



ENVIRONMENT PROTECTION INDUSTRY IN CHINA
Chinese market research and investment

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<p>Abstract</p> <p>The environmental situation in china has been being worse. Chinese central government started to pay much more attention in environmental protection. It shows that the environmental protection will be a potential competitive industry which is going to be developed during the next decade. The purpose of this thesis is to provide a whole structure of environmental protection industry, help people who are interested in Chinese environmental protection industry to find market space and also to find the proper investment method.</p> <p>The theoretical part includes the definition of environment protection industry and the general situation and introduction of the whole industry; in this part, the environmental protection industry has been divided into 5 different types so that could be easier for focus on a specific area.</p> <p>In the research progress, the secondary data is the main source of the whole information. The keystone of the research was related to the potential competitive power and market growth space in different types of environmental protection industry, in order to show the investment opportunity and catch the correct market entry path.</p> <p>Chinese environmental protection industry is growing very fast by now, lots of new technologies and skills will be needed to introduce to this new growing market. Find the right way and right investment methods are the essential points to be successful in environmental protection market.</p>		
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Miscellaneous		

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1 Introduction

1.1 The purpose of research the environmental protection industry

It is obvious that China has obtained a successful economic development revolution during the past 30 years, almost every Chinese people is sharing this great achievement. However, there are two sides of everything; the environment pollution is being considered a potential crisis of the society development. Chinese central government is paying much more attention in trying to change the current situation. Environment protection industry is a relatively new industry if we look back the industry development history of China, which means it is also viewed a new economic attractive point.

In the future, I would like to operate my own business. The environmental protection industry and environmental protection products will be put in the first place because of its social effects and a potential huge market area. As we all know that environmental protection industry is based on the whole future of development of a country, it is not only remarked as a business opportunity, but also as a maintenance development plan within a long term.

Another reason for this study is to help people who are interested in Chinese environment protection market to find the whole market and industry situation, environmental protection products sales and market entry channel when they decided to invest or start the relevant business.

1.2 Research questions

In this research, I would like to present the following questions:

- What is the size/extent of Chinese environment protection market area

- What are the most serious environmental problems
- What kind of environment protection products will have a huge potential market growth space
- How do people who are interested in this market start to invest and operate environment protection business

2 Research methods

Before start the research process, there are several definitions of research methods needed to be mentioned in this study.

There are three general types of research. Each of them is used in different research objectives. If the objective of the research is to understand a problem or situation, *exploratory research* is required. If the objective is to identify cause-and-effect relationships, *experimental research* is conducted. If the research objective is to provide detailed data on who, what, when, where, how, why, and/or how often, *descriptive research* is used. (Melvin Crask Richard J, Fox Roy G Stout, 1995, 16)

After getting to know the three research types, I can specify the research problems. It would be very easy to match research methods exactly.

2.1 Data collection methods and tools

There are three types of data can be used to analyze the situation and discover problems, secondary data, syndicated data and primary data. The definition of primary data: data observed or collected directly from first-hand experience. (<http://www.businessdictionary.com/definition/primary-data.html>). Sample and questionnaire are the most important methods for primary data collection.

Secondary data: are data that have already been collected for some other purpose but

that also providing useful information for the current problem. For many people, marketing research conjures up images of people taking surveys to gather information from consumers about products or services. The truth is, a great deal of valuable marketing information can be gained from a careful examination of secondary data. Many times, secondary data provide information necessary to evaluate the business environment in which a firm must operate. (Melvin Crask Richard J, Fox Roy G Stout, 1995, 98)

Syndicated data: are gathered by syndicated services and provided to all subscribers of the service. Syndicated data result from multisponsored research. Typically, the reason for many sponsors is that the cost of the research is prohibitive for a single firm. While individual firms may request different analyses and report formats, the basic source data is the same. (Melvin Crask Richard J, Fox Roy G Stout, 1995, 122)

2.2 Research methods in this study

In my opinion, all the research questions of this thesis can use secondary data to analyze and find the final result. For example, for the first question, “what is the size/extent of Chinese environmental protection market area?” When it comes to this question, the following factors are necessary considered and referred: government policy, economic development situation, populations’ conscious about the environmental protection, the environmental protection market growth rate annual and so on, all the information could be found from internet and books or other media. Those data and information from secondary data will be more direct and clear, furthermore, it is very easy to put them together in comparison and predict the future trend.

On the other hand, two empirical research methods must be used in this study, qualitative and quantitative. Qualitative research is a field of inquiry that crosscuts disciplines and subject matters. Its aim is to gather an in-depth understanding of

human behavior and the reasons that govern human behavior. It relies on reasons behind various aspects of behavior. Simply put, it investigates the why and how of decision making, not just what, where, and when.
(http://en.wikipedia.org/wiki/Qualitative_methods)

Quantitative research is the systematic scientific investigation of quantitative properties and phenomena and their relationships. The objective of quantitative research is to develop and employ mathematical models, theories and/or hypotheses pertaining to natural phenomena. The process of measurement is central to quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships.
(http://en.wikipedia.org/wiki/Quantitative_methods)

3 Brief description

3.1 Definition environment protection industry

The purpose of the environmental protection industry is to avoid the environment pollution, improve the ecological environment, and protect the natural circumstance in the national economy construction. It contains many kinds of technology research development, such as environmental protection technology, related production research, building business channel, and takes advantage of resources, information service and finding projects.

Environmental protection industry is according the whole life circle of products; it not only includes environmental issues, like sewage management, waste recycling strategy, but also includes the cleaning technology and products of production process. When they are designing some products, they usually need to consider the recycling strategy to save energy so that those products can be fit to the ecological standard when they

are being consumed and used.

Form the trend of environmental protection industry; it helps human beings to emphasis more on environmental protection conscious, further more government will enlarge the environmental protection investment, it is very useful to cause the excellent protection skill and technology, improve the quality of environment, maintain the balance of ecology, and it has an endless development space. (<http://www.ocn.com.cn/reports/2006110huanbao.htm>)

3.2 General overview of environment protection industry

3.2.1 The environmental challenges

Over the past 25 years, the PRC has transformed itself from a closed agrarian economy to a global industrial and economic powerhouse. The rapid economic growth resulting from this transformation has lifted hundreds of millions of people out of poverty. However, this success has been achieved at an enormous cost to the environment. Rapid industrialization and urbanization have been accompanied by accelerated exploitation of natural resources and massive increases in discharge of pollutants.

The overall performance of PRC in environmental protection and natural resource management during the 10th Five Year Plan (FYP) 2001-2005 included some significant achievements. However, despite the Government's best efforts, environmental degradation in PRC has not been reduced. Indeed, it is getting worse. Environmental protection was the only area of the 10th FYP that failed to achieve its targets, including targets for sulfur dioxide emissions, urban wastewater and river and lake pollution controls.

- pollution of water, air and land;
- water shortages and land degradation;
- increasing environmental accidents; and

- Energy inefficiency and greenhouse gas emissions.

(<http://www.adb.org/Documents/Speeches/2007/ms2007017.asp>)

3.2.2 Policy background

Government has proved that coordinated development between the economy, the society and the environment has been effective.

Nowadays, because of the rapid development of modernization, it is confronted with a double task, that is, develop the economy and protect the environment. Proceeding from its national conditions, china has made environmental protection as one of the basic national policies during the process of promoting its overall modernization program. Sustainable development is being considered as an important strategy and carried out throughout the country large scale measures for pollution prevention and control as well as ecological environmental protection. GNP of China has got a great achievement; the annual growth rate is around 10% , while its environmental quality has basically being deterioration. However, from now on, the principle that has been adopted by Chinese central government (http://en.wikipedia.org/wiki/Environment_of_China)

For my part, political background and trend are very important to be known by those people who are willing to invest and run business in China. China is a communist country; central government is playing a vital role in the micro policies decision making process. Generally speaking, Chinese people always spend much more time on researching the micro policies designed by central government. On the other hand, it is also viewed as a new business opportunity for business man and investors.

According to the information that I mentioned in the above paragraph, the following

ones can be used to prove that the environment protection industry has a new future in China:

- Environment protection industry is a relative new industry and business opportunity in china.

A country always has three underpinning industry to form the whole economic development progress, they are agriculture, industry and service industry. Service industry is flourishing in developed counties, like information technology, financial industry, research and development and so on.

Chinese government has noticed that service industry is very helpful in maintaining a long term and high quality economy development, hence, with the environmental problem is being obvious each day, which is considered belong to the third industry (service industry), environmental protection will form a new business chance for environmental protection companies.

- Environmental protection policy will be adopted as basic national policy. As we all know that, this great economic development achievement is based on a big sacrifice—that is the main reason which causes the series environmental problem. China has been being the most attractive investment country for those multinational companies because of the low cost investment and a series of favorable strategies. Foreign investment companies were not asked to spend too much expenditure in environmental protection process, and local Chinese companies only focus more on how to decrease production cost, they don't have environmental protection awareness.

Under this regulation, those enterprises will be forced to be careful about the environmental problems, they are asked to buy equipments or take advantage some new kind of techniques to save resources, decrease environmental pollution.

That would be important information for environmental protection companies.

3.2.3 Economical factors

- small and middle size business are the main unites

It is said that the number of large size enterprises only make up 28% of total amount of environmental protection factories; nearly 90% are small and middle size business. By the end of 2000, more than 10,000 factories were running the environmental protection industry, they employed about 1.8 million workers, the fixed cost worthies 800 billion RMB. During last decade, environmental protection industry produced about 1080 billion RMB, environmental equipment accounts for 27.8%, resource usage was 63%, service environment was 9.2% and environmental protection industry makes up 0.77% of total GDP.

- Low entry condition

Now in China, there are more than 10,000 business working in environmental protection industry within several decade years, compare to other kinds of industry, environmental protection industry can get big profit, and the entry condition are not complicated, in that case, more and more new enterprises intend to join this industry.

3.2.4 Technology factors

From the above paragraph, we will notice that the environmental problem is concentrated on two parts: Environment and Energy. For this result, the technological areas in focus on wasted management, sludge treatment, air protection and monitoring, rural waste water treatment which are for the environmental problems; renewable and clean energy, energy efficiency, energy conservation are mainly developed for energy site.

3.2.5 Bottlenecks of environmental protection industry

Now let's look at the environmental protection industry of developed countries, they all have specific fields for developing. For example, America concentrated on the environmental protection equipment and information system; environmental consultation and service also have a better situation. German is good at air pollution control and solid waste management; Japan has advantage on water equipment control and management; UK and France are good at sewage control system and solid management too. These countries are in the first place in researching related technology, furthermore, they obtained the lots of markets from all over the world, it is very hard to explore new and potential market for those countries that are looking for new market area.

4 The survey of market extent

Now let's take a minute to have a look at the objectives of environmental protection in the next five years:

China's Environmental Priorities (2006-2010)

Five environmental targets have been set in the 11th Five-Year Plan (2006-2010) for National Economic and Social Development as follows:

- Total discharge of major pollutants discharged to be decreased by 10 per cent
- Urban sewage and domestic waste treatment rate to be increased to 70 per cent and 60 per cent respectively
- Energy consumption per unit of GDP to be reduced by 20 per cent

- Water consumption per unit of value-added industrial output to be reduced by 30 per cent
- Forest coverage to be raised from 18.2 to 20 per cent

(<http://www.austrade.gov.au/Environmental-technologies-to-China/default.aspx>)

This is the whole environmental protection plan in the next five years come from Chinese central government, we can know from this information that people can find many business opportunities in environmental protection industry, environmental protection industry will be the first and important goal in the fast economic growth development, which means the market space is going to be more and more wide and clear.

4.1 General overview of the market

Total investment from central government: US dollars 175 billion for 2006-2010, nearly double that in 2001-2005.

The total percentage makes up of GDP to rise to 1.5% during 2006-2010, increased 0.2% compared to 2001-2005.

TABLE1. The overview of environment protection industry in 2005

Number of companies	11,623
Total employees	1,595,000
Revenue (billion)	45.72 US dollar
Profit(billion)	3.93 US dollar
Net profit per person(0000)	2.5

(State Environmental Protection Administration SEPA <http://www.chinaenvironment.com/>)

TABLE2. The overview of environment protection industry in 2006

Number of companies	35,000
Number of employees	3,000,000
total value of products sold(billion)	75 US dollar
Total profits (billion)	6.5 US dollar
total value of products sold in 2010 forecast (billion)	146 US dollar

(State Environmental Protection Administration SEPA

<http://www.austrade.gov.au/Environmental-technologies-to-China/default.aspx>)

From the two tables, it is very easy to discover that the number of environmental companies are not too much, on the other hand, the number of environmental protection industry was being increased every five-years plan. Compare to 2005, the number of environmental protection business was more than twice in 2006; and the number of employees increase very fast too, in 2005, there were almost 160,0000 people worked for environmental protection industry; the number had been changed to 300,0000 in 2006.

environmental protection enterprises can earned profits from industry was 3.93 billion US dollar in 2005, but in 2006, their ability to earn more profit was strengthen, 6.5 billion US dollar was the final profit at the beginning of the 11th five-years plan.

4.2 Market segmentation

Markets consist of buyers, and buyers differ in one or more ways. They may differ in their wants, resources, locations, buying attitudes and buying practices. Trough market segmentation, companies divide large, heterogeneous markets into smaller segments that can be reached more efficiently with products and services that match their unique

needs. (Philip Kotler, 2005, 391)

In this section, I would like to segment the whole environmental protection market into several parts according to the different environmental problems and the series level situation.

At present, there are four most important environmental protection controls and treatments have possessed the first place throughout the whole environmental protection industry. They are water pollution treatment and prevention, air pollution treatment, solid management process and energy conversation. To solve those four major pollutions, the market is forming a related products demand gradually:

- The environment protection products market
- The resources comprehensive utilization market
- The environmental protection service market
- The cleaning products market.

TABLE3. The market segmentation situation

items	Total	Environment protection products	Resources comprehensive utilization	Environmental protection service	Cleaning products
Unites	11623	2867	6105	3387	947
employees(00)	159.5	16.8	95.9	17.0	23.3
Total revenue(billion)	4572.1RMB	341.9RMB	2787.4RMB	264.1RMB	1178.7RMB
Total profit(billion)	393.9RMB	37.0RMB	223.4RMB	26.2RMB	107.3RMB

(http://english.gov.cn/special/envir_index.htm)

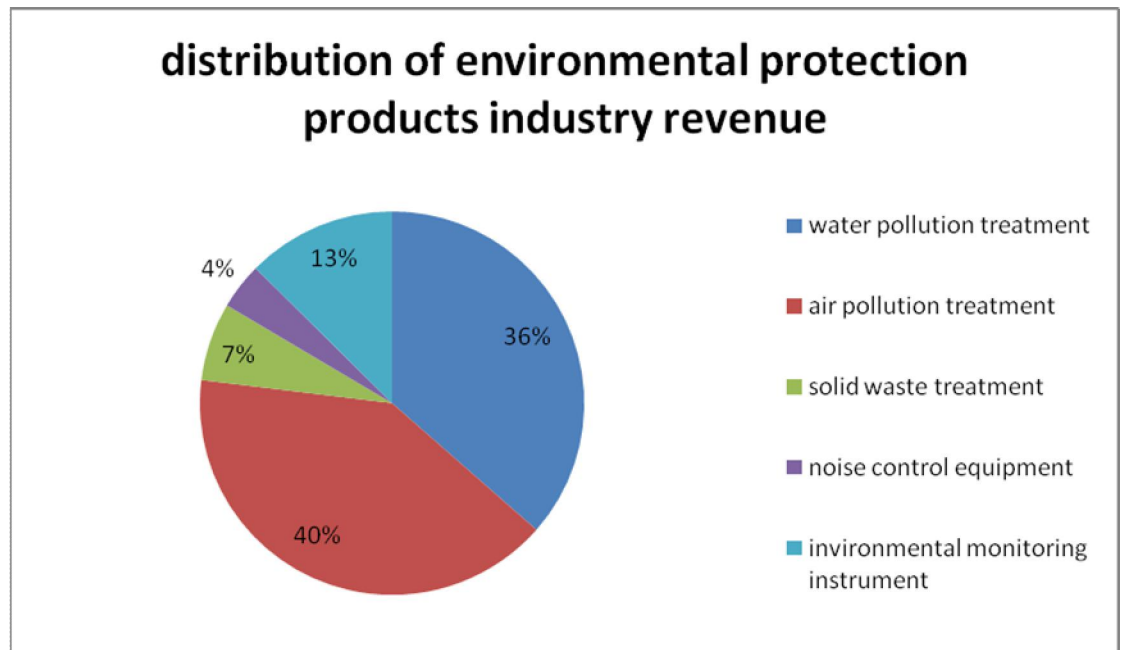
From this table, we can know that there are 11,623 unites which are related to those four market secessions. The environmental production products market has 2867 companies; 6105 enterprises have been found to produce resources comprehensive utilization products and developed technologies, which accounts for the largest percentage of total amounts of companies; about environmental protection service, 3387 corporations were doing relevant business in this field; companies who are responsible for cleaning products make up the smallest number compare to the number of resources comprehensive utilization.

Resources comprehensive utilization field employed the most workers, environmental production products has the least employees. Meanwhile, resources comprehensive utilization has obtained the most revenue and profits compare to the other three market segmentations.

- Environment protection products

Water pollution treatment, air pollution treatment and control, solid waste treatment, noise control equipment and environmental monitoring instrument are the main consumption areas for the environmental protection products.

FIGURE1. Distribution of environmental protection products industry revenue



Water pollution treatment and air pollution treatment have accounted for more than 50% of total revenue of environmental protection products market. It is easy to found that water pollution treatment will be the most important develop section. North and west parts of China have been suffering this problem since last century. Although Chinese central government has made a great effort to improve the water and wastewater infrastructure, there is still 30-40 billion cubic meters water cannot be satisfied to some places in China; Beijing is also included in the list. By the end of 2005, the official municipal wastewater treatment rate was only 45.7% (<http://64.233.183.104/search>), according to the Chinese ‘ministry of Construction report, 297 cities don’t have any kind of wastewater treatment facilities in China.

TABLE4. Waste water discharge and pollutant discharge in recent years

Year	wastewater discharge (100million tons)			COD discharge(10,000tons)			Ammonia discharge(10,000tons)		
	Total	Industrial	Municipal	Total	Industrial	Municipal	Total	Industrial	Municipal
2001	432,9	202,6	230,3	1404,8	607,5	797,3	125,2	41,3	83,9
2002	439,5	207,2	232,3	1366,9	584	782,9	128,8	42,1	86,7
2003	460	212,4	247,6	1333,6	511,9	821,7	129,7	40,4	89,3
2004	482,4	221,1	261,3	1339,2	509,7	829,5	133	42,2	90,8
2005	524,5	243,1	281,4	1414,2	554,8	859,4	149,8	52,5	97,3

(Source: State Environmental Protection administration)

In view of this situation, we can know that the three main water pollution problems are wastewater, COD (chemical Oxygen Demand) discharge and Ammonia discharge. In the last five-years plan, the total number of discharge has been being increased all the time, COD discharge was in the fast speed situation. We can get information from the national public media that during the 11th five-year plan, Chinese government will set an ambitious goal to decrease the COD pollution by 10% by the end of 2010. Water issue is top the first place of the national's environmental protection of the five years. It is predicted that in the next five years, China will spend about 175 billion USD in environmental protection; the number is going to account for 1.3-1.4% of total GDP.

TABLE5. Water pollution control market

Unites: Million USD

	2002	2003	2004	2005
Total Market Size	14,085	16,840	19,337	22,313
Total local production	10,224	11,800	13,565	15,600
Total exports	360	523	585	643
Total imports	4,221	5,563,	6,397	7,356
Imports from USA	422	556	639	735

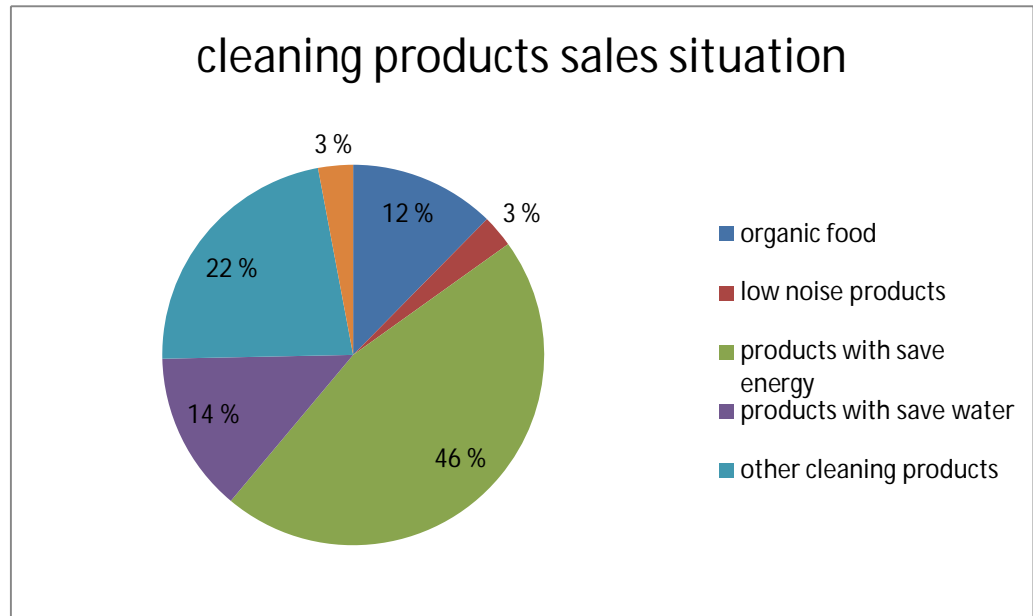
(Source: State Environmental Protection administration)

In 2002, the total market size of water pollution industry was only 14,085, the number was increased gradually from 2003 to 2004, and we can see by 2005, the market size was 22,313 million USD, which means the market size has been being expanded almost every year and the market demand of water pollution was being increased too. Furthermore, not only the market size was in the accelerate process, but also the local production, which has experienced the rise step too, the number of local production increased from 10,224 to 15,600.

The national water-saving technology and policy guideline was issued in the 2005 by Chinese government, which the aim was to promote the development of water-saving technology and as well as the water usage rate in order to keep the sustainable water resources utilization , Chinese government is driven to create a “water Conservation Society”.

- Cleaning production products

FIGURE2. Cleaning production products sales



From the figure 2, it is clearly that products with save energy accounts for almost 50% of total sales of clean production products market.

The concept of Cleaner Production (CP), an international acceptable definition is as the following:

“Cleaner Production is the continuous application of an integrated preventative environmental strategy to processes, products, and services so as to increase efficiency and reduce the risks to humans and the environment”. (<http://www.thefreedictionary.com/cleaning>) Cleaning products includes many kinds of fields, from the home cleaning products to industrial cleaning products. Industrial cleaning products will be used in reduce the toxic emission released.

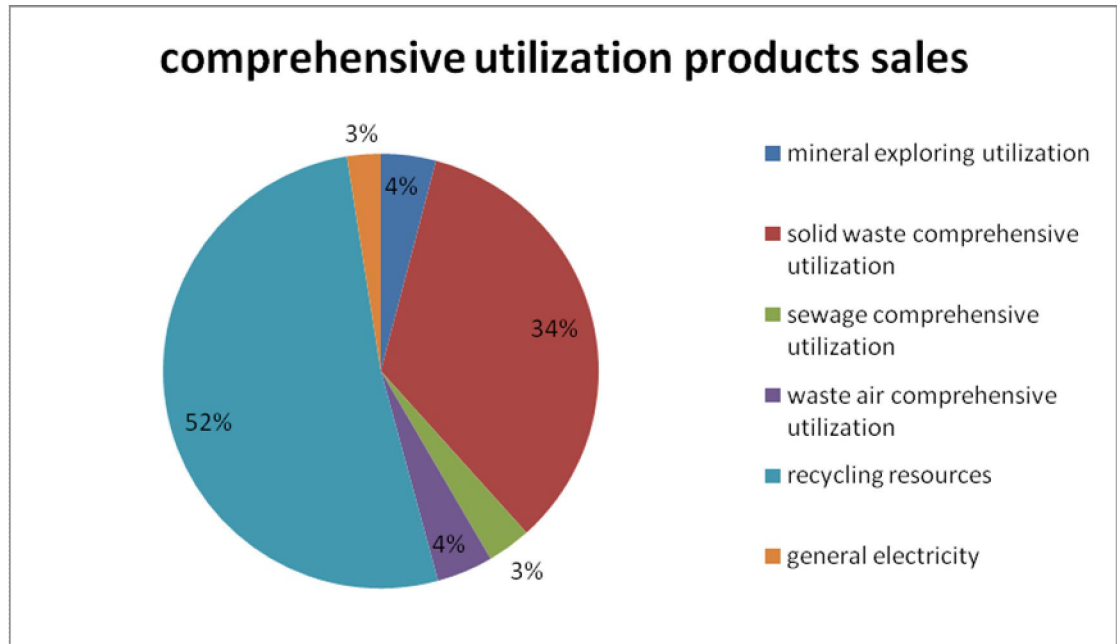
Without any doubts, China is the largest greenhouse gas emitter in the world because of it attracted many international manufacturing companies to set factories around the countryside and urban areas; on the other hand, there are lots of small-size labor-intensive enterprises doing exporting business with manufacturing low level technique products for oversea companies, the two reasons caused the heavy environmental pollution issues.

TABLE6. Energy intensity of GDP

1980	1990	2000	2010
60%	45%	35%	20%

This is the main target of Chinese government to reduce the energy intensity of GDP from 1980 to 2010. In 1980, the percentage of energy intensity of GDP was over 60%, but Chinese government will set a goal to reduce the percentage of energy intensity of GDP to 20% by 2010.

- Comprehensive utilization of resources

FIGURE3. Comprehensive utilization products sales

Recycling resources is in the most popular sales position, the percentage reached to 52% of total sales revenue. The second popular products are about solid waste comprehensive utilization, which accounts for 34% of total market share.

Comprehensive utilization of resources means reproduce and management those waste

and waste materials, take advantage of solid waste to manufacture new products. It includes: usage of exploring and developing mineral resources; recycle the waste water, gas and other kinds of wasted materials which produced by exploring progress; reclaim those wasted materials produced by consumption and social manufacturing

TABLE7. Three main products in comprehensive utilization sales market in 2005

	total revenue (billion RMB)	profits (billion RMB)
source recycling usage	2886,2	223,4
solid waste usage	910	65,9
recycling materials	1386,6	81,2

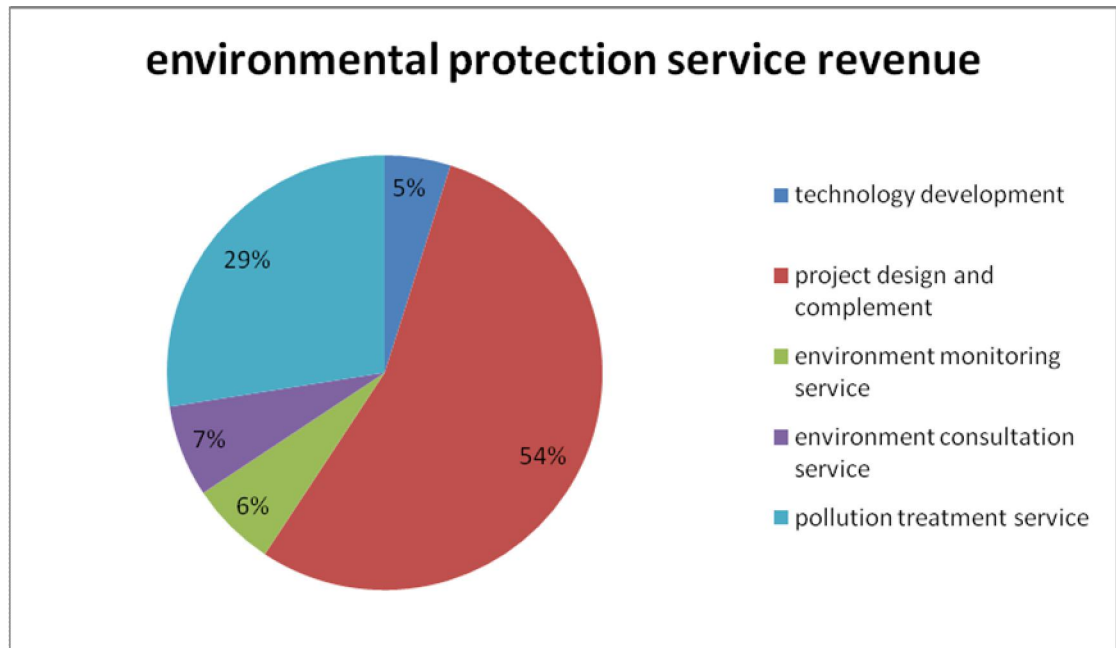
TABLE8. Comprehensive utilization sales in 2008

	total revenue (billion RMB)	profits (billion RMB)
source recycling usage	5772	461,76
solid waste usage	1365	98,28
recycling materials	4159,8	214,3

(Source: <http://www.sciencedirect.com/science>)

Source recycling usage, solid waste usage and recycling materials have been experiencing the growth process from 2005 to 2008, and source recycling usage has the fast growth step. Source recycling usage and recycling materials could be considered as the main business point for comprehensive utilization resources products.

- Environmental protection service

FIGURE4. Environment protection service revenue

Environmental protection service means that business activities which are related to environment protection. It includes environmental technology and development, environmental project designing and establishment, environmental monitoring system, environmental consultation, pollution treatment, environmental business and financial service and so on.

(http://www.forbes.com/prnewswire/feeds/prnewswire/2008/08/04/prnewswire200808041402PR_NEWS_USPR_CN033.html)

Project design and complement is topped the first place in the whole sales situation, the percentage makes up 54% of total revenue. Pollution treatment service is the second popular business area when it comes to the environmental protection service, the percentage is 29%.

4.3 Hot area for environmental protection industry



(<http://www.warriortours.com/images/map/chinamap.gif>)

In order to get better known about Chinese market, it is necessary to identify the main areas which have the best potential development power for environmental protection industry. In China, there are three important economic districts which has been more rapid in economic development process, they are: Pearl River Delta, which is located in the southeast coast; Lower Yangtze River, which lies in the east coast, south part of China; Bohai Gulf, north and northeast part of China. Guangdong, Jiangsu, Zhejiang, Shanghai and Beijing are the core cities and province for those districts respectively.

TABLE9. The overview of environmental protection distribution in different area in China

City and districts	unites	employees	revenue/year billion
Country as a whole	11623	1594765	4572.1
beijing	193	29787	71.8
tianjin	228	31234	84.4
shanghai	353	32635	165.8
Chongqing	351	41663	83.0
hebei	461	68423	89.9
shanxi	487	68714	88.1
neimenggu	74	17531	9.8
liaoning	513	66463	246.2
jilin	226	26004	42.0
heilongjiang	151	18877	18.9
jiangsu	1555	203913	1016.5
zhejiang	1507	159719	644.0
anhui	316	53285	144.4
fujian	569	54368	163.1
jiangxi	121	21404	35.6
shandong	789	161250	345.3
henan	373	66160	160.0
Hubei	320	43969	120.9
hunan	390	45727	60.9
guangdong	943	124530	511.0
guangxi	288	41120	86.6
sichuan	362	72185	129.1

guizhou	171	27974	105.0
yunnan	481	59117	77.8
shanxi	162	26969	34.2
gansu	69	16778	18.1
qinghai	18	337	0.3
xinjiang	69	6698	8.7
nainan	38	1699	3.5
ningxia	43	6196	6.8
xizang	2	36	0.1

(<http://www.epa.gov.tw/en/>)

It is obvious that there are 4 areas have a great amount number of enterprises and employees in environment protection, Beijing, Shanghai, Jiangsu province, Zhejiang province and Guangdong province, as I have wrote from the above information, all of them are located in the wealthiest area in China. They attracted the most foreign investment and also had got a successful experience for running private and corporate owned business. The statistic information was submitted in 2005, if we go back to look at the beginning of this chapter, in 2006, the total number of companies and employees will be almost increased twice.

However, as everything have two sides, when these developed areas experience the fast economic growth progress, the environmental problems has cause many series affection. Alost every year, flooding, earthquake and other kind of natural disaster will happen in those areas, it is the direct affection comes from the environmental issues. These four areas will be the most important environment protection markets at the present and in the future. Corporations whose products or production progress will bring the pollution to the environment must take advantage environmental protection skills or technologies to reduce the potential threats to the environment. In that case, they are going to add expenditure to purchase the environmental protection products,

as well as improve the production technology to save energy, decrease the pollution emission.

TABLE10. GDP overview

Rank	Administrative Division	GDP (in million RMB
	China	20,940,700
1	Guangdong	2,596,855
2	Shandong	2,184,670
3	Jiangsu	2,154,836
4	Zhejiang	1,564,893
5	Henan	1,246,409
6	Hebei	1,161,370
7	Shanghai	1,029,697
8	Liaoning	925,705
9	Sichuan	863,780
10	Beijing	772,030
11	Fujian	750,163
12	Hubei	749,717
13	Hunan	749,317
14	Heilongjiang	621,680
15	Anhui	614,190
16	Guangxi	480,198
17	Inner Mongolia	479,000
18	Shanxi	474,650
19	Jiangxi	461,877
20	Shanxi	438,391
21	Tianjin	433,773
22	Jilin	424,923
23	Yunnan	400,187

24	Chongqing	348,620
25	Xinjiang	301,898
26	Gansu	227,500
27	Guizhou	226,743
28	Hainan	105,243
29	Ningxia	70,698
30	Qinghai	64,105
31	Tibet	29,005

(source:http://en.wikipedia.org/wiki/List_of_Chinese_administrative_divisions_by_GDP)

TABLE11. GDP per capital

Rank	Province	GDP/capital in USD
1	Shanghai	16,444
2	Beijing	14,349
3	Tianjin	11,873
4	Zhejiang	9,184
5	Jiangsu	8,314
6	Guangdong	8,138
7	Shandong	6,825
8	Liaoning	6,319
9	Fujian	6,131
10	Inner Mongolia	5,811
11	Hebei	4,897
12	Heilongjiang	4,715
13	Jilin	4,529
14	Xinjiang	4,310
15	Shanxi	4,089

16	Henan	3,849
17	Hubei	3,817
18	Hainan	3,667
19	Chongqing	3,605
20	Hunan	3,429
21	Ningxia	3,416
22	Shanxi	3,409
23	Qinghai	3,407
24	Jiangxi	3,095
25	Sichuan	3,065
26	Tibet	3,013
27	Guangxi	2,968
28	Anhui	2,911
29	Yunnan	2,597
30	Gansu	2,536
31	Guizhou	1,667

(source:http://en.wikipedia.org/wiki/List_of_Chinese_administrative_divisions_by_GDP_per_capita)

Compare the above two tables, there are six places could be the hot area for the environment protection industry market, and it also could have a huge market growth space for environmental protection industry. Those six places are: **Beijing, Shanghai, Shandong province, Zhejiang province, Jiangsu province and Guangdong province.**

Reasons for environmental business:

- They are in the top ten list of GDP growth and also have a great amount of GDP/capital, that means those areas have a strong economic power to develop

environmental protection.

- They have many environmental protection units which indicated that the environmental issues are being more and more serious.
- Those provinces and cities attracted more than 50% foreign investment and companies, manufacturing factories, as well as much local small and middle size labor-intensive business, now it turns to be that the environmental problems are becoming the most serious crisis which threatens the people's health and living standard.
- At present, Chinese government national policies are putting mainly in how to keep maintain development in order to find a balance of boom economy growth and protect the environment at the same time, in this case, those areas will be the vital area for carry out this campaign.

5 Investment mode and market entry strategy

5.1 Investment mode

Chinese government has spent 474, 42 billion RMB during the 7th five-year plan. After five years, the total investment was 1306, 57 which were twice times than that in the 7th five year plan. Now the investment will be spent in environmental protection industry more than 7000 billion RMB. Cause the percentage is being increased every year, in 2007, the proportion of investment in environmental protection was 1, 4% of total GDP. However, compare to developed countries, the amount of environmental investment is still a small number; there is a big gap between the demanding of environmental control pollution and improving the quality of environment. Consequence, the investment and operating are still needed to be enlarged.

Now the main investment points are:

- Water pollution treatment
- Air pollution treatment

- Solid waste treatment
- Nuclear safety and treatment
- Rural pollution control and ecological conservation
- Capacity building

Investment mode:

BOT: The build-operate-transfer (BOT) / design-build-operate-maintain (DBOM) model is an integrated partnership that combines the design and construction responsibilities of design-build procurements with operations and maintenance. These integrated PPPs transfer design, construction, and operation of a single facility or group of assets to a private sector partner. This project delivery approach is practiced by several governments around the world and is known by a number of different names, including "turnkey" procurement, BOT, and DBOM. (<http://www.fhwa.dot.gov/PPP/bot.htm>)

BOT is the most popular investment mode in china when it comes to the environmental protection industry. The BOT method can lead Chinese government to introduce the foreign capital, equipment and advanced technology to the construction of those investment points.

The character of BOT

- Debt repayment depends on the revenue from projects
- The contractors are allowed to have the right to operate and the permission to have projects only by their own within a time limitation.
- The contractors will afford the whole risks, so the financing cost is very high
- Compare to the traditional investment, the rate of designing projects and operating is most fast, so the customers can get a high quality of service.
- The local currency is the one way as the revenue, for the host countries, if the contractors are from other countries, there will be a large amount of exchange

enters the other countries.

- The contractors don't need to explore the personal finance situation.

From the characteristics, it is easy to find that the main issue of BOT is the investment return. During the past time, the government would promise fixed paybacks; for investors, they can obtain stable and higher paybacks. However, with the financial market is playing the more and more role in investment method, the government cannot guarantee a fixed paybacks anymore- On the other hand, contractors must take advantage of a flexible negotiation strategies in BOT projects. Therefore, for investors, the biggest risk is come from the government policy decisions. By now, Chinese government has not taken any regulations or polices in BOT item, so the important factor to measure the total investment risk is the government's commitment. When the private investors intend to sign a contract, they are required to concentrate more on the conditions and pricing in BOT negotiations.

Joint Venture: is an entity formed between two or more parties to undertake economic activity together. The parties agree to create a new entity by both contributing equity, and they then share in the revenues, expenses, and control of the enterprise. The venture can be for one specific project only, or a continuing business relationship such as the Sony Ericsson joint venture. This is in contrast to a strategic alliance, which involves no equity stake by the participants, and is a much less rigid arrangement.

(http://en.wikipedia.org/wiki/Joint_venture)

According to the national polices, the joint venture is very common for investors who are going to invest in China. It is forbidden to open a business like water pollution treatment only by one foreign company; it usually needs to find a Chinese partner to control the operation and marketing together. Under this condition, joint ventures provide a proper method for foreign investors to enter the environmental protection market, moreover, local companies are good partners, they will be helpful to

understand the local culture, local consumer behavior; furthermore, cause the local business always have a good relationship with government, it can save time and money to build factories and offices.

5.2 Market entry strategy

- (1) Technology and equipment export. For foreign companies, technology and equipment export is the most accessible and acceptable investment strategy to adopt. It will not take long-term period, don't have to buy land for building manufacturing factories and headquarters, save fixed cost; they can undertake B2B e-commerce to find potential or exist customers who will be enterprises.
- (2) Local agents/distributor. This entry method is fit for those foreign companies which are going to have first investment in China market. Local agents/distributors will help to better understand the local surrounding, include the local government policies, regulations and relevant laws; 'investors don't have to find and explore distribution channel by them self, and also can combine the local brand to enter the market. Beijing, Shanghai and Guangzhou could be first investment place for establishing the basic entry points.
- (3) Representative office: they are the simplest way to build offices for foreign firms. But those offices don't have right to sign sales contracts or directly delivery the bill to customers or supply parts; they also can not charge for after sales service. Setting up representative offices can make a company increase the control power of the sales and permits greater utilization of its specialized technical expertise.

5.3 Potential customers

Municipal End-users

In the environmental protection market, local governments and state -owned enterprises will be the main end customers. According to the 11th five year plan different local government will try their best to pay more attention in those kinds of

pollution issues, like waste water treatment, air pollution and solid pollution treatment and control. They will also need to make budget to buy or introduce many new kinds of environmental protection technology and products to finish the goals.

Industrial end users

1) state-owned enterprises/Government owned corporations

According to the new national policies, enterprises that have a heavy pollution manufacturing factories must have to pay much more attention in pollution treatment, such as paper-making, printing, steel and petrochemical industry, they are asked to have their own waste water, solid treatment system and treat plants. Those companies are the main customers for environmental protection products, for example, waste water treatment, air pollution treatment and solid waste treatment. State owned companies and middle-size enterprises always take the environmental policies seriously, they are willing to keep their production process in a good condition and advanced environment, in that case they will be the potential customers for environmental protection service, environmental protection products and cleaning products.

2) Private enterprises

When consider about the quality and safety of products, those private enterprises also will take environmental protection seriously. Lots of companies have a good financial system so that they can have ability to update their production process to keep high energy efficiency and clean. They will require all kinds of environmental protection services, production, cleaning products and environmental protection project design to save production cost and improve the production activity. On the other hand, they are enforced to change the old production system, in order to save energy, keep the resources conservation.

6 Conclusion

Without any doubts, environmental protection industry is considered as the most important part of the economy development. Our country has made a great progress in environmental and ecological protection. Government enhanced the ability to deal with industrial pollutants, recognized the vital environmental issues, gradually improved laws and statutes concerning. After years practice, China has formed an industrial system of environmental protection. It contains a basically complete category and certain economic scale, as well as a series of considerable progress in the production of environmental products and related services, clean products and comprehensive utilization of resources. As I have mentioned from the beginning part, there are 11,623 enterprises working in environmental protection industry, each with an annual sales income of more than 2 million yuan, they employed about 1,595 million workers. The entire industry generated 457.21 billion yuan in revenue and 39.39 billion yuan in profits.

Environmental protection industry has been being grown year by year with a huge market space and a great supporting from central government. Around the main three environmental issues, water pollution, air pollution and solid waste treatment can provide many commercial opportunities to those investors.

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China Waste Management: Working Paper for Streams Technology Programme, published on 17.05.2004, referred to 04.04.2008. http://akseli.tekes.fi/opencms/opencms/OhjelmaPortaali/ohjelmat/Streams/fi/Dokumenttiarkisto/Viestinta_ja_aktivointi/Julkaisut/Kansainvaliset_selvitykset/S24045_Waste_Management_Review.pdf

APPENDICES

Appendix1.

Trade events

1 EPTEE The china EPTEE show is organized by the Chinese society for environmental sciences and shanghai ZM international exhibition Co Ltd. It has been held annually in Shanghai since 1999. The exhibition has become the most highly attended and most influential show in china.

China EPTEE show 2009, for water, air, waste, energy and recycling

April 28-30 2009 Shanghai Mart & Index Shanghai, China

www.eptee.com

the 10th china EPTEE show for water, air, waste, energy and recycling is the leading environmental exhibition in china regarding water treatment, air protection, waste treatment, energy and recycling, which offers complete solutions for environmental and energy problems in Asia.

2. IFAT China is the trade fair in Asia covering an extensive range of practice solutions in the areas of water supply, sewage, waste disposal, recycling, air pollution control, environmental technology and natural energy sources. The exhibition offers an effective business and networking platform for Chinese and international professionals in the environmental sector and is accompanied by a first-class technical –scientific conference program. IFTA CHINA 2006 attracted 234 exhibitors from 25 countries, and approximately 10,000 visitors from 66 countries. The 3rd international trade fair for water, sewage, refuse, recycling and natural energy sources is taking place at the shanghai new international Expo center in china from 23-25 Sep 2008.

Organizers: **Messe München GmbH**

IFAT CHINA Exhibition Management

Messegelände

81823 München, Germany

Tel.: (+49 89) 949-20284

Fax: (+49 89) 949-20289

info@ifat-china.com

Association of sources comprehensive utilization of China

Address: Xizhimen North street, 52, 1106, Haidian district Beijing, China

Tel: 008610 85841055 82298839 82298547-839

Fax: 0086 10 51413308

www.carcu.org

ifat2008@126.com

3. CIEPEC-China international environmental protection exhibition and conference, is a biennial event, sponsored by the Ministry of Environmental Protection and organized by china Association of Environmental industry. CIEPEC has been successfully held since 1986. It is the most influential environmental exhibition in china with the largest scale, and widely recognized by domestic and overseas professionals. Famed as the best gateway to understand and enter into the Chinese market, CIEPEC builds a bridge for domestic and overseas professionals, suppliers and users to meet each other.

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Address: Room 2A, Tower A, Beijing Science & Technology Convention Center,
No.48 North Third Ring West Road,Haidian District, Beijing, P.R.China

Post Code: 100086

Appendix2.

Information of the main environmental protection industry companies

Tianjin Capital Environmental Protection Company. Ltd

No.45 Guizhou Road, Heping District, Tianjin, China

Tel: +86 8522803-2373

URL: <http://www.ticep.com>

Wuhan Kaidi holding Investment Co, Ltd

No1. Jiangxia Road Donghu hi-tech and economic development area, Wuhan, Hubei province.

Tel: +86 27 67869001

<http://www.china-kaidi.com/konggu/konggu/index.htm>

Beijing Capital Group Co., Ltd

Address: 15/F, Capital Group Plaza, No.6 Chaoyangmen North Street,

Dongcheng District Beijing, China

Tel: 0086 10 58385566

Fax: 0086 10 58383050

Information Management Department master@bjcapital.com

Eguard Resources Development Co. Ltd

Directorate Office:

Address: 17th floor, Zhonghuan Square, No18 Xiling one Road, Yichang City, Hubei Province, China

Postcode: 443000

Tel: 86-717-6918566

Fax: 86-7176918783

Email:000826@eguard-rd.com

Headquarter (Beijing Office):

Address:Jinqiao Science Industrial Park, Majuqiao, Tongzhou District, Beijing, China

Postcode: 101102

Tel: 86-10-60504191, 60504756

Fax: 86-10-60504028

Email:market@eguard-rd.com

Appendix3.

People Republic of China environmental protection policies

This English document is coming from the "LAWS AND REGULATIONS OF THE PEOPLE'S REPUBLIC OF CHINA GOVERNING FOREIGN-RELATED MATTERS" (1991.7) which is compiled by the Brueau of Legislative Affairs of the State Council of the People's Republic of China, and is published by the China Legal System Publishing House. In case of discrepancy, the original version in Chinese shall prevail. Whole Document (法规全文) ENVIRONMENTAL PROTECTION LAW OF THE PEOPLE'S REPUBLIC OF CHINA (Adopted at the 11th Meeting of the Standing Committee of the Seventh National People's Congress on December 26, 1989, promulgated by Order No. 22 of the President of the People's Republic of China on December 26, 1989, and effective on the date of promulgation)

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Chapter I General Provisions

Chapter II Supervision and Management of the Environment

Chapter III Protection and Improvement of the Environment

Chapter IV Prevention and Control of Environmental Pollution and Other Public Hazards

Chapter V Legal Liability

Chapter VI Supplementary Provisions

Chapter I General Provisions

Article 1

This Law is formulated for the purpose of protecting and improving people's environment and the ecological environment, preventing and controlling pollution and other public hazards, safeguarding human health and facilitating the development of socialist modernization.

Article 2

"Environment" as used in this Law refers to the total body of all natural elements and artificially transformed natural elements affecting human existence and development, which includes the atmosphere, water, seas, land, minerals, forests, grasslands, wildlife, natural and human remains, nature reserves, historic sites and scenic spots, and urban and rural areas.

Article 3

This Law shall apply to the territory of the People's Republic of China and other sea areas under the jurisdiction of the People's Republic of China.

Article 4

The plans for environmental protection formulated by the state must be incorporated into the national economic and social development plans; the state shall adopt economic and technological policies and measures favourable for environmental protection so as to coordinate the work of environmental

protection with economic construction and social development.

Article 5

The state shall encourage the development of education in the science of environmental protection, strengthen the study and development of the science and technology of environmental protection, raise the scientific and technological level of environmental protection and popularize scientific knowledge of environmental protection.

Article 6

All units and individuals shall have the obligation to protect the environment and shall have the right to report on or file charges against units or individuals that cause pollution or damage to the environment.

Article 7

The competent department of environmental protection administration under the State Council shall conduct unified supervision and management of the environmental protection work throughout the country. The competent departments of environmental protection administration of the local people's governments at or above the county level shall conduct unified supervision and management of the environmental protection work within areas under their jurisdiction. The state administrative department of marine affairs, the harbour superintendency administration, the fisheries administration and fishing harbour superintendency agencies, the environmental protection department of the armed forces and the administrative departments of public security, transportation, railways and civil aviation at various levels shall, in accordance with the provisions of relevant laws, conduct supervision and management of the prevention and control of environmental pollution. The competent administrative departments of land, minerals, forestry, agriculture and water conservancy of the people's governments at or above the county level shall, in accordance with the provisions of relevant laws, conduct supervision and management of the protection of natural resources.

Article 8

The people's government shall give awards to units and individuals that have made outstanding achievements in protecting and improving the environment.

Chapter II Supervision and Management of the Environment

Article 9

The competent department of environmental protection administration under the State Council shall establish the national standards for environment quality. The people's governments of provinces, autonomous regions and municipalities directly under the Central Government may establish their local standards for environment quality for items not specified in the national standards for environment quality and shall report them to the competent department of environmental protection administration under the State Council for the record.

Article 10

The competent department of environmental protection administration under the State Council shall, in accordance with the national standards for environment quality and the country's economic and technological conditions, establish the national standards for the discharge of pollutants. The people's governments of provinces, autonomous regions and municipalities directly under the Central Government may establish their local standards for the discharge of pollutants for items not specified in the national standards; with regard to items already specified in the national standards, they may set local standards which are more stringent than the national standards and report the same to the competent department of environmental protection administration under the State Council for the record. Units that discharge pollutants in areas where the local standards for the discharge of pollutants have been established shall observe such local standards.

Article 11

The competent department of environmental protection administration under the State Council shall establish a monitoring system, formulate the monitoring norm and, in conjunction with relevant departments, organize a monitoring network and strengthen the management of environmental monitoring. The competent departments of environmental protection administration under the State Council and governments of provinces, autonomous regions and municipalities directly under the Central Government shall regularly issue bulletins on environmental situations.

Article 12

The competent departments of environmental protection administration of the people's governments at or above the county level shall, in conjunction with relevant departments, make an investigation and an assessment of the environmental situation within areas under their jurisdiction, draw up plans for environmental protection which shall, subject to overall balancing by the department of planning, be submitted to the people's government at the same level for approval before implementation.

Article 13

Units constructing projects that cause pollution to the environment must observe the state provisions concerning environmental protection for such construction projects. The environmental impact statement on a construction project must assess the pollution the projects is likely to produce and its

impact on the environment and stipulate the preventive and curative measures; the statement shall, after initial examination by the authorities in charge of the construction project, be submitted by specified procedure to the competent department of environmental protection administration for approval. The department of planning shall

not ratify the design plan descriptions of the construction project until after the environmental impact statement on the construction project is approved.

Article 14

The competent departments of environmental protection administration of the people's governments at or above the county level or other departments invested by law with power to conduct environmental supervision and management shall be empowered to make on-site inspections of units under their jurisdiction that discharge pollutants. The units being inspected shall truthfully report the situation to them and provide them with the necessary information. The inspecting authorities shall keep confidential the technological know-how and business secrets of the units inspected.

Article 15

Work for the prevention and control of the environmental pollution and damage that involve various administrative areas shall be conducted by the relevant local people's governments through negotiation, or by decision of the people's government at a higher level through mediation.

Chapter III Protection and Improvement of the Environment

Article 16

The local people's governments at various levels shall be responsible for the environment quality of areas under their jurisdiction and take measures to improve the environment quality.

Article 17

The people's governments at various levels shall take measures to protect regions representing various types of natural ecological systems, regions with a natural distribution of rare and endangered wild animals and plants, regions where major sources of water are conserved, geological structures of major scientific and cultural value, famous regions where karst caves and fossil deposits are distributed, traces of glaciers, volcanos and hot springs, traces of human history, and ancient and precious trees. Damage to the above shall be strictly forbidden.

Article 18

Within the scenic spots or historic sites, nature reserves and other zones that need special protection, as designated by the State Council, the relevant competent department under the State Council, and the people's governments of provinces, autonomous regions and municipalities directly under the Central Government, no industrial production installations that cause environmental pollution shall be built; other installations to be built in these areas must not exceed the prescribed standards for the discharge of pollutants. If the installations that have been built discharge more pollutants than are specified by the prescribed discharge standards, such pollution shall be eliminated or controlled within a prescribed period of time.

Article 19

Measures must be taken to protect the ecological environment while natural resources are being developed or utilized.

Article 20

The people's governments at various levels shall provide better protection for the agricultural environment by preventing and controlling soil pollution, the desertification and alkalization of land, the impoverishment of soil, the deterioration of land into marshes, earth subsidence, the damage of vegetation, soil erosion, the drying up of sources of water, the extinction of species and the occurrence and development of other ecological imbalances, by extending the scale of a comprehensive prevention and control of plant diseases and insect pests, and by promoting a rational application of chemical fertilizers, pesticides and plant growth hormone.

Article 21

The State Council and the people's governments at various levels in coastal areas shall provide better protection for the marine environment. The discharge of pollutants and the dumping of wastes into the seas, the construction of coastal projects, and the exploration and exploitation of offshore oil must be conducted in compliance with legal provisions so as to guard against the pollution and damage of the marine environment.

Article 22

The targets and tasks for protecting and improving the environment shall be defined in urban planning.

Article 23

In urban and rural construction, vegetation, waters and the natural landscape shall be protected and attention paid to the construction of gardens, green land and historic sites and scenic spots in the cities in the light of the special features of the local natural environment.

Chapter IV Prevention and Control of Environmental Pollution and Other Public Hazards

Article 24

Units that cause environmental pollution and other public hazards shall incorporate the work of environmental protection into their plans and establish a responsibility system for environmental protection, and must adopt effective measures to prevent and control the pollution and harms caused to the environment by waste gas, waste water, waste residues, dust, malodorous gases, radioactive substances, noise, vibration and electromagnetic radiation generated in the course of production, construction or other activities.

Article 25

For the technological transformation of newly-built industrial enterprises and existing industrial enterprises, facilities and processes that effect a high rate of the utilization of resources and a low rate of the discharge of pollutants shall be used, along with economical and rational technology for the comprehensive utilization of waste materials and the treatment of pollutants.

Article 26

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. No permission shall be given for a construction project to be commissioned or used, until its installations for the prevention and control of pollution are examined and considered up to the standard by the competent department of environmental protection administration that examined and approved the environmental impact statement. Installations for the prevention and control of pollution shall not be dismantled or left idle without authorization. If it is really necessary to dismantle such installations or leave them idle, prior approval shall be obtained from the competent department of environmental protection administration in the locality.

Article 27

Enterprises and institutions discharging pollutants must report to and register with the relevant authorities in accordance with the provisions of the competent department of environmental protection administration under the State Council.

Article 28

Enterprises and institutions discharging pollutants in excess of the prescribed national or local discharge standards shall pay a fee for excessive discharge according to state provisions and shall assume responsibility for eliminating and controlling the pollution. The provisions of the Law on Prevention and Control of Water Pollution shall be complied with where they are applicable. The income derived from the fee levied for the excessive discharge of pollutants must be used for the prevention and control of pollution and shall not be appropriated for other purposes. The specific measures thereof shall be prescribed by the State Council.

Article 29

If an enterprise or institution has caused severe environmental pollution, it shall be required to eliminate and control the pollution within a certain period of time. For enterprises and institutions directly under the jurisdiction of the Central Government or the people's government of a province, an autonomous region, or a municipality directly under the Central Government, the decision on a deadline for the elimination or control of pollution shall be made by the people's government of the province, autonomous region and the municipality directly under the Central Government. For enterprises and institutions under the jurisdiction of a people's government at or below the city or county level, such decision shall be made by the people's government of the city or county. Such enterprises and institutions shall accomplish the elimination or control of pollution within the specified period of time.

Article 30

A ban shall be imposed on the importation of any technology or facility that fails to meet the requirements specified in the regulations of our country concerning environmental protection.

Article 31

Any unit that, as a result of an accident or any other exigency, has caused or threatens to cause an accident of pollution, must promptly take measures to prevent and control the pollution hazards, make the situation known to such units and inhabitants as are likely to be endangered by such hazards, report the case to the competent department of environmental protection administration of the locality and the departments concerned and accept their investigation and decision. Enterprises and institutions that are likely to cause severe pollution accidents shall adopt measures for effective prevention.

Article 32

If the safety of the lives and property of inhabitants is endangered by severe environmental pollution, the competent department of environmental protection administration of the local people's government at or above the county level must promptly report to the local people's government. The people's government concerned shall take effective measures to remove or alleviate the hazard.

Article 33

The production, storage, transportation, sale and use of toxic chemicals and materials containing radioactive substances must comply with the relevant state provisions so as to prevent environmental

pollution.

Article 34

No unit shall be permitted to transfer a production facility that causes severe pollution for use by a unit that is unable to prevent and control pollution. Chapter V Legal Liability

Article 35

Any violator of this Law shall, according to the circumstances of the case, be warned or fined by the competent department of environmental protection administration or another department invested by law with power to conduct environmental supervision and management for any of the following acts:

- (1) refusing an on-site inspection by the competent department of environmental protection administration or another department invested by law with power to conduct environmental supervision and management, or resorting to trickery and fraud while undergoing inspection;
- (2) refusing to report or submitting a false report on items for which declaration is required by the competent department of environmental protection administration under the State Council;
- (3) failing to pay, as provided for by the state, the fee for the excessive discharge of pollutants;
- (4) importing technology or a facility that fails to meet the requirements specified in the state provisions concerning environmental protection; or
- (5) transferring a production facility that causes severe pollution for use by a unit that is unable to prevent and control pollution.

Article 36

When a construction project is commissioned or put to use in circumstances where facilities for the prevention and control of pollution either have not been completed or fail to meet the requirements specified in state provisions, the competent department of environmental protection administration responsible for the approval of the environmental impact statement on the construction project shall order the suspension of its operations or use and may concurrently impose a fine.

Article 37

A unit which dismantles or leaves idle the installations for the prevention and control of pollution without prior approval by the competent department of environmental protection administration, thereby discharging pollutants in excess of the prescribed discharge standards, shall be ordered by the competent department of environmental protection administration to set up the installations or put them to use again, and shall concurrently be fined.

Article 38

An enterprise or institution which violates this Law, thereby causing an environmental pollution accident, shall be fined by the competent department of environmental protection administration or another department invested by law with power to conduct environmental supervision and management in accordance with the consequent damage; in a serious case, the persons responsible shall be subject to administrative sanction by the unit to which they belong or by the competent department of the government.

Article 39

An enterprise or institution that has failed to eliminate or control pollution by the deadline as required shall, as provided for by the state, pay a fee for excessive discharge; in addition, a fine may be imposed on it on the basis of the damage incurred, or the enterprise or institution may be ordered to suspend its operations or close down. The fine as specified in the preceding paragraph shall be decided by the competent department of environmental protection administration. An order for the suspension of operations or shut-down of an enterprise or institution shall be issued by the people's government that set the deadline for the

elimination or control of pollution. An order for the suspension of operations or shut-down of an enterprise or institution directly under the jurisdiction of the Central Government shall be submitted to and approved by the State Council.

Article 40

A party refusing to accept the decision on administrative sanction may, within 15 days of receiving the notification on such a decision, apply for reconsideration to the department next higher to the authorities that imposed the sanction; if the party refuses to accept the decision of reconsideration, it may, within 15 days of receiving the reconsideration decision, bring a suit before a people's court. A party may also bring a suit directly before a people's court within 15 days of receiving the notification on the sanction. If, upon the expiration of this period, the party has not applied for reconsideration or has neither brought a suit before a people's court nor complied with the sanction, the authorities that imposed the sanction may apply to the people's court for compulsory enforcement.

Article 41

A unit that has caused an environmental pollution hazard shall have the obligation to eliminate it and make compensation to the unit or individual that suffered direct losses. A dispute over the liability to make compensation or the amount of compensation may, at the request of the parties, be settled by the competent department of environmental protection administration or another department invested by

law with power to conduct environmental supervision and management. If a party refuses to accept the decision on the settlement, it may bring a suit before a people's court. The party may also directly bring a suit before the people's court. If environmental pollution losses result solely from irresistible natural disasters which cannot be averted even after the prompt adoption of reasonable measures, the party concerned shall be exempted from liability.

Article 42

The limitation period for prosecution with respect to compensation for environmental pollution losses shall be three years, counted from the time when the party becomes aware of or should become aware of the pollution losses.

Article 43

If a violation of this Law causes a serious environmental pollution accident, leading to the grave consequences of heavy losses of public or private property or human injuries or deaths of persons, the persons directly responsible for such an accident shall be investigated for criminal responsibility according to law.

Article 44

Whoever, in violation of this Law, causes damage to natural resources like land, forests, grasslands, water, minerals, fish, wild animals and wild plants shall bear legal liability in accordance with the provisions of relevant laws.

Article 45

Any person conducting supervision and management of environmental protection who abuses his power, neglects his duty or engages in malpractices for personal gains shall be given administrative sanction by the unit to which he belongs or the competent higher authorities; if his act constitutes a crime, he shall be investigated for criminal responsibility according to law.

Chapter VI Supplementary Provisions

Article 46

If an international treaty regarding environmental protection concluded or acceded to by the People's Republic of China contains provisions differing from those contained in the laws of the People's Republic of China, the provisions of the international treaty shall apply, unless the provisions are ones on which the People's Republic of China has announced reservations.

Article 47

This Law shall enter into force on the date of promulgation. The Environmental Protection Law of the People's Republic of China (for Trial Implementation) shall be abrogated therefrom.