waste left by past production activities of nuclear industry. In addition, it will carry out investigations and assessment on radioactive pollution status of uranium mining and mineral processing enterprises and associated mines as well as the supervision on the prevention and control of such pollution.

With the implementation of the demonstration projects, China will master the treatment technology for high-radioactivity waste and

actively facilitate the construction of solidification treatment facilities for high-radioactivity liquid waste. China will actively carry out geological survey and exploration for the disposal of high-radioactivity waste. With the study on long-term safety of disposal facilities for high-radioactivity waste, China will identify development strategy and overall safety objectives for geological disposal of high-radioactivity liquid waste.

#### 4. Improve the prevention and control of electromagnetic radiation pollution

China will set up and improve laws, regulations and standards for the prevention and control of electromagnetic radiation pollution and strengthen environmental impact assessment for electromagnetic radiation. Measures will be taken to optimize spatial distribution of electromagnetic field with appropriate layout of such sources in order to prevent electromagnetic radiation pollution in areas with dense population.

#### (VIII) Enhance management capacity building and raise law enforcement supervision

Aiming at monitoring & assessment, timely early warning, quick response and scientific management with the orientation of automation and informationization, China will carry out the plan for building the capacity in environmental supervision in accordance with the requirements that tools matching with the objective and task matching with the capacity, focusing on the development of advanced environmental monitoring early warning system and well established supervision system for environmental law enforcement. Active efforts will be made to strive for financial input at all levels and improve the capacity in environmental management.

##### 1. Establish advanced environmental monitoring and early warning system

According to the requirement for a professional team and modern equipment, China will facilitate standardized development of environmental monitoring stations at all levels. It is expected that by 2010, 80% county-level environmental monitoring stations will meet the standard.

According to the requirements of scientific layout, accurate data and timely transmission, China will set up national environmental quality monitoring network for air, surface water, coastal sea areas, radiation and ecological environment in order to comprehensively and timely reflect environmental quality status and change trend in a scientific way.

Based on the requirements of dynamic monitoring, timely early warning and accurate measurement, China will establish the supervisory monitoring and automatic monitoring systems for key pollution sources to carry out real-time monitoring on pollution emissions. Priority will be given for the development of on-line monitoring system of coal fueled power plants.

##### 2. Establish complete environmental law enforcement supervision system

China will improve the equipment for environmental law enforcement, focusing on supporting law enforcement capacity building in central and western part of China. It is expected that by 2010, the environmental law enforcement teams at province, city and

county levels will basically meet the requirements for standardized capacity building. China will enhance the building of the capacity in supervision of nuclear safety and radiation environment at national, province and city levels, and raise the safety supervision level.

### 3. Develop environmental emergency response system

China will set up national emergency response monitoring network and command center for sudden environmental accidents. Each province and city should establish corresponding environmental emergency response command system. Environmental emergency response monitoring vehicles, instruments and equipment for sudden water and air environmental accidents should be equipped with at relevant institutions at national, province, city or watershed levels, key coastal harbors and inland ports should be equipped with emergency monitoring ship.

### 4. Improve comprehensive environmental assessment capacity

China will carry out general investigations on such aspects as pollutions sources, drinking water source areas, status of groundwater pollution, status of soil pollution, POPs, electro-magnetic radiation pollution of key facilities and development of mineral resources with associated radioactivity across the country.

China will beef up the capacity in environmental statistics, reform environmental statistic method, carry out quarterly statistic reporting system in order to provide prompt, accurate and comprehensive environmental information in an all round way. In addition, China will carry out regular assessment on environmental quality and eco changes as well as environmental economic accounting.

### 5. Develop "Jinhuan Project"

China will develop national and local environmental protection information system. It will construct a basic network platform for environmental protection information, develop a national environmental information database and a supporting system for environmental management decision making, a high-efficiency and prompt information transmission system for commanding emergency response to environmental pollution accidents. It will develop digital environmental protection, improve information release system and facilitate sharing of environmental information.

### 6. Strengthen supporting capacity in the innovation of environmental science & technology

China will construct a number of national key environmental laboratories, national environmental engineering centers and environmental base laboratories. It will basically develop a national research & development and production base for environmental reference samples.

### 7. Enhance the development of environmental team and talents



China will make more efforts in training the managers and technical staff in the field of environmental protection to cultivate high-quality environmental protection professionals. It will implement qualification authentication system and gradually enlarge the qualification scope of technical staff in the field of environmental protection. It will enhance the work on moral and political education as well as honest administration for the management on environmental protection.

Box 4 Key Elements for the Capacity Building in Environmental Supervision
<p>Ambient air quality monitoring: Efforts will be made to ensure that automatic air quality monitoring station is installed in each prefecture-level city across China. China will construct baseline station of rural air quality and quality control sites for air monitoring. National acid deposition monitoring network &amp; sand and dust storm monitoring network will also be established.</p> <p>Water environmental quality monitoring: enhance the development of national surface water monitoring stations with focus on the enhancement of real time monitoring on the pollution of trans-province or trans-boundary waters or estuaries as well as early warning for pollution accidents. China will strengthen the capacity in environmental monitoring of coastal sea areas.</p> <p>Routine monitoring of environmental monitoring network: strengthen the capacity of routine monitoring stations for surface water, drinking water source areas, solid waste, soil, ecology, noise and coastal sea waters.</p> <p>Radiation environmental monitoring: construct national automatic radiation monitoring stations and real-time monitoring system for the discharged effluent from nuclear facilities. China will construct technical support system for the supervision of nuclear safety.</p> <p>Environmental emergency response monitoring: emergency response monitoring vehicle for suddenly occurred water or air pollution accidents and emergency response monitoring instrument and equipment for nuclear pollution and radiation accidents should be equipped with at provincial level.</p> <p>Basic environmental monitoring at county level: routine lab instruments should be equipped with at county environmental monitoring stations, thus the up-to-the-standard rate of such monitoring stations will reach 90% in East China, 80% in central China and 60% in West China.</p> <p>Standardization of the supervision on environmental law enforcement: all meeting Grade I standard at province level; no less than 90% meeting Grade II standard at city (prefecture) level and no less than 70% meeting Grade III standard at district or county level.</p> <p>Automatic monitoring of key pollution sources: all key pollution sources under national monitoring program should install automatic monitoring equipment. China will establish three-level monitoring centers at national, province and city level to carry out on-line monitoring and management. China will improve its capacity of key urban monitoring stations in the supervision and monitoring of pollution sources.</p> <p>Basic conditions for environmental management: China will put in place necessary infrastructure and working conditions of environmental protection institutions; construct a number of key environmental labs and environmental engineering centers as well as research &amp; development and production bases for reference samples. In addition, it will establish a national environmental protection information system.</p>

IV. Key Projects and Investment Focus

China's environmental issues must be addressed in accordance with planning supported by engineering projects and guaranteed by investment. The "11th Five-Year Plan" environmental targets can be achieved through implementing environmental plan and projects and by putting investment in place.

(I) Key projects

Efforts will be made to accelerate the completion of the unfinished projects under national key pollution control program during the

"10th Five-Year Plan" period. The projects listed in the "11th Five-Year Plan" should commence in time. A number of new engineering projects should be further assessed and reviewed. It is planned that 10 key environmental protection projects will be carried out during the "11th Five-Year" period. With mobilization of various resources and opening diversified investment channel, China will concentrate its resources and capital for the implementation of projects.

**Box 5 Key Environmental Protection Projects during the "11<sup>th</sup> Five-Year Plan" Period**

Capacity building for environmental supervision: It will include such activities as the construction of environmental quality monitoring network; strengthening environmental law enforcement; development of automatic on-line monitoring system for key pollution sources under national monitoring program, emergency response system for suddenly occurred environmental accidents, comprehensive environmental assessment system, "Jinhuan" project, innovation in environmental science & technology to support capacity building.

Hazardous and medical waste disposal project: Complete the construction of 31 provincial hazardous waste disposal centers and 300 medical waste disposal centers in all cities with administrative districts.

Chromium slag pollution treatment projects: comprehensive treatment of chromium slag stockpile and the polluted soil will be carried out.

Urban waste water treatment projects: new addition of the capacity of 45 million t/d for urban waste water treatment; reform & improve existing waste water treatment plants and sewer pipelines, sludge disposal facilities and the use of treated waste water.

Water pollution prevention and control projects in key river basins: focus on the prevention and control of key industrial pollution sources, water pollution and control in upstream areas of the drinking water source, pollution control of scaled livestock & fowl farms, and comprehensive environmental control of some cities.

Urban garbage treatment project: new addition of capacity of 24,000 t/d for urban garbage disposal.

Flue gas desulphurization projects for coal fired power plants and sintering machines of iron & steel industry: it is expected that the capacity of existing thermal power generating units with desulphurization facilities will reach 213 million kW.

Projects for the construction of key ecological function areas and nature reserves: a number of demonstration sites of national key ecological function protected areas will be established. Efforts will be made to improve the infrastructure of a number of national nature reserves.

Nuclear and radiation safety project: China will set up such systems as nuclear equipment performance examination lab, radioactive substance identification labs, radioactive waste safety management center, electro-magnetic radiation monitoring lab, national radiation environment monitoring network, and national nuclear and radiation safety supervision management system, etc.

Environmental protection action plan under the rural *Xiaokang* (well-off) program: It is expected that 2000 environment-beautifully towns will be developed and comprehensive environmental control for 10,000 administrative villages will be finished.

**(II) Investment Focus**

To achieve environmental protection targets of the "11th Five-Year Plan" the estimated environmental protection investment should account for 1.35% of GDP of the same period.

**1. Water pollution treatment**

To achieve the target of 10% reduction of total COD discharge, engineering measures must be taken to reduce COD by 4 million tons in which 3 million tons reduction will be realized by a new addition of urban waste water treatment capacity of 45 million tons per day, one million tons reduction by industrial waste water treatment. Water pollution control will be the top priority for environmental investment.

## 2. Air pollution control

To achieve the target of 10% reduction of SO<sub>2</sub> emission, engineering measures must be taken to reduce SO<sub>2</sub> emissions from existing thermal power plants by 4.9 million tons in addition to the installation of desulphurization facilities in all newly built coal fired power plants during the "11th Five-Year Plan" period. This will make the installed capacity of existing thermal power generating units with desulphurization devices reaching 213 million kW. In addition, flue gas desulphurization projects of sintering machines of iron & steel industry will reduce 300000 t of SO<sub>2</sub>. China will also promote comprehensive treatment of air pollution with such measures as the control of industrial waste gases of other industries, concentrated urban heat supply and gas supply.

## 3. Solid waste treatment

China will keep on the implementation of the plan for the construction of disposal facilities for hazardous and medical waste. It is expected that another 240,000 t/d capacity in innocuous disposal of urban garbage will be added. China will facilitate the treatment of solid waste including the disposal and comprehensive use of industrial solid waste and waste electric appliances.

## 4. Nuclear safety and treatment of radioactive waste

The focus will be the construction of disposal facilities of the waste with medium and low radioactivity from decommissioned nuclear facilities as well as pollution prevention and control facilities of uranium mining.

## 5. Rural pollution control and ecological conservation

China will carry out environmental protection action plan for Xiaokang countryside, initiate rural environmental control, investigate and remedy soil pollution, and reinforce the development of key eco function protected areas and nature reserves.

## 6. Capacity building

China will develop advanced early warning system for environmental monitoring, well established environmental law enforcement supervision system and strengthen environmental science & technology as well as industrial supporting capacity.

## (III) Source of Investment

### 1. Government investment

Government investment will focus on such areas as the construction of environmental infrastructure, integrated control of key watersheds, nuclear and radiation safety, rural pollution treatment, the development of nature reserves and key eco function areas, and building of environmental supervision capacity. The investment will be dominated by local government at all levels with the support of the central government according to situation.

## 2. Corporate investment

Enterprises will be responsible for the treatment of industrial pollution according to "polluter pays" principle. Among them, the investment for the control of existing pollution sources will employ self capital of the enterprise or bank loan. Environmental protection investment of new, expansion or reform projects should be mainstreamed into development investment plan.

With active adoption of market mechanism and absorption of social investment, a diversified input situation will be developed. It is expected that a total of 75 billion yuan pollution emission fee will be collected during the "11th Five-Year Plan" period, which will be used for pollution control. With such approaches as subsidy or interest discount, the authority will attract banks in particular policy banks to actively support environmental protection projects.

## **V. Guarantee Measures for Implementation**

Actively promote historic transformations and focus on overcoming the institutional obstacles that constrain long-term development of environmental protection. With such measures as enhanced reform and innovation efforts, improvement in institutions, innovation of mechanism, enhancement of legal system, and increase of input, China will improve its work on environmental protection.

### (I) Promote harmonious development between regional economy and the environment

China will carry out overall strategy for regional development. The classification of total land area into four main function areas is a strategic measure for optimized economic layout and the promotion of harmonious regional development. It is also a fundamental and long-term measure for the conservation of ecological environment. Meanwhile, it has provided a base for strengthening macro regulation and classified guidance in the field of environmental protection.

#### 1. Enhance regional classified guidance

According to the strategic framework for national coordinated regional development, western part of China should enhance ecological conservation. Based on national policies and plan, China will steadily carry out grain for green project, keep on the promotion of various ecological construction projects, develop key eco function protected areas, make more efforts in the control of desertification and stony desertification, strengthen environmental supervision on resource development activities, control and prevent pollution and ecological damages caused by the development of heavy & chemical industries and resource development process, intensify the control of water pollution and prevention and control of soil & water erosion of key watersheds such as the Three Gorges reservoir area and upper reaches, mid and upper streams of the Yellow River. In northeast China, efforts will be made to strengthen comprehensive control of water and soil erosion of black soil and desertification in western part of Northeast China. China will enhance its efforts in ecological restoration of resource depletion cities and mines; promote pollution treatment of such river basins as the Songhua River, Liaohe River, Yalu River and transboundary rivers, accelerate the pace for the development of ecological province and trial province on circular economy. In central part of China, the authority will accelerate the construction of environmental infrastructure, put more efforts in the control of water pollution of key watersheds, effectively maintain environmental carrying capacity of regional resources and strictly control total emission of pollutants. In East China, the authority

will firstly push forward the historic transformation and pay back historical debts. It will speed up the optimization and upgrading of industrial structure, facilitate the shift of growth mode and make more efforts in comprehensive control of regional environment of coastal city cluster in the Yangtze River delta and Pearl River delta and Beijing-Tianjin-Hebei Province and dramatically reduce total emissions of major pollutants.

## 2. Gradually carry out environmental classified management

According to the requirements for national zoning of main function areas, China has developed classified environmental policy and assessment indicator system for the four types of main function areas, and it will carry out gradual classified management.

In areas with optimized development, the authority will adhere to environment first, optimize industrial structure and layout, vigorously develop high and new technology; speed up technical upgrading of traditional industries, carry out strict environmental access system for construction projects, firstly finish the task of emission reduction with increased output but decreased emissions. In addition, China will address a number of pre-eminent environmental problems to improve environmental quality.

In areas focusing on development, the authority will adhere coordinated development between the environment and economy, use environmental carrying capacity in an scientific way, facilitate industrialization and urbanization, speed up the construction of environmental infrastructure, strictly control total emissions of pollutants with increase in output but decrease in pollution, and basically curb the degradation trend of the environment.

In areas restricting development, the authority will focus on conservation. With selection of appropriate development orientation, the authority will develop unique industry with local advantage, accelerate the development of key eco function protected areas, ensure the restoration and maintaining of eco function and gradually restore ecological balance.

In areas banning development, the authority will adhere to compulsory conservation. It will carry out strict supervision and management according to laws, regulations and relevant plan. Any development activities not in line with the main functions of the area will be prohibited and artificial disturbance and damage on natural ecology will be under control.

## 3. Focus on supporting environmental protection in West China

China will make more efforts to support environmental protection in western part of China in accordance with the overall strategy on the development of West China. It will strengthen policy guidance to western part of China and strictly control the movement of pollution to the region. Priority will be given to establish and implement ecological compensation mechanism in West China. Careful consideration on total emission quota will be given to the region with more capital allocated for pollution control and capacity building. According to voluntary principle with mutual benefits, China will advocate that the central and eastern part of China help West China in terms of capacity building and personnel training. In addition, assistance to Tibet will be done well.

## (II) Accelerate economic restructuring

China will vigorously facilitate industrial restructuring and upgrading, promote clean production, develop circular economy, reduce pollution at source and promote the development of an environment-friendly society.

#### 1. Enhance environmental access

Full consideration about environmental protection will be given when identifying the access conditions of key industries such as iron & steel, non-ferrous metals, building materials, power and light industry. New construction projects must comply with national environmental access conditions and emission standards. In case of no environmental carrying capacity, the area will be banned from any new development projects that add emissions.

More efforts will be made to phase out lag-behind technology, equipment and enterprises with heavy pollution in accordance with national industrial policy and environmental regulations. China should take phasing out lag-behind enterprises as an important approach for the development of an environment-friendly society.

#### 2. Accelerate the development of circular economy

China will develop relevant supporting regulations and improve assessment indicator system according to the requirements for developing circular economy. It will carry out economic policies conducive to resource saving and development of circular economy. It will facilitate the trial work on circular economy in key industries, industrial parks (zones), provinces and cities; promote advanced practical technologies and typical experience of circular economy; and carry out demonstration projects on circular economy. It will speed up the development of standards and evaluation indicator system as well as compulsory clean production examination technical guidance for clean production of key industries, and set up a technical supporting system for the promotion of clean production. China will further promote enterprises to actively carry out clean production program. To enterprises with emissions exceeding national or local standards or total emission limit or enterprises that employ toxic and hazardous raw materials or discharge toxic substances, compulsory clean production examination will be carried out according to law.

#### 3. Vigorously conserve resources and comprehensively utilize waste

According to the principle of "low input, high output, low consumption, low emissions, circulation and sustainable", China will integrate the conservation of energy, water and land with the reduction of total emission of pollutants. With overall plan and synchronized implementation as well as raising the efficiency of energy and resources as an important measure, China will achieve the emission reduction target specified in the "11th Five-Year Plan".

#### (III) Improve the institutions and carry out responsibilities

Efforts will be made to adapt new situation in environmental protection, identify the power of central and local governments, distinguish government responsibility and that of enterprises so as to establish a unified, coordinated and highly efficient environmental supervision institution.

## 1. Enhance national supervision

China will improve policy measures and strengthen the assessment, plan, macro regulation, guidance and supervision on environmental protection across the country. It will seep up the establishment of regional office for environmental supervision, strengthen the coordination and supervision of environmental protection work at regional or watershed levels and investigate & sanction striking environmental infringements.

## 2. Strengthen local supervision

Local governments should be responsible for environmental quality within their administrative region and they should fulfill their responsibilities for the environment. Environmental protection target responsibility system should be set up and more efforts will be made in assessment and examination.

## 3. Corporate responsibility

With the application of both constraining mechanism and incentive mechanism, China will facilitate enterprises and other organization strictly comply with environmental laws, regulations and standards so that they take initiative to control pollution and conserve the ecology. China will set up corporate environmental information disclosure system and enhance social supervision. It will establish enterprise's environmental supervisor system and carry out professional qualification management.

## 4. Enhance department cooperation

China will gradually sort out function division of each department in order to strengthen the coordination and integration of environmental supervision. It will set up inter-department information sharing and joint coordination mechanism and make full use of inter-department joint meeting. According to its own function and responsibility, each department should do well environmental protection work of relevant fields. Environmental protection department should perform its duties. It should make a unified environmental plan, carry out unified law enforcement supervision and issue unified environmental information, and strengthen integrated management.

## (IV) Innovate Institutions with More Input

China will strive for policy innovation, combine government regulation with market mechanism, and combine regulation constraint with policy incentives. Government input will drive social input with mobilization of market resources by economic policies. Publicity and education will be conducted to guide public participation. Efforts will be made to further improve the new mechanism for environmental protection guided by government, promoted by market force and participated by the public.

### 1. Increase government input

China will gradually increase the investment in environmental protection, which will be a focus of financial budget. Higher proportion

of national capital construction investment will be allocated to environmental protection. The central budget will support national key projects on environmental protection and the projects under national environmental control plan according to different conditions. Local governments at all levels should increase their investment in pollution prevention and control, ecological conservation and construction of public environmental facilities; integrate working fund of environmental protection department into government financial expenditure budget and ensure the fund for environmental protection institutions. They should strengthen the management of the utilization of pollution discharge fee and intensify the supervision and assessment of the benefits of such capital. Based on appropriate division of the power of central and local government, the central government should enhance its support to environmental protection in central and western part of China.

## 2. Improve environmental economic policy

Environmental protection requirements will be taken into account when introducing or reforming resource tax, consumption tax and import & export tax. China will explore the establishment of environmental taxation system and employ tax lever to facilitate the development of a resource saving and environment-friendly society.

Taking the advantage of price lever, China will establish pollution emission price and charging mechanism that reflect the full cost of pollution control. Areas or unit with appropriate conditions could carry out the trading of emission right of pollutants including SO<sub>2</sub>. Efforts will be made to realize internalization of environmental cost, facilitate reduced emission from enterprises and raise effectiveness of environmental pollution control. China will also carry out preferential policies for the power from renewable energy, power plants with desulphurization devices and garbage fueled power plants, which include prioritized on grid or higher electricity price. In addition, it will carry out dynamic management of the price of electricity from generation sets installed with desulphurization devices.

China will collect treatment & disposal fee for urban sewage, domestic garbage, hazardous waste and medical waste as well as collection & storage fee for radioactive waste in all cities to ensure smooth operation of such treatment facilities and collection and storage facilities. China will make more efforts in collecting and checking the collection of emission fee and further improve emission fee collection system. Efforts will be made to speed up the reform of civil public goods, encourage the participation in the construction and operation of environmental infrastructure by various enterprises and promote commercialization of pollution control.

China will improve credit policies and encourage banks especially policy banks to provide loans to environmental infrastructure construction projects and corporate pollution control projects with repaying ability. China will explore the establishment of environmental liability insurance and environmental venture investment. It will expand the channel for using foreign capital and keep on striving for the assistance and favorable loans from international organizations and foreign governments.

According to the principle of "developer protects, damager restores, beneficiary compensates and polluter pays", China will expand the trials work, improve eco compensation policy and establish eco compensation mechanism with the Three Gorge area, water source areas of the South-North Water Diversion Project and national nature reserves as entry point.



## (V) Strengthen rule of law and carry out strict supervision

Strengthening the rule of law is the key for the prevention and control of pollution and ecological conservation. It is also an effective approach to take part in comprehensive decision making on environment and development and promote fundamental shift of economic growth mode. China will adopt strong measures to address such problems as incomplete regulations, difficulty in law enforcement, low infringement cost, no sanction to lawbreakers and loose law enforcement.

### 1. Improve laws, regulations and standard system

China will speed up the amendment and improvement of existing laws, regulations and standards and fill the law gap. The focuses will be the amendment of the Environmental Protection Law of the People's Republic of China and Law of the People's Republic of China on the Prevention and Control of Water Pollution. Relevant authority will formulate the draft laws and regulations in relation to such aspects as soil pollution, chemical pollution, ecological conservation, biosafety, genetic resources, ozone layer protection, nuclear safety, circular economy, environmental monitoring and compensation for environmental damages. Local governments shall improve local regulations, too. China will improve technical specification and environmental standard system, identify environmental limits in a scientific way and encourage more stringent local emission standards.

With active cooperation with legal department, the authority and effectiveness of environmental law enforcement will be ensured through legal means.

### 2. Improve law enforcement supervision system

According to the requirements of "clear definition of power and responsibilities, standardized conduct, strong supervision and efficient operation", the authority will identify law enforcement responsibilities and procedures, raise law enforcement efficiency, and enhance law enforcement supervision. It will see to it that laws are fully observed and strictly enforced and that lawbreakers are duly punished.

The authority will further carry out special campaigns on streamlining enterprise that discharge pollutants against the law and ensuring public health and strictly investigate and sanction any environmental infringements and cases. It will keep on the inspection on environmental safety, focus on the investigations on environmental safety of petroleum, chemicals and metallurgical enterprises along rivers or in areas with dense population to eliminate any hidden environmental problems. It will enhance the supervision and administration of such substances as hazardous chemicals, hazardous waste and radioactive waste to minimize environmental risk. Local governments at all levels and key enterprises should develop emergency response program, establish necessary emergency response facilities in order to raise the capacity in handling sudden environmental events.

### 3. Focus on carrying out three environmental management systems

Carry out total control system for pollution emissions. The authority will divide the planned target for total control of the emissions of major pollutants down to grass-root level and enterprises with emissions. It will strengthen the monitoring and statistics on pollution

emissions. It will achieve the total emission control target with combined application of various environmental management systems and tools including emission permit, emission fee, compulsory phasing out, corrections within a given period of time and environmental impact assessment (EIA).

China will strengthen EIA system and "Three synchronizations system"(Installations for the prevention and control of pollution at a construction project must be designed, built and commissioned together with the principal part of the project). On the bases of accelerated trial work, China will facilitate EIA for various development projects and plans in order to prevent environmental pollution and ecological damage at the source. The authority will carry out strict management on EIA and "Three synchronizations" of construction projects, enhance the administration on environmental impact assessment qualifications, raise EIA work quality and carry out EIA responsibility system. It will strictly check and accept the "Three synchronizations" and reverse the situation as soon as possible where local authorities emphasize review & approval but supervision, focus on pre-construction assessment but ignore post-construction assessment, commencement of construction without approval and putting into operation without check & acceptance.

Implement environmental target responsibility system. The "11th Five-Year Plan" environmental targets and tasks will be fragmented to local government at all levels that will carry out their own target. China will set up an examination mechanism on environmental management performance and mainstream environmental protection into the economic and social development evaluation system. It will identify scientific assessment indicators and integrate them into the comprehensive evaluation system for the performance of party and government officials. It will establish environmental protection accountability and awarding & punishment system and strictly carry out the "Provisional Regulations on the Punishment of Behaviors that Violate Environmental Protection Laws or Disciplines".

#### (VI) Develop Environmental Industry based on Science & Technology

Driven by scientific innovations and supported by industrial development, China will strive for the improvement of environmental science and technology.

##### 1. Vigorously promote scientific innovations

To enhance the capacity of science & technology in guiding and supporting environmental protection, China will carry out scientific innovation projects in an all round way focusing on key fields and priority areas specified in the Outline of National Mid and Long-term Plan for the Development of Science & Technology. Supported by fundamental theory and technical innovations, China will carry out the development of environmental standard system in an all round way. Aiming at improving environmental management and pollution prevention & control technology, China will launch the development of environmental technical management system. In addition, China will enhance fundamental studies in the field of climate change, and further develop and improve study and analysis methods.

With deepening reform of environmental science & technology institution, China will unite all social forces, optimize and integrate the resources of environmental science & technology, foster talents in the field of environmental science & technology, develop

environmental science & technology supporting system and raise the capacity in environmental science & technology innovations. In addition, efforts will be made to improve democratic environmental decision making in a scientific way.

<b>Box 6 Priority Areas for Environmental Science &amp; Technology Innovations during the "11<sup>th</sup> Five-Year Plan" Period</b>
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Prevention and control of water pollution: It includes the development of technologies ensuring drinking water safety and key supporting technologies and water pollution control at watershed (regional) level and demonstration projects, etc.
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Prevention and control of atmospheric pollution: It includes such contents as current status and cause of regional air pollution and pollution loss evaluation, urban air pollution and control, and treatment technology for industrial waste gas etc.
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Prevention and control of soil pollution and comprehensive control of rural environment: It includes soil pollution and remedy technologies, comprehensive control of rural environment and the prevention and control of rural non-point source pollution.
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Prevention and control of pollution by solid waste and chemicals: It includes such contents as material flow feature and pollution control technology for solid waste, treatment and disposal technologies for hazardous waste, chemical environmental effects and risk assessment technology, etc.
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Ecological conservation and development: It includes such contents as conservation and development of national key eco function areas, and environmental protection and ecosystem monitoring of regional ecology, etc.
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Nuclear and radiation safety: It includes such contents as nuclear safety risk assessment and control of radioactive waste pollution, optimized management on nuclear and radiation, electro-magnetic radiation and environmental safety, etc.
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Key science & technology supporting to comprehensive environmental management: It includes such contents as identification of total emission of pollutants, environmental supervision and early warning, environmental monitoring statistics and information management, environmental standards and criteria, environmental policy and regulations, etc.
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Common technologies for circular economy: It includes such contents as prevention and control of industrial pollution and reuse technologies, ecological reform technology of industrial parks (zones), analysis of material flow and control pathway, economic policy on pollution control.
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Environment and health: It includes such contents as environmental pollution and health hazard, impact mechanism of pollution on health and identification techniques, etc.
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Global environmental problems: It includes such contents as adaptation technology and countermeasures for the impacts of global climate change; POP control technology, supporting technologies for biodiversity conservation and biosafety, etc.
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## 2. Actively promote the development of environmental protection industry

Focusing on key environmental protection projects and guided by standardization, product series, assimilation of foreign technology and modernization, China will vigorously develop manufacturing industry of environmental protection equipment based on environmental protection demonstration projects with the combination of self innovation with the introduction and absorption of foreign technologies.

Focusing on EIA, environmental engineering service, research & development of environmental technology and consultation as well as environmental venture investment, China will actively develop environmental protection service industry facilitated by market force.

With such measures as the formulation of development plan, promotion of technological advance, enhancement of industrial self discipline, standardize market conduct and facilitation of fair competition, China will promote healthy development of environmental protection industry.

With the opening up strategy, China will support all kinds of enterprises (in terms of ownership) entering environmental protection industry. It will foster a range of dominant enterprises or corporations with self brand, strong core technology, high market share and more job opportunities, thus making environmental protection industry a new pillar industry for national economy.

**Box 7 Priority Areas for Environmental Protection Industry during the "11<sup>th</sup> Five-Year Plan" Period**

Water pollution prevention and control technologies and equipment: It will focus on such activities as prevention and control of eutrophication, reuse of waste water, removal of organic substance and microbes in drinking water, biological removal of nitrogen and phosphorus of high-load waste water, high-efficiency anaerobic and aerobic biological treatment, treatment of waste water with high salinity and toxic organic compounds hard to degrade, sludge stabilization and reuse, emergency response to oil spills in estuary and coastal waters and chemical accidents, etc.

Air pollution prevention and control technologies and equipment: The focuses will be desulphurization of power plants with capacity no less than 300 MW, sulphur and nitrogen removal and their reuse, fume denitrification by selective catalyst reduction, cloth dust remover in furnaces of large coal fueled power plants, emission control of diesel engines, emission catalyst of petrol vehicles and motorbikes.

Technologies and equipment for treatment and disposal of solid waste: The focuses will be the development of big urban garbage incineration plants with the capacity over 600t/d, control of incineration fume and dioxins, landfill biogas recycling and reuse with the capacity over 2000m<sup>3</sup>/h, medium and high temperature anaerobic digestion with capacity over 200t/d, collective incineration of hazardous waste in rotary kilns with the capacity over 30t/d as well as plasma high-temperature treatment of special hazardous waste, etc.

Remedy technology for polluted sites: The focuses will be the development of highly efficient ecological regulation and restoration techniques that minimize soil pollution, remedy of the soil polluted by chemicals, vegetation rehabilitation of mine waste land, reuse of mine waste, ecological restoration of acid mine stockpiles as well as ecological rehabilitation and stability of alkaline red mud storage facilities.

Environmental monitoring technology and equipment: The focuses will be the development of on-line automatic monitoring system, special instrument for the identification of hazardous waste, sampling instruments for fine particulate and organic pollutants, dioxin analytical instrument, emergency response monitoring technology and instruments for pollution accidents, and remote pollution measurement system.

Physical pollution control: The work will focus on the development of control of urban traffic noise and vibration, control of the noise and vibration of urban resident communities and supporting facilities of buildings, sound source control and noise reduction equipment, control of electromagnetic pollution as well as optical pollution control, etc.

Special reagent and materials: The work will focus on the development of membrane materials and components, cloth dust filtering materials tolerate to high temperature and corrosion. High-efficient bio filler and special catalyst as well as anti-seepage materials for the bed of landfill facilities, etc.

Comprehensive utilization of resources: The focuses will be recycling and reuse of waste; utilization of neutralized water, brackish water and desalinized water, water conservation by high-efficiency cooling; reuse of waste vehicles, tyres, household appliance, electronic products and tailings.

Construction, operation and consultation service for pollution treatment facilities: The focuses will be the promotion of the commercialization of the construction and operation of environmental facilities such as urban sewage treatment plant, landfill and hazardous waste disposal; scaled treatment of industrial effluent, professional operation of desulphurization and dust removal facilities in power plants. In addition, China will vigorously develop technical consultation and management services for environmental protection.

Environmental service trade: China will set up environmental service standard system that follows international practice. It will facilitate contracting of overseas environmental engineering design and construction project and encourage the export of environmental products and services.

(VII) Mobilize Social Forces to Protect the Environment

With various kinds of environmental publicity and education activities and disclosure of environmental information, China would mobilize all social forces to take part in environmental protection.

#### 1. Improve social awareness in ecological culture

More efforts will be made to improve environmental awareness and legal concept of officials at all levels and the general public with focus on the strengthening environmental education and training of leaders at all levels. Media guide and supervision role will be brought into full play. More efforts will be made to promote the guidelines, policies, laws and regulations on environmental protection and disclose environmental infringements. Work on fundamental environmental education, professional education, follow-up education and post training on environmental protection will be done well. Efforts will be made to replicate the production mode and life style that meet the requirements for the development of a resource saving and environment-friendly society in an all round way and at multiple levels.

#### 2. Expand public right and access to environmental information

China carries out open administration. That is, it makes public such administrative information about environmental protection policies and regulations, project review & approval as well as case handling. China will improve government website on environmental information, and make public environmental information such as environmental quality and environmental management. It will facilitate disclosure of corporate environmental information according to law. All listed companies should be assessed on their environmental performance and issue a bulletin on their environmental information.

#### 3. Improve the mechanism for public participation in environmental protection

China will vigorously popularize the knowledge about environmental science and implement the "environmental science popularization initiative in 10,000 villages of 1,000 towns". It will promote environmental label and certification, and advocate green consumption, green office and green procurement. It will extensively carry out such activities as the development of green communities, green schools and green household and bring the roles of trade union, Chinese Communist Youth League and women federation, communities, various environmental NGOs and environmental volunteers into full play. It will enhance the work on public complaints by letters and visits, bring the role of environmental hotline of "12369" into play and expand public complaint & report channels. It will study on environmental public interests litigation, strengthen administrative reconsideration, facilitate administrative lawsuit and safeguard public environmental rights & interests according to law. It will improve the rule and procedures for public participation, listen to public comments by means of hearings, review meeting and public announcement, accept public supervision and carry out democratic decision making.

#### (VIII) Actively carry out international environmental cooperation

Taking environmental protection as an important field for China's opening up, China will keep on its opening up and play a more active role in international environmental affairs.

1. Actively take part in global environmental protection

Adhering to the principle of "common but differentiated responsibilities", China will actively participate in international environmental conventions and WTO environment and trade negotiations, and safeguard environmental rights & interests of China as well as developing countries. China will perform its obligations, vigorously promote the domestic implementation work, accelerate the phasing out of substances that deplete ozone layer and try its best to control the emissions of greenhouse gases.

<b>Box 8 International Environmental Conventions with China as a Party</b>		
Name of Convention	Ratifying time	Department in charge
Convention on International Trade in Endangered Species of Wild Fauna and Flora	April 8, 1981	State Forestry Administration (SFA)
Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter	September 6, 1985	State Oceanic Administration
The Vienna Convention for the Protection of the Ozone Layer	September 11, 1989	SEPA
London Amendment for Montreal Protocol on Substances that Deplete the Ozone Layer	June 14, 1991	SEPA
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	September 4, 1991	SEPA
Ramsar Convention	July 31, 1992	SFA
Convention on Biological Diversity	November 7, 1992	SEPA
United Nations Framework Convention on Climate Change	November 7, 1992	NDRC
Convention on Nuclear Safety	April 9, 1996	SEPA
Convention on the Prevention and Control of Desertification	December 30, 1996	SFA
Amendment of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	May 1, 2001	SEPA
Kyoto Protocol	August 1, 2002	NDRC
Copenhagen Amendment for Montreal Protocol on Substances that Deplete the Ozone Layer	April 22, 2003	SEPA

Stockholm Convention on Persistent Organic Pollutants	June 25, 2004	SEPA
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals in International Trade	December 29, 2004	SEPA
Cartagena Protocol on Biosafety	April 17, 2005	SEPA
1996 Amendment of the Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter	June 29, 2006	State Oceanic Administration

## 2. Extensively carry out international environmental cooperation

China will consolidate and deepen its environmental cooperation with key big countries, EU and countries with traditional friendship, in particular environmental cooperation with neighboring countries. It will expand and develop environmental cooperation with developing countries and continuously deepen its cooperation with international organizations such as UNEP, WB and GEF. It will promote China's policies and progresses in environmental protection through such cooperation and exchanges and safeguard environmental rights & interests of China and other developing countries.

The introduction of foreign capitals, technologies and management experience will help China improve the environmental protection technology and management level. Efforts will be made to facilitate the environmental protection equipment and technology entering international market. China will enhance its capacity in self innovation and actively promote international cooperation and technological transfer that reduce the emissions of greenhouse gases.

China will enhance the coordination between environment and trade. It will take active measures to address green trade barrier, improve environmental standard on foreign trade products, establish an environmental risk assessment mechanism and monitoring and control system for hazardous substance in imported goods. In doing so, it will appropriately introduce useful renewable resources and species resources and strictly prevent the introduction of pollution, illegal import of waste, invasion of hazardous alien species and the loss of genetic resources.

## VI. Implementation and Performance Examination of the Plan

It is the common obligation of the whole society to carry out the current Plan and important responsibility of governments at all levels. The people's governments at all levels shall perform their duties, make more efforts to ensure input in environmental protection and guide social resources. Each responsibility will have a corresponding unit to fulfill, each input will have an appropriate channel and each task will be finished. In doing so, each task and ensuring measure presented by the current Plan will be carried out.

The total emissions control target for major pollutants during the "11th Five-Year Plan" period is a binding targets specified in the Outline of the "11th Five-Year Plan for National Economic and Social Development and has been fragmented to each province, autonomous region and municipality directly under the State Council. The government of each province, autonomous region and municipality directly under the State Council shall further fragment it down to each prefecture, cities, key industries and enterprises to ensure its realization.

Guided by the current Plan, local authorities shall waste no time to develop special environmental protection plan for key regions,

watersheds and areas and organize its implementation. They should do well the coordination between environmental protection plan and socio-economic development plan with mutual promotion and synchronized implementation. Each prefecture shall also develop its own environmental protection and carry it out after approval.

Inter-department cooperation should be enhanced to promote the implementation of the Plan. Development and reform department should develop industrial, pricing and investment policies conducive to environmental protection and mainstream key environmental protection projects into economic and social development plan or program. Financial and taxation department shall study and develop financial & taxation policies in favor of environmental protection, establish and improve eco compensation mechanism, and support the development of environmental monitoring & early warning system and supervision system for environmental law enforcement. Construction department shall do well the construction and management of environmental infrastructure including urban sewage treatment plant, garbage disposal and public green land. Other relevant departments including national land resources, transportation, water, agriculture, forestry, tourism and oceanic administrations shall, based on their own functions and responsibilities, support and promote environmental protection.

Environmental protection departments shall establish an assessment and examination mechanism, strengthen the supervision and inspection on the implementation of the current Plan, intensify environmental statistics and monitoring, and make public such information as the emissions of major pollutants of each region, progress of each key projects and the change of environmental quality of key watersheds and cities once for every 6 months.

Interim assessment and final examination on the implementation of the current Plan will be conducted in the end of 2008 and 2010 respectively.