Chapter 1
Water Environment Protection Management and Integrated Governance Policies in China

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1. Background: Environmental Problems in China

With its extraordinary economic development during the last thirty years, China has entered a new era of prosperity. However, China has not had adequate time to solve new problems caused by the high speed of economic development, such as those related to well-being, social security, property distribution and environmental pollution.

Exacerbated by the industrial and urbanization boom, environmental pollution became increasingly serious starting in the 1980s. However, ordinary people were unaware of the pollution since they had no previous experience with it, and there was little communication concerning it between China and developed counties. Also, initially, there was little accumulation of pollution, and the natural environment still had self-cleaning capability. At that time, wastewater and solid waste were the two main pollutants due to the large amount of primary industries.

In the 1990s, many small-size enterprises (SSEs) were established in rural areas in China. During this decade, the country tried to increase the national wealth rather than address other problems. SSEs contributed greatly to property increase, but they were not adequately regulated. The pollution sources were small and dispersed, and the pollutants increased in quantity and complexity as industry developed. Laws, regulations and governance rules began to be introduced into China late in this decade. Wastewater from textile and dyeing factories, papermaking factories and chemical factories in eastern and southern China exerted heavy pressure on the water environment.

Since 2000, both the country and the public have placed increasing emphasis on the pollution problem. Environmental problems have become a major barrier to China's economic development, human well-being, quality of life and public health. Increasingly tough policies on environmental governance were released, and the damage has slowed in recent years. However, in the past 10 years, pollutants have become all the more complex and include heavy metals, organic waste, soil

contamination, T-N, T-P and exhaust gas from vehicles.

Compared to traditional social problems, environmental problems are a very new issue in China, with only a 30-year history. Although there is a primary governance framework that provides various protections, it is still a huge challenge for China to reduce and halt environmental pollution, especially given such a high speed of economic development.

2. Water Environment Protection Management System

Water is essential to human life, and so the contamination of water is a cause for serious concern, making it the pollution issue the most focused upon in China. For water pollution treatment, the Chinese government has established a series of policies and regulations.

2.1 Water Contamination in China

Wastewater and the main pollutants[1]

In 2008, the total wastewater discharge was 57.17 billion tons per year, of which industry wastewater was 24.17 billion tons. In terms of quantity, wastewater from industry has started to decrease in recent years, while domestic wastewater has continued to increase due to urbanization. COD_{Cr} and NH_3-N are the two main pollution components of wastewater. COD from industrial sources has decreased steadily, while domestic COD discharge increased slightly. The total discharge of COD kept decreasing because the central government set a mandatory requirement for decreasing COD discharge in its 11^{th} 5-Year Plan. NH_3-N from industrial sources decreased significantly because of the construction of wastewater treatment facilities and wastewater pipelines, while NH_3-N from domestic sources is still rising. However, a large source for NH_3-N is agriculture, which is not included in the statistics.

[1] Statistical Yearbook of the Environment 2008.

Table 1. Wastewater and Its Components from 2001 to 2008 (100 million tons)

	Wastewater Discharge			COD_{Cr} Discharge			NH_3-N Discharge		
	Total	**Industrial**	**Domestic**	**Total**	**Industrial**	**Domestic**	**Total**	**Industrial**	**Domestic**
2001	433.0	202.7	230.3	1404.8	607.5	797.3	125.2	41.3	83.9
2002	439.5	207.2	232.3	1366.9	584.0	782.9	128.8	42.1	86.7
2003	460.0	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	133.0	42.2	90.8
2005	524.5	243.1	281.4	1414.2	554.7	859.4	149.8	52.5	97.3
2006	536.8	240.2	296.6	1428.2	542.3	885.9	141.3	42.5	98.8
2007	556.8	246.6	310.2	1381.8	511.0	870.8	132.4	34.1	98.3
2008	571.7	241.7	330.0	1320.7	457.6	863.1	127.0	29.7	97.3

Source: Statistical Yearbook of the Environment 2008.

Water standards

In China, there are water standards which divide the water quality into five grades, from ‘Grade I’ to ‘Grade V’. ‘Grade V-’ is used to designate water quality which even does not reach Grade V. Divided by utilities of the water body, the water grades are calculated by an integrated index table which includes most of the water pollutants and assigns a quotient to each one.

Table 2. The Five Grades of Water Quality in China

Grade	Utility and Protection Target
I	Water source; National Nature Protection Zone
II	Domestic drinking water source (Class I); Rare aquatic biology habitat; Egg-laying site for aquatic life forms; Feeding and preying site for baby fishes
III	Domestic drinking water source (Class II); Hibernation site, migration route and breeding site for aquatic life forms; Swimming site
IV	Water use for industry; Entertainment use where water does not touch the human body
V	Agriculture use; Scenic body of water

Source: Chinese National Standard GB3838-2002.

Water contamination in river systems

In 2009, there were 408 monitoring points in 203 rivers in China. Of these, 57.3% reached the standards of Grade I to Grade III, 24.3% were Grade IV to Grade V, and 18.4% were Grade V-. The main pollutants were COD_{Mn}, BOD_5 and NH_3-N. Of seven major river systems in China, the Pearl River and Yangtze River had good water quality; the Songhua River and Huai River had light contamination; the Yellow River and Liao River had medium contamination; and the Haihe River was badly contaminated.

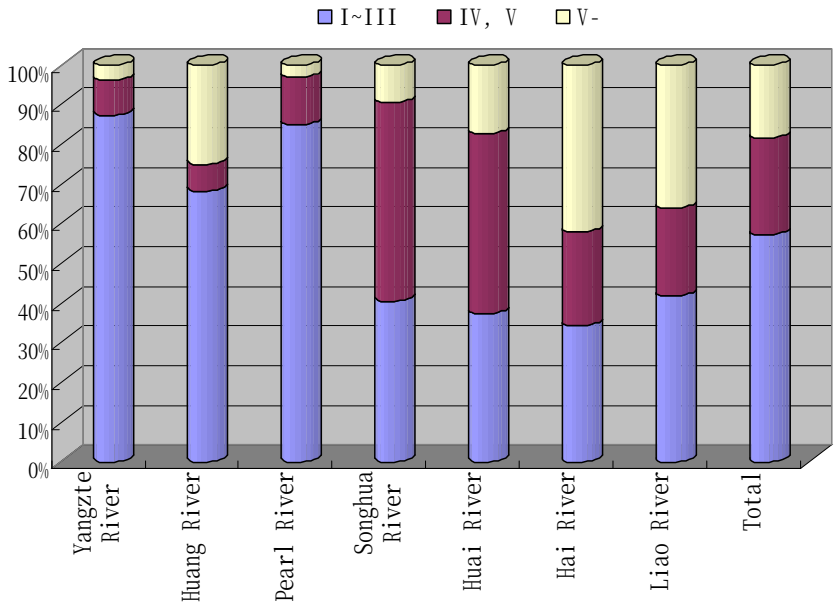

Figure 1. Water Quality in Seven Major River Systems

Source: http://jcs.mep.gov.cn/hjzl/zkgb/2009hjzkgb/201006/t20100603_190435.htm

Water contamination in lakes

There were 26 lakes and reservoirs monitored by the government, and the water quality of the lakes was found to be worse than that of the rivers. The main pollutants in all the lakes are T-N and T-P.

Table 3. Water Quality in Different Types of Lakes

Type	Number	Grade I	Grade II	Grade III	Grade IV	Grade V	Grade V-	Main Pollutants
Three Lakes*	3	0	0	0	0	1	2	T-N, T-P
Large Lakes	9	0	0	3	2	1	3	
City Lakes	5	0	0	0	2	1	2	
Large Reservoirs	9	0	1	2	2	2	2	
Total	26	0	1	5	6	5	9	
Percentage (%)		0	3.9	19.2	23.1	19.2	34.6	

*The Three Lakes are Tai Lake, Dianchi Lake and Chao Lake.

Source: Same as Table 1.

T-N and T-P are the main components of eutrophication. In China, eutrophication is the most serious environmental problem in bodies of water such as lakes. In the chart below, all the lakes are nutritive, and 11 of them are eutrophicated.

2.2 Laws and Regulations

Legal systems

In Article 26 of China's Constitution, environmental protection, ecological conservation and preservation of natural resources are proclaimed as the nation's mission, and this is the basis of all environmental laws and regulations in China.

In 1973, China published its first national environment standard entitled 'Trial Standard for Industrial Discharge of Wastewater, Solid Waste and Waste Gas'. At that time, people believed only industry could cause pollution.

In 1979, the first version of the Environmental Protection Law (provisional) was passed, thereby legalizing environmental governance and authorizing the state council and its environmental protection departments to establish environmental standards and regulations. In 1989, the Environmental Protection Law was formally passed, and this is the fundamental law for China's environmental protection.

Following this fundamental law, the Law of the People's Republic of China on the Prevention and Control of Water Pollution, is the most important law pertaining to

water environment protection. Passed in 1984 and revised in 1996 and 2008, this law stipulates rules for water pollution control with regard to standard setting, planning, monitoring and management, prevention measures for different bodies of water, drinking water source protection, emergency response and legal responsibility.

There are also some other laws related to water protection. The Marine Environmental Protection Law of the People's Republic of China, passed in 1982 and revised in 2000, is a special law pertaining to the marine environment. It regulates marine environment monitoring, marine ecological protection, pollution from land sources, pollution from construction projects, pollution from waste discharge and pollution from watercraft. The Water Law of the People's Republic of China, revised in 2002, was established for water resource management in which water protection is emphasized. The Law of the People's Republic of China on Water and Soil Conservation, passed in 1991 and revised in 2010, focuses on water and soil erosion. The Fisheries Law of the People's Republic of China, twice revised in 2000 and 2004, states in Article 36 that monitoring, management and pollution prevention activities should comply with the rules in the Law of the People's Republic of China on the Prevention and Control of Water Pollution and the Marine Environmental Protection Law of the People's Republic of China.

Regulations

Regulations are issued by the State Council, while laws are passed by China's legislative body, the National People's Congress. The State Council issues regulations based upon the authority granted to it by the Constitution, and regulations include important complementarities, explanations and executive details for the legal system.

The most important regulation related to water environment management is the Rules for Implementation of the Law of the People's Republic of China concerning the Prevention and Control of Water Pollution, passed in 1989 and revised in March 2000. In this regulation, monitoring and management, surface water pollution control and ground water pollution control are explained in detail. This regulation has significance because some general rules are stipulated in it and many new environmental policies were deriving from them.

Other regulations concerned with water environment management:

1) Implementation of the Law of the People's Republic of China on Soil and Water Conservation;

2) Implementation of the Fisheries Law of the People's Republic of China;

3) Implementation of the Law of the People's Republic of China on Soil and Water Conservation

2.3 Rules and Measures

Rules and measures are issued by different departments (ministries) and local governments which have legislative authorization to issue them. Rules and measures are very important components of China’s environmental governance because they can be adjusted and changed very quickly. Moreover, when new topics and challenges emerge, they can be released expeditiously.

As of December 2010, there are 62 rules in effect published by China’s Environmental Protection Ministry (formerly the Environmental Protection Bureau (EPB) and State Environmental Protection Agency (SEPA)) in conjunction with other ministries. Of these 62 rules, 10 are related to water environment management. They cover a wide range of water management issues, including drinking water sources, marine issues, nature reserves, mining industry, toxic waste, agriculture and aquaculture, and one of them even focuses on the emission permits for the Huai River and Tai Lake area.

Table 4. Rules and Measures concerning Water Environment Conservation

No	Title	Administrative Departments
1	Rules for Pollution Prevention in Drinking Water Source Protected Zones	SEPA, MOH, MOHURC, MWR, MLR*
2	Rules for Pollution Prevention for Gangue**	SEPA
3	Rules for Functional Zone Management in Marine Areas	SEPA
4	Rules for Pollution Prevention involving Stock Breeding	SEPA
5	Rules for Emission Permit Management for Key Water Pollutants in Huai River and Tai Lake (provisional)	SEPA
6	Executive Penalty Measures for Medical Waste	MOH, SEPA
7	Rules for Hazardous Waste Pollution Prevention	SEPA
8	Rules for Automatic Monitoring of Pollution Source Management	SEPA
9	Rules for Supervision of National Nature Reserves	SEPA
10	Rules for Electronic Waste Pollution Prevention Management	SEPA

* SEPA: State Environmental Protection Agency, now reformed as the Ministry of Environmental Protection; MOH: Ministry of Health; MOHURC: Ministry of Housing and Urban-Rural Construction; MWR: Ministry of Water Resources; MLR: Ministry of Land Resources;

** Gangue: Worthless rock or other material in which valuable minerals are found.

Source: http://www.mep.gov.cn/gkml/hbb/bgg/201012/t20101228_199215.htm

2.4 Guidelines

Guidelines are useful tools in China because they allow administrative enforcement without an alteration to the legal system. Moreover, in many cases, guidelines furnish details and explanations as an addition to the brief prescripts of laws and regulations.

Guidelines may be published by various levels of government.

Case 1: Guidelines for the Prevention and Treatment of Cross-Border Provincial Water Pollution Conflicts

Bodies of water such as rivers and lakes are often cross borders and thus so does the water pollution. However, there was no problem-solving mechanism for this in China. In response, SEPA published guidelines in 2008, which present a series of management measures for preventing pollution, monitoring water quality, joint sampling, negotiating duties and other problem-solving actions. These guidelines present good examples of problem solving.

Case 2: Guidelines for Distribution of the Emission Amounts of Major Water Pollutants

The total emission amounts of major pollutants are controlled by the central government, and they are listed in the compulsory mission of the 5-Year Plan. So, it is important for all province, lower-level governmental units and large companies to meet the quota. These guidelines are a technical document for controlling the distribution of the water pollutants in local areas, and with these guidelines, quotas can be distributed according to a rule that everyone accepts. Supervisory tasks are also simplified.

Case 3: Managing and Evaluating the Means for Meeting the Water Environment Treatment Targets in Tai Lake, Wuxi[2]

These guidelines were designed by Wuxi City, and they are local guidelines for assessing the government's work on water environment management. These guidelines were designed according to several policies and rules published by higher levels of government. In these guidelines, financial support, organization, administrative procedure, planning, assessment and many other activities are regulated for the whole of Wuxi City.

2-5 Local Aggressive Action in the Tai Lake Basin

[2] http://www.wuxi.gov.cn/web101/wxqk/gazette/office_file/418849.shtml.

Tai Lake Basin and Jiangsu Province constitute the most developed area in China and also the most aggressive area in terms of environmental management due not only to sensitivity toward Tai Lake but also because of the desire of the residents here for a better environment.

Case 1: Regulation of Tai Lake Water Pollution Prevention and Control in Jiangsu Province

The above-named regulation is the only local regulation for a part of a lake in a single province. Passed in 1996 and revised in 2007, this regulation is symbolic of the decision of Jiangsu Province to enforce water protection for Tai Lake. Many of the articles in this regulation are the most restrictive in China. For example, the actual amount of the loss is charge as a penalty to the persons responsible for the damage, while other laws and regulations set a limit on fines such that they do not cover the majority of the loss. Moreover, in China, environmental protection departments do not have the authority to ask a factory to shut down directly, but in this regulation, the provincial government authorizes the environmental protection departments to halt producing until the pollution problem is resolved. Generally speaking, this regulation is considered to be the most restrictive environmental regulation in China so far.

Case 2: Policy System for Paid Use of Environmental Resources and Pollutant Allowances

There are three main elements in the paid use system: permits, paid use and trade. According to the latest version of Law of the People's Republic of China on the Prevention and Control of Water Pollution and Rules for Implementation of the Law of the People’s Republic of China on the Prevention and Control of Water Pollution, the permit system has been introduced in water pollution control already. However, in most places at this time, permits may be obtained free-of-charge, which means this policy did not take effect as intended. In Jiangsu Province, Jiangsu EPD published an important local regulation, Rules for Paid Use and Charge of Main Water Pollutants in the Tai Lake Basin in Jiangsu Province, in 2008 with several detailed implementation rules. With these policies, Jiangsu became the first place in China to charge for every pollutant discharged. This policy changed the behavior of corporations radically. They have to choose between purchasing more permits for production and investing to reduce

emission of pollutants. In the detailed rules, a permit trading system is brought forward. To produce a better design and assess the policy, Nanjing University has been invited as a technical support organization and has been asked to design the entire charging system and trading system. This project is at the forefront of policy design in China now.

Case 3: Rules for Regional Compensation for Environmental Resources in Jiangsu Province

Another pioneering policy concerns regional compensation. The relevant rule was published on the first day of 2008. Although there are national guidelines regarding cross-border management, there was still a lack of material regulations at the beginning. In relation to the pricing system of pollutants, researchers from Nanjing University helped to calculate the price of ecological recovery and provided the compensation price. Under these rules, the upstream government would have to establish the monitoring point at which cross-border rivers should reach the established water quality standard; if the standard is not reached, the upstream government will have to pay a large amount of money to the downstream government according to the formula in the rules. This policy is in trial operation in the Tai Lake Basin area, and it has attracted the entire country's attention. Nowadays, regional compensation policies have been expanded to other places, including some areas of Huai River.

3. Policy Review and New Progress in the 5-Year Plan

3.1 Water Environment Changes since 2005

Pollutants

According to the data, there is a 12% decrease in COD emission in 2010 compared to emission in 2005. There is a 29% decrease in BOD_{Mn} in 2009 compared to the 2005 data. Fifty-seven percent of state monitoring points in seven main river systems in China reached Grade III in 2009, while this number was 41% in 2005.[3] This is a positive trend in water quality change.

However, COD is a traditional index of water pollution and does not cover all the pollutants. Heavy metals, T-VOC, T-P, T-N and many other pollutants are also toxic to

[3] Environment Statistic Communiqué, 2005, 2009.

the water environment. In the past five years, China has included a COD target in its 5-year plan, and this has produced a constructive result. However, pollutants were not reduced to their pre-industrial level because, as the economy develops, pollutants became more and more complex.

Urbanization has progressed rapidly in recent years following decades of industrialization in China. Agriculture, aquaculture, feeding, fertilization and daily human life contribute more and more to the water pollution.

Construction

One of the most important changes in the 11th 5-Year Plan is the increase in investment in construction. Since the treatment target is the point source, construction of treatment facilities is the most direct remedy. From 2005 to 2008, investment in facilities including wastewater treatment facilities, pipelines and treatment projects, increased almost 50%. The money for treatment accessories invested by corporations nearly doubled from 2005 to 2008.

Table 5. Investment in Environmental Pollution Treatment from 2005 to 2008

(RMB100 million)

Item	2005	2006	2007	2008
Environmental infrastructure facility construction	1289.7	1314.9	1467.8	1801.0
Industry pollution source treatment	458.2	483.9	552.4	542.6
Treatment accessories in corporations	640.1	767.2	1367.4	2146.7
Total	2388	2566	3387.6	4490.3

Source: Environment Statistic Communiqué.

Management

There are four main ministries in China with responsibility for managing the water environment.

1) National Development and Reform Commission (NDRC). This is the most powerful department in China. The duties of NDRC span national economic policy making for the environment, large environmental treatment facility construction and supervision of basin treatment projects.

2) Ministry of Environmental Protection (MEP). There is an interesting story regarding the development of MEP. It was formerly a bureau in China and later it became an agency, which has greater power than a bureau, but it was still not part of the State Council. In 2008, environmental protection became the hottest topic in China, and the status of the agency was raised again to that of ministry. From this background, we can see the growth of emphasis on environmental protection in China.

3) Ministry of Water Resources (MWR). MWR is another ministry which has the power to manage the water environment. It has almost the same drainage management departments as MEP.

4) Ministry of Construction (now reformed as the Ministry of Housing and Urban-Rural Development (MOHURD)). Water supply, wastewater treatment facility construction and groundwater protection are under the domain of MOHURD.

The responsibility for management of the water environment is not integrated into one single department, and this results in management that lacks consensus. This is a difficult problem to solve since it related the power distribution of ministries.

Policy

Since 2005, policy reform has focused on economic and market-based methods. Some policy trials have also taken place but have been implemented very carefully.

New economic policies include:

1) Pollutants discharge fees;
2) Water resources fee;
3) Ecological compensation;
4) Emission trade (on trial basis).

Besides new policies, there have been many new measures for enforcement in the past five years.

1) Total pollutant amount control (well-known as the COD target);

2) Integrated treatment activities in large drainage basins, e.g., 'Water Pollution Prevention and Control Plan of the Three-Gorges Reservoir and Its Upstream Area' in 2008, 'Water Pollution Prevention and Control Plan of Huai River, Hai River, Liao River, Chao Lake, Dianchi Lake and Upstream of Huang River 2006-2010', and 'Integrated Measures for Water Environment Treatment in Tai Lake' in 2008;

3) Special activities for enforcing executive control, e.g., 100% attainment of the drinking water standard; enforcement of the replacement of advanced technology in corporations; cessation of EIAs in the region where illegal environmental activities occur.

Public tools:

4) Hotline. This is the main means for the public to express their concerns about the environment. However, the hotline is mainly used for appeals concerning environmental pollution, rather than as a communication channel;

5) Public involvement in EIAs and other policy making. This is a relatively successful public tool in China, especially in the policy making process;

6) Hearings. There are some examples of hearing in environmental protection projects. At most of them, people oppose any construction which would affect their life or health;

7) Informal dialogue. The roundtable meeting is one kind of informal dialogue. This kind of public tool is rooted grass-roots tool and requires support from both the government and from the public itself.

3.2 Policy Orientation for the Next Five Years

There is a shared consensus that there will be additional targets to be controlled in the next five years. In addition to target control, China will start to control overall categories of pollutants from now on.

Among the pollutants, T-N, T-P and heavy metals will be the most emphasized:

1) T-N and T-P. There is reliable information that T-N has been included in the 12th 5-Year Plan as a target control. The most important source of T-N and T-P is non-point sources, so there will be more policies and control measures for non-point sources in the next five years.

2) Heavy metals. Heavy metal pollution was noticed both in soil and water. There may be some policies for it, but it would be point source control and the measures would be focused on the pollution source.

3) Organic compounds pollution. This is newly-raised problem, and in the next five years, it will be popular in the research field but will not be controlled by detailed policies until the 13th 5-Year Plan.

For the measure that could be taken place:

1) Ecological recovery. The total emission amount has started to decrease, and the

infrastructure projects have been finished in most of the eastern area. There is a need for recovery of lakes and rivers using ecological means.

2) Enforcement of the market-based tools. After several years' trial, market-based tools will be applied formally in the next five years.

3) Non-point source control. This will be a hot topic both in research and practices. Integrated agriculture and breeding will be supported, and solutions for many other challenges in this field will be sought.

4) Public involvement. There is a trend toward public participation in public affairs. There will be more rules and guidelines regarding public involvement as well as the development of NGOs in the next five years.

4. Rural Lifestyle and Agriculture, New Challenges

4.1 Non-point Source Contribution

Fertilizer usage in China was 25.9 million tons in 1990, but the amount increased to 52.4 million tons in 2008. Fertilizer usage per unit increased from 270.75 kg/km^2 in 1990 to 430.43 kg/km^2 in 2008. This number is much higher than the regulatory standard of developed countries, which is 225kg/km^2. The average efficiency of fertilizer is 35% in China, which is 5% to 10% lower than in developed countries.

The usage and production of pesticides in China is the highest in the world, and 70% of the pesticides contain organic phosphorus.

There is a large breeding industry in China. Animal waste amounts to almost 4 billion tons per year, and there is an estimate that it will reach 6 billion tons in 2015. Over 90% of the breeding factories do not have adequate wastewater treatment facilities, and the waste flows directly into bodies of water.

Fertilizers, pesticides and animal waste are the main cause of water pollution.[4]

According to the data from 20 monitoring points in Tai Lake in 2000, 93% of T-P and 95% of NH3-N come from agricultural non-point sources, rural domestic sources and township domestic sources.

[4] Chen, Yong. Research Progress on Non-point Sources in Agriculture [J]. Journal of Northwest Agriculture and Forestry Technology University (Nature Science Edition) (2010) 38(8).

Table 6. Main Pollutant Source and Percentage in Tai Lake (%)

Category	Industrial source	Township domestic source	Rural domestic source	Agricultural non-point source
COD	44	29	11	16
TP	7	27	28	38
NH3-N	5	18	20	57

Source: Wang, Xubo. 'Different Measures: Difficulty of Treating Non-point Pollution in Taihu Lake. Journal of Hehai University (Social Science Edition) (2007) 9 (2).

4.2 Countermeasures Being Undertaken

There is little experience with or management tools for non-point source pollution, and the database is still under construction. The conservation measures for non-point sources in 11th 5-Year Plan were mostly policy support and trial demonstrations. Promotion of integrated breeding is the only actual measure implemented.

Although it is still not easy to control non-point source pollution, enormous sums of money have been invested in research and demonstration projects. However, one of the difficulties is that such pollution control measures are not yet economically efficient. Over 90% of the demonstration projects proved effective at decreasing pollution, but the technology needs to be promoted to the public.[5]

For non-point source pollution control, 'Technical Guidelines for Environmentally Safe Fertilizer Usage'[6] was released and took effect in 2010. 'Technical guidelines on Environmentally Safe Application of Pesticides'[7] and 'Technical Guidelines for Agricultural Solid Waste Pollution Control'[8] were stipulated as national environmental protection standards and will take effect in 2011.

4.3 Difficulties, Challenges and Opportunities

Lack of policy recognition

[5] Liu, Jian. Systematic Mechanism Design of Long-term Agricultural Non-point Source Pollution Control [J]. China Population, Resources and Environment (2010) 20 (3).
[6] http://bz.mep.gov.cn/bzwb/stzl/201003/t20100312_186790.htm
[7] http://bz.mep.gov.cn/bzwb/stzl/201007/t20100720_192285.htm
[8] http://bz.mep.gov.cn/bzwb/stzl/201010/t20101022_196533.htm

There has been no emphasis for a long time on the problem of non-point sources, from the standpoints of either systematic building or management strategy. In China's mainstream environmental policies, the target of governance is industry pollution sources such as the EIA system. Meanwhile, a department for managing agricultural non-point source pollution does not even exist. No one bears responsibility when pollutants are generated in agricultural production. China needs to build a comprehensive system for non-point sources, but it will require substantial time and entail many experiments.

Lack of economically efficient technical and management tools

The character of non-point source pollution is unstable, and complete information about it does not exist, which means that large-scale, continuous monitoring and management is infeasible considering the current situation of both financial and personnel resources. Actually in most cases, the technology and the means to reduce the pollutants are available, but they do not work through economic incentive measures.

Difficulty of finding substitutes for the fertilizers and pesticides

China is an agricultural society, and a large portion of the population is engaged in agriculture. More agricultural production is needed, and so agriculture must be promoted. It is difficult to replace the fertilizers and pesticides if a certain level of production is to be maintained. There are some new technologies using low amounts of phosphate, but these technologies are still in the early stage of research. It may be possible to modify the method of utilization so as to increase the absorption efficiency. However, it will not be possible to replace the current fertilizers and pesticides in a short period of time.

Lack of capability and investment

There are few laws and regulations on rural environmental protection. There is almost no environmental management monitoring or supervision in rural areas. The environmental monitoring network does not cover rural areas, and there is no database on these areas. This situation is due to long-term lack of investment in rural areas. There is no budget to provide financial support for construction for environmental protection

in rural areas. There are no pipelines for wastewater collection, and there are no subsidies for any construction by households in rural areas.

Outlook and opportunity

Fortunately, non-point source pollution and rural environmental problems are being noticed, and greater resources are being invested. For example, looking at research projects, there are hundreds of projects, from the national level to the local level, that were organized and conducted starting in the first year of the 12th 5-Year Plan. Just as rapid progress has been witnessed in the past 5 to 10 years, it is expected that progress will be rapid in the next 5 years in this field.

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