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Something Old, Something New, Something Borrowed and Something Blue

Tackling Diffuse Water Pollution from Agriculture in China: Drawing Inspiration from the European Union

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1. Introduction

More than 10,000 dead pigs were pulled out of the Huangpu River in Shanghai in March 2013. Some weeks later the residents of Shanghai still did not dare to drink tap water because the Huangpu River is one of the city's four drinking water sources. According to news reports, those dead pigs had been thrown in the river by farmers in the upstream province of Zhejiang and then floated down to Shanghai. This international scandal finally put the spotlight on China's poorly regulated water management related to agricultural activities.

Diffuse water pollution from agriculture is increasingly recognized as a main contributor to water pollution both in China and Europe. A great deal of effort has been spent on mechanisms to address such pollution, especially through legislation and policy. The legal challenge for China is to develop an adequate legal framework to tackle diffuse pollution. This article provides (1) an overview of the current policy design regarding diffuse water pollution management in China and of its shortcomings; and (2) an overview of the legal framework for diffuse water pollution control in China and the European Union (EU). The aims of this article are (1) to provide policy makers and scholars a clear background to understand the Chinese legal approach to managing water pollution problems, and (2) to discuss to what extent the EU legal framework could provide inspiration for China.

This study has a comparative approach. I take the EU as a comparative case because it is much closer to China's situation as regards the level of agricultural intensification and fertilizer application rates than the USA or Australia.¹

In this article, I will first give an overview of *old problems* in Section 2: the status of diffuse water pollution from agriculture in China. Section 3 introduces the Chinese legal framework of water management as well as the law and policies which apply to diffuse water pollution, with the aim to present a complete overview of the Chinese water management system. Section 4 gives an overview of the EU legal framework which is relevant to diffuse water pollution. *Something new* will be included in this section: a case study in the Netherlands to give an indication of incentive instruments within the EU. The findings from the comparisons between China and the EU as well as *what can be borrowed* to benefit China are discussed in Section 5. A conclusion is presented in the last section, Section 6.

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¹ China Council for International Cooperation on Environment and Development (CCICED), *Working Reports on the Task Force on Non-point Pollution from Crop Production*, CCICED Press, 2004, p. 18.

2. Diffuse water pollution

Water pollution in EU water law is defined as the discharge by man, directly or indirectly, of substances or energy into the aquatic environment, the results of which are such that they cause hazards to human health, harm to living resources and to aquatic ecosystems, damage to amenities or interference with other legitimate uses of water.² ‘Discharge,’ here, does not only include the pollution from multiple and diffuse sources, but also refers to any act attributable to a person by which one of the dangerous substances is directly or indirectly introduced into the waters.^{3,4}

Coming from widespread activities without one concrete source, diffuse pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification.⁵ A useful thing to keep in mind about diffuse pollution is that it is often individually minor but collectively a significant source of pollution in a catchment.⁶ Diffuse pollution cannot be the subject of prior authorization⁷ because its pollutant emissions and discharges cannot easily be measured in terms of effluent limitations and it is often unclear who is the polluter.⁸

Three important pollutants associated with diffuse pollution are nitrogen, phosphorus and pesticides, which are mostly from agriculture. Modern-day agricultural practices are associated with high levels of fertilizers, pesticides and manure,⁹ which leads to surplus nutrients (e.g. nitrogen and phosphorus) and results in diffuse pollution in both surface and groundwater through various diffuse processes.

2.1. Diffuse water pollution in China

The annual chemical nitrogen loss through leaching and runoff from farmland is about 1.73 million tons in China; the annual nitrogen input from agriculture into the Yangtze River and the Yellow River is 92% and 88%, respectively.¹⁰ As some 90% of animal farms are equipped with inadequate waste disposal or treatment facilities or even with no facilities whatsoever,¹¹ farmland pollution in China is also taken as a diffuse source in this article. This is because if there is no sufficient disposal facility or standardized management, the pollution sources will be very difficult to trace in practice.

The Gross Domestic Product (GDP) of China was the second largest in the world in 2010.¹² However, the environmental pressure is also bigger than in many other countries. China has the same amount of water as Britain; but its population is 20 times larger.¹³ Cultivated lands in China cover about 1,825.74 million acres (738.85 million hectares), only 12.68% of the total territory. The per capita arable land area is only 1.38 acres (0.56 hectares), less than 40% of the world’s average level. Moreover, China’s cultivated land is distributed mainly in hilly, mountainous and plateau areas, only 30.73% is in plains and basins.¹⁴ To feed more people with less land, agriculture in China has been greatly intensified since the 1980s. Fertilizers and pesticides have played an important role in boosting crop yields, and livestock and poultry farms are being expanded to meet the increasing consumer demands. Meanwhile, serious environmental

2 Directive 2006/11/EC of the European Parliament and of the Council of 15 February 2006 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community, OJ L 64, 4.3.2006, p. 52.

3 Dangerous substances listed in List I or List II of the Annex to Directive 2006/11/EC.

4 Case C-231/97, *A.M.L. van Rooij v Dagelijks bestuur van het waterschap de Dommel*, Judgment of the Court (Sixth Chamber) of 29 September 1999, [1999] ECR I-06355; Case C-232/97, *L. Nederhoff & Zn. v Dijkgraaf en hoogheemraden van het Hoogheemraadschap Rijnland*, Judgment of the Court (Sixth Chamber) of 29 September 1999, [1999] ECR I-06385.

5 United States Environmental Protection Agency (USEPA), ‘What is nonpoint source pollution?’, available at: <<http://water.epa.gov/polwaste/nps/whatis.cfm>> (last visited 17 February 2014).

6 Ibid.

7 *L. Nederhoff & Zn. v Dijkgraaf en hoogheemraden van het Hoogheemraadschap Rijnland*, supra note 4.

8 R.C. Ferrier et al., ‘Diffuse Pollution – What is the Nature of the Problem?’, 2005 *Water and Environment Journal* 19, no. 4, pp. 361-366, at p. 362.

9 European Environmental Agency (EEA), ‘Diffuse sources’, 2008, available at: <<http://www.eea.europa.eu/themes/water/water-pollution/diffuse-sources>> (last visited 17 February 2014).

10 CCICED, supra note 1, p. 2.

11 Ibid.

12 The World Bank, ‘China Overview’, available at: <<http://www.worldbank.org/en/country/china/overview>> (last visited 17 February 2014).

13 D. Stanway, ‘After China’s multibillion-dollar cleanup, water still unfit to drink’, 2013, available at: <<http://www.reuters.com/article/2013/02/20/us-china-pollution-water-idUSBRE91J19N20130220>> (last visited 17 February 2014).

14 H. Xue, ‘Research on Evaluation of Intensive Use of Agricultural Land under the New Countryside Construction’, 2009 *International Journal of Business and Management* 4, no. 4, pp. 176-182, at p. 176.

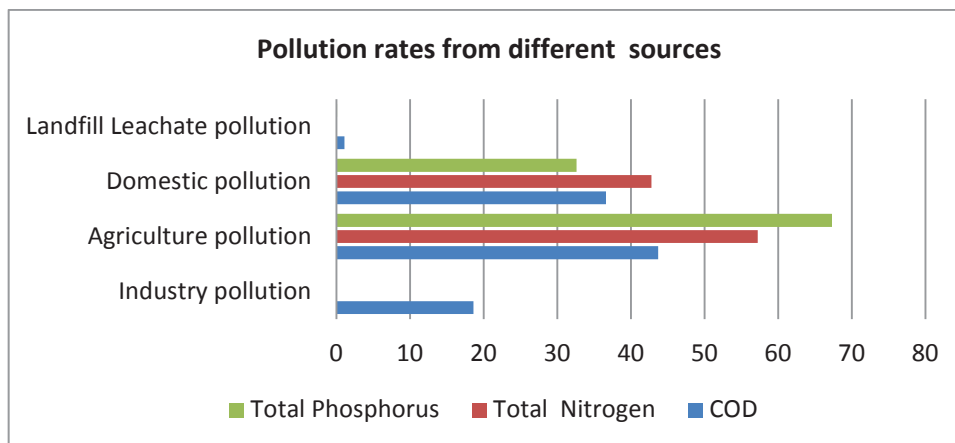
pollution has been caused by the overuse and misuse of fertilizers, pesticides and increasing animal waste. Over half of all rivers and about two-thirds of lakes in seven river systems and 28 major lakes in China were assessed to have poor water quality (Grade IV and above)¹⁵ in the 2000-2008 period.¹⁶ According to the government report, the status of surface water was that of moderate pollution in 2010:¹⁷ 51.9% of surface water was in Class I-III, and 20.8% below V.¹⁸ The Environment Ministry stated that 43% of the locations monitored in 2011 contained water that was not even fit for human contact.¹⁹

After two years of monitoring pollution sources and collecting data, China released its First National Census on Pollution Sources in 2010. The revelation came as a shock to many, who had previously believed that China's water problems, while severe, had slowly been improving over the years.²⁰

The Census examined data for the year 2007. Nearly 6 million pollution sources were covered in the Census: industrial pollution, agricultural pollution, domestic pollution and intensive pollution treatment facilities.

The outcomes of the Census revealed some problems that were previously known, like striking structural industrial pollution, pollution concentrated in several sectors and greater pollution in developed regions.²¹ However, there were also some new problems that were identified by the Census: agriculture was actually the main contributor to environmental pollution. It contributed 43.7% to chemical oxygen demand (COD) pollution, 67.3% to total phosphorus pollution, 67.3% to total phosphorus pollution and 57.2% to total nitrogen pollution (See Figure 1).

Figure 1 Pollution rates from different sources



15 There are five classifications of water quality in China: Class I: water source, national protection areas; Class II: centralized drinking water supply, spawn grounds for rare fishes and shrimps, nursery areas for larva, juvenile and young fish; Class III: grounds and migration paths for common fishes and shrimps, aquaculture areas and swimming areas; Class IV: general industrial water areas, entertainment areas; Class V: farmland areas, general landscape.

16 B. Sun et al., 'Agricultural non-point source pollution in China: causes and mitigation measures', 2012 *Ambio* 41, no. 4, pp. 370-379, at p. 371.

17 The biological index is used to assess the quality of water sources: clean water: 0~8, low pollution 8~20, moderate pollution: 20~60, and high pollution: 60~100.

18 Ministry of Environmental Protection, '2010 National Environmental Quality Report by the Ministry of Environmental Protection', 2011, available (in Chinese) at: <http://www.gov.cn/gzdt/2011-01/15/content_1785113.htm> (last visited 20 February 2014).

19 Stanway, *supra* note 13.

20 Y. Wu, 'Fighting Water Pollution With Data', 2010, available at: <<http://chinawaterrisk.org/opinions/fighting-water-pollution-with-data/>> (last visited 20 February 2014).

21 China.org.cn, '1st National Census on Pollution Sources Completed', 2010, available at: <http://www.china.org.cn/china/2010-02/09/content_19394384.htm> (last visited 20 February 2014).

3. The Chinese legal framework for water management

3.1. General policies for water resource management in China

During the past few years, China has adopted a large number of environmental and water policy documents to reduce the environmental impact of its incredible economic growth. See Annex 1.

The 12th Five-Year Plan (12 FYP), covering 2011-2015, places heavy emphasis on the environment and energy (with 8 guidelines, one third of the total of 24 guidelines).^{22, 23} For the sake of national environmental protection, it sets impressive sustainability targets for water pollution management. For example, it sets a COD reduction target of 8% and a growth target of 5% for the surface water which has been qualified as Class III and above in seven river basins by 2015 (compared to 2010). The 12 FYP governs policy documents at all levels for the next five years and its objectives are to be achieved by complying with detailed implementing actions, laws and policies.

A subordinated plan of the 12 FYP, the 'General Planning for the Development of Environmental Protection Legislation and Environmental Economic Policies', lists key fields and main targets especially for environmental protection, and includes improving environmental legal systems and establishing eco-compensation mechanisms.

The 'No. 1 Document of 2011' (called No. 1 because it was announced as the first policy document in the year 2011) highlights sustainable use of water resources over the next ten years. It places water conservancy projects high on a primary list of national infrastructure developments, and sets 'The Most Stringent Standards' which is usually called 'Three Red Lines', i.e. the first line is to define a control limit of water resource exploitation and utilization, the second is to establish a control limit of water-use efficiency, and the third is to establish a pollutant-carrying limit of water function zones, which is the most important element related to water quality.

To guide the implementation of the 'Three Red Lines', an *Opinion of the State Council on Implementing the Most Stringent Water Resources Management System* (hereafter referred to as 'Opinion') was released by the State Council at the beginning of 2012. It sets out a number of requirements called the 'Four Indicators': total quantity control of water consumption; efficiency control of water use; pollutant-receiving capacity control of water quality in water function zones; and a performance assessment system for water resources management.

The first three indicators were designed based on the process of water use: abstraction, utilization and drainage, which also correspond to the 'Three Red Lines'. The fourth indicator states that water resources management will be incorporated into the system for assessing local economic and social development levels. This Opinion is a fundamental document guiding water-related issues in China at present and in the foreseeable future.

The 'Assessment Methods for the Most Stringent Water Management System' is a specific method to implement the 'Three Red Lines'. It sets out the main objectives for each province, and will evaluate their implementation in a scoring system (with a maximum of 100 points): excellent (90 points or more), good (more than 80 and less than 90 points), sufficient (more than 60 and less than 80 points), and insufficient (less than 60 points). These scores will be used as an important indicator to assess government officials' achievement.

The 'National Plan on Groundwater Pollution Control' is the first-ever national plan on groundwater pollution control in China.²⁴ According to the Plan, China will create a general understanding of the country's groundwater pollution situation, bring the sources of groundwater pollution under preliminary control by 2015, and fully monitor typical sources of groundwater pollution and ensure the safety of essential underground drinking water sources by 2020.²⁵

22 North Head, *Report On the 12th Five-Year Plan An in-depth overview and analysis of China's policy blueprint for years 2011-2015*, Beijing North Head, 2011, p. 8.

23 The national 'Five-Year Plan' is a developmental blueprint to guide policies and sets targets for the next five years in China.

24 China Water Risk, '2011-2013 Water Policies Review', 8 March 2013, available at: <<http://chinawaterrisk.org/resources/analysis-reviews/2011-2013-water-policies-review/>> (last visited 20 February 2014).

25 X. Mu, 'China introduces first national plan on groundwater pollution control', 2011, available at: <http://news.xinhuanet.com/english2010/china/2011-10/29/c_122211369.htm> (last visited 20 February 2014).

The ‘Water Pollution Prevention Plan in Key Basins (2011-2015)’, which was released jointly by a number of institutions of the State Council, aims to enhance watershed protection and to improve the overall water quality in key river basins from moderately polluted to slightly polluted by 2015. It includes a total of 22 indicators to evaluate water quality.²⁶

The ‘Water Development Plan (2011-2015)’, another specific national plan that is part of 12 FYP, is an important basis for water resources management reform and development. It aims to improve the water quality of major rivers and lakes, improve 60% of it to Grade I-III, increase the rate of urban wastewater treatment to 85%, and raise the waste-water renewal rate of water-needy cities to above 20%.²⁷

3.2. Policy review of specific pollution sources

Based on the 12 FYP, the Ministry of Environmental Protection (MEP) and the Ministry of Agriculture (MA) jointly released a document entitled *12 FYP on the Prevention and Control of Livestock and Poultry Breeding* to guide local governments on the work of regional livestock and poultry breeding. The document focuses on three categories: large-scale farms (slaughtered fattened hogs > 500 heads), professional farms (50 heads < slaughtered fattened hogs < 500 heads) and backyard poultry and livestock breeding. Based on the amount of main pollutants discharge, environmental bearing capacity and confirmed key river basins, the document sets out key prevention and control regions for livestock and poultry breeding, which are distributed in 16 provinces (out of 34). After calculating the total national discharge amounts of COD, ammonia and nitrogen, the Central Government distributed them to each province with certain discharge amounts as referenced targets for the year 2015. This distribution was based on three elements: regional economic development, pollution emission intensity and emission reduction potential. This is similar to the allocation criteria of some developed countries.²⁸

The ‘Discharge Standards of Pollutants for Livestock and Poultry Breeding’ (2001), released by the EPA and General Administration of Quality Supervision (GAQ), sets out a maximum daily discharge concentration on average for water pollutants and odour, and the total allowed water discharge. However, it applies only to large-scale intensive livestock breeding (pigs in stock per farm above 3,000 heads). Backyard poultry and livestock breeding (small numbers of domestic animals such as pigs, goats, or chicken surrounding the house, often mixed together) is beyond legal control even though it still makes up a high proportion in China, see Section 4.

The ‘Exposure Draft on the Prevention and Pollution Control of Livestock and Poultry Breeding’ (2012), is the first regulation specifically designed for dealing with livestock and poultry breeding pollution. It promotes a new system which differs from traditional industrial pollution control – using rewards to promote treatment and replace subsidies – to prevent and control pollution from livestock and poultry breeding. However, this regulation is only applied in large-scale farms too. For more policies on livestock and poultry breeding, see Annex 2.

The large market demand is one of the driving forces for the high-speed development of livestock and poultry farms in China, another one is the support policies. For example, in order to promote large-scale intensive livestock farms, a Notice²⁹ states that ‘any prohibition or restriction of scaled intensive livestock breeding is not allowed on the ground of new rural construction or environmental renovation’; ‘local competent authorities shall give scaled intensive livestock breeding support policies by distinguishing among differing cases’.

The intensive use of fertilizers and pesticides was also promoted by the governments at the earlier stage. To increase yields, agricultural outreach officers under local governments persuaded farmers to use more chemical fertilizers and pesticides since 1980. Officers were rewarded for such promotion.³⁰

26 China Water Risk, supra note 24.

27 Ibid.

28 For further information, see H.F.M.W. van Rijswijk, ‘Moving Water and the Law. On the Distribution of Water Rights and Water Duties within River Basins in European and Dutch Water Law’, inaugural address Utrecht University, Europa Law Publishing, Groningen, 2008; H.F.M.W. van Rijswijk, *The allocation and regulation of limited water use rights in international, European and Dutch Water Law*, in print; J.J.H. van Kempen, *Europees waterbeheer: eerlijk zullen we alles delen?*, 2012.

29 Ministry of Land and Resources, ‘Notice of Facilitating Land Use to Intensive Livestock Breeding’, 2007, No. 220.

30 Y. Yang, ‘A China Environmental Health Project Sheet: Pesticides and Environmental Health Trends in China’, 2007, available at: <http://www.wilsoncenter.org/sites/default/files/pesticides_feb28.pdf> (last visited 21 February 2014).

Another dominant strategy that China has used for many years to boost grain production is to keep chemical fertilizer prices low. Subsidies are provided to fertilizer manufacturers in various ways, particularly through low energy prices. The total subsidies have amounted to more than ¥6,300 million (€779 million) every year since 2003.³¹

More than 30 kinds of highly toxic pesticides have been banned by different regulations since the 1980s in China. However, small-scale surveys have shown that a number of banned pesticides are still in use.³² The laws and policies which apply to the use of fertilizers and pesticides are normally too vague to be applied in practice (see Annex 3). For example, according to the Agricultural Law, Water Law and Water and Soil Conservation Law, governments above county level are responsible for guiding the use of fertilizers and pesticides and supervising the pollution. However, the practical problem is that most extension staff at county level who provide advice and assistance to farmers are not sufficiently educated. According to one survey, only 10% of extension staff had university-level education, and more than 46% had no special training at all.³³ Moreover, there is no sufficient staff or financial support for this implementation at county level.

4. An overview of the legal framework on diffuse water pollution in the European Union

4.1. Diffuse water pollution in the European Union

Europe's waters are affected by several pressures, including water pollution, water scarcity and floods.³⁴ Recent figures show that 20% of (Europe's) surface water is at serious risk of pollution.³⁵ The pressures reported to affect most surface water bodies are pollution from diffuse sources, in particular from agriculture, which is a significant pressure in more than 40% of Europe's water bodies in rivers and coastal waters, and in one third of the water bodies in lakes and transitional waters.³⁶ A large proportion of water bodies, particularly in the regions with intensive agriculture and high population density have poor ecological status and are affected by pollution pressures.³⁷

A high input of fertilizers and pesticides in intensive agriculture results in significant loads of pollutants entering the aquatic environment through diffuse pollution. Widespread problems of nutrient enrichment have had detrimental effects on aquatic ecosystems and have resulted in the loss of aquatic flora and fauna, and this is a cause of concern for public health.³⁸

4.2. An overview of the EU legal framework of water management

According to the 2012 Blueprint, Europeans can safely drink tap water and swim in thousands of coastal areas, rivers and lakes across the EU.³⁹ This status is the result of many efforts, such as scientific research, advanced technology and efficient communication etc., and EU water policy has also successfully contributed to water protection. An adequate legal framework in place is the precondition to manage water resources sustainably. In the EU, various directives apply at the national, regional and river basin level and they aim to protect the quality of water from pollution by certain substances.⁴⁰

The Water Framework Directive (WFD)⁴¹ entered into force in 2000 and aims to create an integrated and coherent water policy within the EU by applying an integrated approach to manage water quality and

31 Sun et al., supra note 16, p. 376.

32 CCICED, supra note 1, p. 4.

33 CCICED, supra note 1, p. 14.

34 European Environmental Agency (EEA), 'European waters – assessment of status and pressures', Office for Official Publications of the European Union, 2012, p. 8.

35 European Commission, 'Water Framework Directive Factsheet', 2010, available at: <<http://ec.europa.eu/environment/pubs/pdf/factsheets/water-framework-directive.pdf>> (last visited 21 February 2014).

36 EEA, supra note 34.

37 Ibid.

38 Ibid.

39 European Commission, 'A Blueprint to Safeguard Europe's Water Resources', COM (2012) 673 final, p. 9.

40 H.F.M.W. van Rijswijk, 'The Relationship between the Water Framework Directive and other Environmental Directives, with Particular Regard to Agriculture – A Dutch Point of View', 2006 *Water Law* 17, pp. 193-203, at p. 197; H.F.M.W. van Rijswijk & H.J.M. Havekes, *European and Dutch Water Law*, 2012, pp. 341-349.

41 Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, OJ L 327, 22.12.2000, p. 1.

quantity across entire catchments. It involves land use and management that affect both water quality and quantity and requires coordination with spatial planning by the Member States and integration into funding priorities.⁴² Member States are required to prepare River Basin Management Plans (RBMP), of which the Programme of Measures (PoM) is a central tool.⁴³ As agriculture is identified as a major source of pollution, these programmes have to address agricultural pressures to ensure the full implementation of the WFD and the concretization of the WFD objectives⁴⁴: achieving a 'good status' of all community waters by 2015.

The PoM of the WFD includes both 'basic measures' and 'supplementary measures' (see Annex 4). Basic measures are the minimum requirements to be complied with⁴⁵ and they are based on existing EU legislation. For instance, the WFD itself contains no specific provisions concerning pollution by fertilizers⁴⁶ or pesticides, so to achieve its goals, the requirements of the Nitrates Directive⁴⁷ and the Plant Protection Products Directive⁴⁸ must be applied and enforced. Supplementary measures are the measures designed and implemented in addition to the basic measures, with the aim of achieving the objectives,⁴⁹ e.g. economic or fiscal instruments and negotiated environmental agreements.

The Nitrates Directive is clearly directed towards nitrogen pollution in the EU. Its very purpose is to counter water pollution resulting from the spreading or discharge of livestock effluent and from the excessive use of fertilizers.^{50, 51} It contributes significantly to the implementation of the WFD. The Nitrates Directive requires Member States to establish code(s) of good agricultural practice (e.g. determining periods when fertilizing land is inappropriate) and allows them to impose more stringent restrictions on the use of fertilizers.⁵²

The Plant Protection Products Directive, which focuses on the application of a separate product and the ensuing exposure and risk, was replaced by a Regulation on the placing of plant protection products on the market in 2009.⁵³ The new Regulation aims to achieve a uniform and a high level of protection for both human and animal health and the environment, and it requires Member States to comply with the objectives of the WFD when they review approval and authorization of the Plant Protection Products Directive.

A new Directive on the sustainable use of pesticides⁵⁴ requires national action plans for reducing risks and dependence on pesticides, training programmes, specific practices, and specific measures for the protection of the aquatic environment.⁵⁵ These measures, including the establishment of buffer and safeguard zones or planting hedges along surface waters, giving preference to pesticides that are not classified as dangerous, applying the most efficient application techniques and using mitigation measures, need to be compatible with the relevant provisions of the WFD and other existing directives.

The Common Agricultural Policy (CAP) provides a framework for agricultural policy and rural development for all EU Member States. In general, the CAP is based on two principles (the so-called 'pillars') of agricultural expenditure, namely the market and income support (pillar 1), and the sustainable development of rural areas (pillar 2).⁵⁶ Sustainable rural development and cross-compliance

42 European Commission, *supra* note 39, p. 3.

43 European Commission, 'Guidance for administrations on making WFD agricultural measures clear and transparent at farm level', 26 May 2011, available at: <http://ec.europa.eu/environment/water/quantity/pdf/guidance_en.pdf> (last visited 21 February 2014).

44 T. Dworak et al., *Assessment of agriculture measures included in the draft River Basin Management Plans – Summary Report*, 2010, p. 2.

45 Article 11(3) of the WFD.

46 Van Rijswijk 2006, *supra* note 40.

47 Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources, OJ L 375, 31/12.1991, p. 1.

48 Council Directive 91/414/EEC of 15 July 1991 concerning the placing of plant protection products on the market, OJ L 230, 19.8.1991, p. 1.

49 Article 11(4) of the WFD.

50 Van Rijswijk 2006, *supra* note 40, p. 199.

51 Case C-416/02, *Commission v Spain*, Judgment of the Court (Third Chamber) of 8 September 2005, [2005] ECR I- 7566.

52 Van Rijswijk 2006, *supra* note 40, p. 201.

53 Regulation (EC) No. 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC, OJ L 309, 24.11.2009, p. 1.

54 Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides, OJ L 309, 24.11.2009, p. 71.

55 H.F.M.W. van Rijswijk & E.M. Vogelesang-Stoute, 'The Water Framework Directive and pesticides legislation: the influence of environmental quality standards and the river basin approach taken in the Water Framework Directive on the authorization of plant protection products', 2008 *European Energy and Environmental Law Review*, pp.78-89, at p. 82.

56 N. Herbbe et al., 'WFD and Agriculture – Linkages at the EU Level. Analysis of the Policy and Legal Linkages between CAP and WFD', 2006,

are two important instruments of the CAP. Sustainable rural development measures provide a broad set of opportunities to organize a link between water management (of the WFD) and rural development.⁵⁷ It potentially supports WFD implementation: it provides many opportunities for payments linked to the WFD, and it allows farmers to be compensated for income losses caused by the implementation of the WFD. The cross-compliance instrument establishes a link between the implementation of existing EU legislation (e.g. the Nitrate Directive, the Habitats Directive) and it also benefits WFD objectives:⁵⁸ although complying with animal health requirements does not have direct effects on WFD implementation, it does have indirect positive effects on water quality due to strong animal health standard controls. Both sustainable rural development and cross-compliance provide a direct or indirect contribution to the supplementary measures of the PoM under the WFD.

4.3. A case study within the EU legal framework

Incentive approaches have frequently been adopted in the EU since the introduction of the first EU Rural Development Regulation. Here I take one of the Member States – the Netherlands – as a case study to show how it has adopted the approach of buffer zones to address agricultural diffuse water pollution within the EU's harmonious legal system.

In the Netherlands, the agricultural sector has been stimulated from the 1950s onwards to intensify production in order to make the EU self-sufficient.⁵⁹ Due to the relatively large scale of horticulture and intensive livestock farming, the environmental impact of the agricultural sector in the Netherlands is greater than in most other (EU) countries.⁶⁰ For example, the use of chemical crop protection agents is roughly 2.5 times greater than the average in the EU-15 and discharges of nitrogen are approximately four times higher.⁶¹

The Dutch agriculture sector has been forced to take measures to deal with this problem under the WFD and the Nitrates Directive. The Nitrates Directive, as discussed above, has the aim of reducing water pollution caused or induced by nitrates from agricultural sources and in order to further prevent such pollution. It gives Member States the choice to apply nitrate action programmes either in designated areas or on their whole territory.⁶² The Netherlands has adopted the latter method. This means, according to Article 4 of the Nitrates Directive, that the Netherlands is obliged to formulate codes of good agriculture practice for the whole territory. The codes of good agriculture cover activities such as application periods, fertilizer use near water sources and on slopes, manure storage methods, spreading methods and crop rotation and other land management measures.⁶³

A 'buffer zone', a construction that is similar to the fertilizer-free zone under the codes of good agriculture, is an efficient policy instrument to address nitrate water pollution in the Netherlands. A buffer zone is a strip of land alongside water courses with restrictions regarding the application of nutrients and pesticides and mowing times.⁶⁴ The creation and management of buffer zones can contribute to the abatement of various water management problems at the same time.

Buffer zones with a specified width are obligatory under the Nitrates Directive and the Pesticides Directive in the EU. As the Netherlands uses nitrate action programmes for the whole of its territory, buffer zones are therefore obligatory in the whole of the Netherlands. However, these buffer zones can be extended under the EU Rural Development Programmes. The extended part is called a 'voluntary

available at: <http://www.ecologic.eu/download/projekte/1950-1999/1966/1966_deliverable_2-1.pdf> (last visited 21 February 2014).

57 Ibid.

58 Ibid.

59 The EU-15 comprised the following 15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom. A. Jolink, *Legal Implications of Introducing Economic Instruments in the Field of European and Dutch Water Law*, 2009, p. 18.

60 The Dutch Rural Development Programme 2007-2013, 2006, at p. 18, available at: <<http://www.regiebureau-pop.eu/nl/english/>> (last visited 21 February 2014).

61 Ibid.

62 A.M. Keessen et al., 'The Need for Flexibility and Differentiation in the Protection of Vulnerable Areas in EU Environmental Law: The Implementation of the Nitrates Directive in the Netherlands', 2011 *Journal for European Environmental & Planning Law* 8, no. 2, pp. 141-164, at p. 144.

63 Jolink, *supra* note 59, p. 20.

64 T. Dworak et al., *International review on payment schemes for wet buffer strips and other types of wet zones along privately owned land*, 2009, p. 13.

buffer zone,' which is additional to the mandatory buffer zones. A certain width of voluntary buffer zones provides additional ecosystem services: for example, they might filter more nitrates to benefit the water alongside and serve as water storage and they can be used to improve the ecological status of waters and serve nature conservation goals. However, if they do not receive anything in return, farmers will not use more land than is necessary for this purpose, because it will only entail higher costs for them, decreasing the amount of land available for production.⁶⁵ Therefore, in exchange for the additional services and maintenance of good water quality, the Dutch Water Boards pay certain compensation to farmers who voluntarily use more land as buffer zones and offer ecosystem services which exceed what is obligatory under EU law.⁶⁶ This idea of using financial compensation in exchange for ecosystem services is supported by the Rural Development Regulation under the EU.

Although more research is still needed, e.g. to increase understanding about buffer zone functions and requirements, the buffer zone approach, combined with other policy instruments, has now been implemented successfully to reduce nitrate water pollution in the Netherlands.

5. Legal discussion

The review of general policies in China (Section 3.1) shows that China has paid increased attention to water protection. A series of regulations and standards have been gradually improved or established. However, why is the water still so seriously polluted when there are so many laws? Well, 'the existing laws do have some effect', as one expert said, 'without these laws, the environment would be in worse shape.'⁶⁷

The 12 FYP marks a shift from the country's previous emphasis on economic development to a balanced and more sustainable development. Such a blueprint significantly contributes to water resource protection. However, actually putting it into practice is also a big challenge.

China has adopted a co-operative management approach to manage its water resources. Under the State Council there are at least 8 ministries (committees) which are directly related to water management.⁶⁸ Each of the policies addressed above was well designed, but overall it is difficult to say whether the regulations are working well together. Each institution has its own interests and does not pay much attention to the others when drafting a regulation, even though every draft needs final approval from the State Council. This makes coherent policy formulation more difficult, and easily leads to inefficient implementation and unsustainable water use. The Government is gradually improving this shortcoming, but to break down bureaucratic barriers, e.g. harmonizing the different interests of the different institutions, there is still a long way to go. In addition, enforcement is another continuous problem, particularly a lack of proportionate action against transgressions. For example, average environmental fines in 2006 were only ¥10,000 (€1,250),⁶⁹ which is too low to stimulate compliance.

In addition to the water resource management approach, there are two other important elements in the water pollution control system: one is water pollution control policies, and the other is pollution abatement measures.⁷⁰

Chinese water pollution control policies and regulations focus on the industrial sector rather than on agriculture. There are few policies specifically designed for agricultural pollution (see Table 1). No matter from which perspective – mandatory policies, economic policies or policies of public participation –

65 Jolink, supra note 59, p. 18.

66 Jolink, supra note 59, p. 26.

67 'Time to Enforce China's Environmental Law', Interview with Wang Canfa, 8 March 2013, available at: <<http://chinawaterrisk.org/interviews/time-to-enforce-china-environmental-law/>> (last visited 21 February 2014).

68 L. Dai, 'Recovering the Costs of Water Services in the People's Republic of China: Lessons from Article 9 of the European Union Water Framework Directive', 2012 *Utrecht Law Review* 8, no. 3, pp.102-118, at p. 103, available at: <<http://www.utrechtlawreview.org/index.php/ulr/article/view/208/0>> (last visited 21 February 2014).

69 B. Van Rooij, 'The People's Regulation Citizens and Implementation of Law in China', Amsterdam Law School Legal Studies Research Paper No. 2011-22, p. 9.

70 Ministry of Environmental Protection (MEP) & Asian Development Bank (ABD), 'Market-based instruments for water pollution control in China', 2010, available at: <https://www.google.nl/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CCwQFjAA&url=http%3A%2F%2Fhosted.com100.com%2Fknowledgebase%2FDownload_ArticleAttachment.aspx%3Fid%3D100046%26siteid%3D88094&ei=f0XuUc6XCMXsGajp4GoCQ&usq=AFqjCNHfJcfvimYMOI9aGG07HUTBY-iiwg&sig2=b7t43Js-4qRwW33nQDM2kQ&bvm=bv.49641647,-d.Yms>> (last visited 21 February 2014).

agricultural pollution control is seldom mentioned. In practice, the policies to control water pollution from agriculture are merely an extension of the policies to control industrial pollution.

Table 1 Classification of China's water pollution control policies

Approaches	Industrial sources of pollution	Agricultural sources of pollution	Urban residential and tertiary industry pollution sources
Coercive (mandatory) rules	Basin water pollution control planning; Environmental impact assessment and the 'three simultaneousness';* Total pollutant discharge control; Discharge permits; Plant closure and suspension of production; Centralized sewage treatment	Basin water pollution control planning	Basin water pollution control planning; Environmental impact assessment and the 'three simultaneousness'; Discharge permits; Centralized sewage treatment
Economic rules	Pollution levies; Waste-water treatment tariffs; Ecological compensation pilot programmes; Emission trading pilot programmes	–	Pollution levies; Waste-water treatment tariffs
Public participation rules	Public reporting and grievance hotlines	–	Public reporting and grievance hotlines

* The 'three simultaneousness': the design, construction, and operation of pollution control facilities are required to be constructed simultaneously with the main project. Source: Revised on MEP & ABD, supra note 70.

This table clearly shows that there is insufficient attention for agricultural pollution compared to industrial pollution. This constitutes a high risk for water management because today agriculture is actually the biggest contributor to water pollution in China. If the Government continues to fail to improve this, the established 'Three Red Lines' (Section 3.1) will never be complied with.

Another problem is the control measures selection. China has adopted a similar approach to point-source pollution control when dealing with diffuse pollution. It relies on administrative enforcement rather than combining it with other instruments – e.g. the incentive approach, public participation or rural education – as is done in the EU. To address the pollution from rural domestic refuse, the main instrument in China currently is still administrative punishment, which is a typical point-source pollution control approach. For this kind of control measure to be effective, it needs a large number of competent authorities, staff, equipment and funds. This is very difficult under the current financial conditions and the institutional structure, as the staff and financial support at the local level are far from sufficient. Although clear targets have been established by 12 FYP and its subordinated plans, it still needs time to develop efficient approaches to reach these goals. Appropriate legal instruments will be the key to diffuse water pollution control.

There is an old Chinese saying: *Know what to expect before you go (zhi ji zhi bi, bai zhan bu dai)*. It means that only when you know the enemy well, can you win the battle. As regards the battle against diffuse water pollution, only when one clearly knows the problems, can one take a further step.

The current problem of the legal systems for dealing with animal waste pollution in China is that the systems do not match the practical situation very well. For example, there are few regulations on backyard breeding, which still accounts for a large part of national livestock breeding. According to the China Agriculture Year Book, the ratios of slaughtered fattened pigs in backyard poultry and livestock breeding and large-scale intensive breeding were 76.8% and 23.2% in 1998; and 44% and 56% in 2008, respectively.⁷¹ Although there has been a drop in backyard poultry and livestock breeding, it is still a

71 Y. Qiao & X. Ji, 'Economic Analysis of Pig-breeding by Scaled Farms and Backyard Poultry in China', 2012 *Market Perspective* 48, no. 8,

large proportion of the total pollution. However, there is no sufficient legislation to address this problem. Compared to the intensive large-scale farms, backyard poultry and livestock farmers normally have more difficulty in accessing markets and meeting market standards, so they tend to squeeze breeding costs and seldom consider environmental impacts. Based on different traditions, knowledge, wealth and geography, the ways of feeding and faecal treatment are also diverse. These diversities entail high risks of the spreading of diseases and multiple pollution. Therefore some local governments have tried to ban this breeding mode by introducing specific policies. However, this is very difficult in practice as it is a traditional custom: many young, especially male, rural residents in China are flooding into big cities as migrant workers, leaving the elderly, women and children to tend their households and farms alone.⁷² Backyard poultry and livestock breeding is not only a way of self-sufficiency for these families, but also a source of income. In addition, the products from backyard poultry and livestock breeding are actually very popular in markets as customers believe that less chemical feeding has been used compared to large-scale farms. Therefore, prohibition has been ineffective.

Compared to farmers who own large-scale farms in some European countries, farmers in China only have small pieces of land. This makes China's government supervision over the use of fertilizers and pesticides more difficult and expensive. The traditional end-of-pipe control cannot work well as there is insufficient monitoring staff, equipment and funding. Currently the misuse and overuse of fertilizers and pesticides are still the main causes of agricultural pollution. This is because previously, Chinese local governments persuaded farmers to promote the use of chemical fertilizers and pesticides to increase yields. Most farmers today are still of the opinion that 'the more fertilizers and pesticides, the greater the yields'. It is very difficult to change such established behaviour without long-term government encouragement and education.

Subsidies for fertilizer production are indirect causes of diffuse water pollution. To a large extent, subsidies have disrupted the market, which cannot perform its functions based on market rules, resulting in market failure. In the case of chemical fertilizers, this failure will result in a large demand for and the overuse of these fertilizers, which, in turn, will result in heavy nitrogen loss and eventually in environmental pollution when the overused fertilizers cannot be completely absorbed by crops. China still has a high input of fertilizers and pesticides because it needs to feed its increasing population, which seems impossible to achieve without using them. However, this overuse has already caused serious side effects: not only has it led to excessive nitrogen in water, but it has also increased food safety risks for the general public.

In the EU, an interactive legal system is applied to address water problems. In contrast to China's legal system in terms of diffuse water pollution prevention and control, in the EU's legal system one of the main features is coordination across sectors (e.g. the water sector and the agricultural sector).

The WFD serves as an umbrella directive for water management and refers to many other specific directives and regulations, e.g. the Nitrates Directive and the Directive on Pesticides. The main achievements of this coordination are the following: greater transparency in policy implementation, better communication and use of joint resources by the administration bodies concerned (within and across Member States and regions), as well as stronger incentives to avoid transboundary conflicts.⁷³ This integrated system has been successful in improving the EU's water protection, even though full compliance has not yet been reached.⁷⁴

The successful application of buffer zones in the Netherlands was described in Section 4.3. However, this does not mean that buffer zones can definitely be adopted in China, since the two countries have very different water management systems. The lesson that China can draw is a new perspective to tackle the old problems, as applied by the EU as well as the Netherlands.

pp. 14-19, at p. 14.

72 M. Schneider, 'Feeding China's Pigs: Implications for the Environment, China's Smallholder Farmers and Food Security', 2011, available at: <<http://www.iatp.org/documents/feeding-china%E2%80%99s-pigs-implications-for-the-environment-china%E2%80%99s-smallholder-farmers-and-food>> (last visited 21 February 2014).

73 A. Volkery et al., *European Commission – General Directorate Environment Support to Fitness Check Water Policy*, 2011, p. 14.

74 European Commission, *supra* note 39, p. 9.

Of course the EU's legal framework also entails some concerns. The WFD's policy objectives, for example, are sometimes perceived as overambitious. At this stage it is difficult to estimate the reality of such concerns – certainly the objectives are ambitious, but the implementation timetable from 2000 has been, and will be, longer than any other EU environmental legislation, so it will take some years before an ex-post evaluation of the level of ambition can be made.⁷⁵

'The moving of a rule or a system of law from one country to another has now been shown to be the most fertile source of legal development since most changes in most systems are the result of borrowing.'⁷⁶ Yet legal borrowing needs a very careful approach. An expert once said 'China has borrowed heavily from a number of international sources and experts in drafting its laws, but the end product is, in almost every case, uniquely Chinese.'⁷⁷ In the current period of social transition, China is now facing many newly emerging situations, some of which have occurred in other regions too, e.g. in the EU, and some of which are somehow 'uniquely Chinese', like the pollution from backyard poultry and livestock breeding. Both the native and the more universal problems need to be taken into account in legal reform efforts.

6. Conclusion

Diffuse water pollution from agriculture is a major contributor to water pollution in both China and the EU.

The direct causes of diffuse water pollution in China are animal waste from livestock and poultry farms, and the overuse and misuse of chemical fertilizers and pesticides. Pollution from livestock and poultry manure was underestimated until the National Census revealed that they actually amounted to 45% of total national COD emissions and 96% of COD in agriculture diffuse pollution. Fertilizer overuse has turned out to be a serious problem in China since the 1980s, the average levels of nitrogen fertilizer have exceeded the internationally accepted limit (225kg per hectare) in more than half of the regions. China has only 7% of the world's arable land, but it is the largest consumer of pesticides. The annual usage remains at 1.3 million tons, which is 2.5 times higher than the global average. The misuse of fertilizers and pesticides has caused serious water pollution even if they were not used near water, since rainfall could eventually wash them into waters.

In the past few years, the Chinese Government has paid increasing attention to water management. The 12 FYP is the backbone of the new approach, to guide water resource management in China in the coming years. Compared to the 11 FYP, it has added two new pollutants (ammoniacal nitrogen and nitrogen oxides) to the 'Total Amount Control System' and has added agricultural source pollution and traffic source pollution to its management scope. To achieve the goals of 12 FYP, the Central Government evaluates (once every five years) the performance of local governments based on their implementation of the 'Most Stringent Water Management System'. Under this pressure, local governments have set up their own 12 FYPs and will make efforts to reach the targets. However, in these Plans, the pressure of diffuse pollution from agriculture has not been addressed sufficiently; governments have not shifted their focus from point-source pollution control to diffuse source pollution control. Until now, in most regions of China, the approach to tackling diffuse water pollution is still the extension of 'command-control' approach, which works efficiently in industrial pollution control but is not an adequate approach when dealing with diffuse pollution. Furthermore, the current legal framework does not match the practical situation. For example, for animal waste pollution control, there are no tailored measures to address backyard poultry and livestock production, which still greatly contributes to diffuse pollution.

The review of the legal framework in the EU has shown that the EU has adopted an interactive legal system to address its diffuse water pollution problems. Harmonization of various directives and regulations is the main feature of the EU legal system. Applying incentive instruments to deal with diffuse water pollution is not new in the EU, and this article has described the buffer zone instrument

75 Volkery et al., *supra* note 73, p. 8.

76 U. Mattei, 'Efficiency in legal transplants: An essay in comparative law and economics', 1994 *International Review of Law and Economics* 14, no. 1, pp. 3-19.

77 C. McElwee, 'Shaping China's green laws', 2011, available at: <<http://www.chinadialogue.net/article/show/single/en/4425-Shaping-China-s-green-laws>> (last visited 21 February 2014).

as used in the Netherlands to show how a Member State tackles nitrates water pollution within the EU's harmonious legal framework.

An efficient and effective legal framework plays an essential role in dealing with diffuse water pollution problems. Collaboration, especially between the water management sector and the agricultural sector, is essential to tackle diffuse water pollution. The EU legal framework provides valuable lessons for China, which has less experience in this regard. China has the option to apply similar solutions to tackle its diffuse water pollution as the Netherlands and some pilot projects have already been started in a number of rural regions.

However, further research is required to build an efficient legal framework or apply incentive instruments in China, as there are many differences between the two legal systems and water management systems, and also the instruments *per se* need more exploration. This article has provided an overview of the EU legal framework and a new perspective of the incentive instrument as a reference, and has hopefully provided valuable information for policy makers and suggested workable solutions for dealing with the continuous diffuse water pollution in China.

Following this comparison, the following can be concluded regarding the existing deficiency of China's legal framework:

(1) In general, the pressure of diffuse pollution has received insufficient attention, both in the field of water management and in the agricultural field. This certainly affects the selection of legal instruments, and (2) the current approach to tackle diffuse water pollution is still the extended performance of point-source control. This makes it necessary for the Government to invest more in resources: staff, equipment and funds to combat China's diffuse water pollution directly. (3) Other elements in the failure to combat diffuse water pollution are the flawed design of livestock and poultry breeding policies, and the numerous subsidies for fertilizers and pesticides, which affect the water environment indirectly.

The lessons that China can learn from the EU are not to simply copy the instruments, but to adopt an integrated approach to deal with the problem. China has made a good start by carrying out a National Census to reveal the problem and producing a 12FYP to express its determination. However, there is still a long way to go. In the future process of legal formulation and perfection, many lessons provided by the EU can be taken as reference or inspiration, e.g. the integration and harmonization of water and agriculture policies, the good agriculture practices, the best technology for pesticides production, and the rural development incentive programmes. ¶

Annex 1 Policy overview of water resources management in China

Name	Date & Institution	Highlights
Notice of the State Council on Issuing the '12 FYP' for National Environmental Protection	No. 42 [2011] of the State Council	Setting Reduction targets for main pollutants by 2015; Implementing a target responsibility system for environmental protection; Strengthening the construction of legal systems; Improving environmental economic policies.
General Planning for the Development of Environmental Protection Legislation and Environmental Economic Policies in China for the 12 FYP Period	No. 129 [2011], MEP	Key Fields and Major Tasks (2011-2015): - Improving the system of laws on environmental protection; - Promoting the legalization of environmental economic policies; - Establishing the system of the paid use and trading of emission rights; - Establishing ecological compensation mechanisms; - Improving policies for public finance support for environmental protection.
2011 No. 1 Document (Decision of the CPC Central Committee* and the State Council on Accelerating Water Resources Reform and Development)	No. 1 [2011] of the CPC Central Committee	Applying the most stringent water management system.
Opinions of the State Council on Applying the Strictest Water Resources Control System	No. 3 [2012] of the State Council	Three red lines: a red line of water resource development and use; a red line of water use efficiency; and a red line of the total amount of pollutant emissions into rivers and lakes. Four indicators: total quantity control of water consumption, efficiency control of water use, pollutant-receiving capacity control of water quality in water function zones, and a performance assessment system for water resources management.
National Plan on Groundwater Pollution Control	No. 128 [2011] of the Ministry of Environmental Protection	A total of RMB 34.66 billion (\$5.48 billion) will be invested in six categories of projects between 2011-2020: survey, prevention, remediation of groundwater pollution, control of pollution in underground drinking-water sources, agriculture-related groundwater pollution control, and underground water environment monitoring.
Water Pollution Prevention Plan in Key Basins, 2011-2015	May 2012, Ministry of Environmental Protection, National Development and Reform Commission, Ministry of Finance and Ministry of Water Resources	Six major tasks: - to strengthen the protection of drinking water, - to improve industrial pollution controls, - to enhance urban sewage treatment systems, - to actively promote comprehensive environmental and ecological construction, - to enforce coastal water pollution prevention and control, and - to enhance the watershed level of risk prevention.

Name	Date & Institution	Highlights
Water Development Plan, 2011-2015	No. 618 [2012], National Development and Reform Commission, Ministry of Water Resources, and Ministry of Housing and Urban-Rural Construction	Main targets: Flood control, the saving and protection of water sources, water and soil conservation, ecological rehabilitation, developing a basic system of water projects and water rights.
Assessment Methods for the Most Stringent Water Management System	No. 2 [2013] of the General Office of the State Council	Sets out water usage criteria, efficiency ratios for industry and agriculture and water quality measurements for each province which filter into the national water caps and targets.
Guidance on the Development of Environmental Protection Services	No. 8 [2013] of the Ministry of Environmental Protection	Formation of 50 environmental protection service companies with revenues in excess of RMB1billion (\$0.16 billion).
12FYP on the Prevention and Control of the Environmental Risks of Chemicals	No. 20 [2013] of the Ministry of Environmental Protection	This plan aims to control the use and discharge of 58 harmful chemicals according to categories and their levels of potential harm to the environment.
Circular on Issues Concerning Collection Standards for the Water Resource Fee	No. 29 [2013], National Development and Reform Commission, Ministry of Finance and Ministry of Water Resources	Formulating principles, standards and goals of the water resources tariff formulation system.

* CPC Central Committee: Central Committee of the Communist Party of China

Annex 2 Policy overview of livestock and poultry breeding

Name	Date & Institution	Highlights
12 FYP on Prevention and Control of Livestock and Poultry Breeding	Nov. 2012, MEP & MA	Aims of 2011-2015: - Establishing 'forbidden zones'; - Decreasing the discharge of COD, ammonia and nitrogen by 8% and 10% respectively compared to the year 2010; - Increasing waste treatment facilities for large-scale breeding farms to more than 50% and reducing 1.4 million tons of COD, and 100,000 tons of ammonia and nitrogen every year.
12 FYP on National Rural Economic Development	June 2012, NDRC	Promoting biomass projects in rural areas
12 FYP on Animal Husbandry Development	No. 8 [2011], MA	- Promoting the ecological management mode (combining planting and breeding) according to local conditions; - Ensuring the recycling of wastes.
Discharge Standards of Pollutants for Livestock and Poultry Breeding	Dec. 2001, EPA & GAQ	- Applying to large-scale intensive livestock breeding; - Providing environmental standards for waste water, odour discharge and residue disposal; - Setting out a maximum daily discharge concentration on average for water pollutants and odour, and the total allowed water discharge.
Technical Standards for Preventing Pollution in Livestock and Poultry Breeding	Dec. 2001, EPA	Stimulating basic technical requirements for the siting and layout of livestock and poultry farms, the process of clearing and stockpiling dung, sewage treatment, the treatment and use of solid manure, feedstuff and breeding management, the treatment and disposal of dead livestock and poultry caused by diseases, and pollutant monitoring.
Exposure Draft on the Prevention and Pollution Control of Livestock and Poultry Breeding	July 2012, LAO of the State Council	Incentive measures: - Financial support for pollution treatment facilities; - Reward for voluntary emission reductions.

EPA: Environmental Protection Agency which was upgraded to the Ministry of Environmental Protection (MEP) in 2008.

MA: Ministry of Agriculture.

NDRC: National Development and Reform Commission.

GAQ: General Administration of Quality Supervision, Inspection and Quarantine.

LAO: Legislative Affairs Office.

Annex 3 Legal and policy overview of the use of fertilizers and pesticides

Legislation & Regulations	Year	Production Management	Competent Authorities	Usage	Competent Authorities	Diffuse Water Pollution Control	Competent Authorities	Economic Instruments
Cleaner Production Promotion Law	2002, 2012	Adopting toxin-free, non-hazardous or low-toxin and low-harm raw materials to replace toxic and hazardous raw materials	Ministry of Industry and Information Technology	Agricultural producers should use chemical fertilizers, pesticides, agricultural films and feed additives wisely based on scientific recommendations.				
Agricultural Law	1993, 2009, 2012			Farmers and agricultural producers should maintain cultivated land, use fertilizers, pesticides, and agricultural films rationally.	Administrative departments of agriculture in People's Governments above county level monitor cultivated land quality regularly.	Preventing and controlling waste water, gas and solid waste pollution and agro-ecological pollution.	Governments above county level	Farmers who convert cultivated land back to nature are eligible for subsidies from governments; The State encourages farmers and raises agricultural funds in various forms on a voluntary basis.
The Prevention and Control Law for Water Pollution	1984, 1996, 2008	National standards for water environment quality; National standards for the discharge of water pollutants.	Ministry of Environmental Protection	Providing guidance to agricultural producers as to how to apply fertilizers and pesticides wisely.	Administrative departments of agriculture in People's Governments above county level.	A whole section (Section 4) to address the prevention and control of agricultural and rural water pollution.		The State will adopt eco-compensation mechanisms for water environments located in certain areas.

Legislation & Regulations	Year	Production Management	Competent Authorities	Usage	Competent Authorities	Diffuse Water Pollution Control	Competent Authorities	Economic Instruments
Water and Soil Conservation Law	1991, 2010	Monitoring water and soil conservation.	People's Governments at and above county level	Controlling the use of fertilizers and pesticides.		Organizing entities and individuals to reduce diffuse pollution resulting from water and soil loss.	Local People's Governments at all levels	The states shall raise funds and bring the ecological benefit compensation within the State's ecological benefit compensation system.
Water Law	1988, 2002	Combining river basin management with administrative regional management.	Ministry of Water Resources			Drinking-Water Sources Protection Zones	People's Governments at or above provincial level	Units and individuals that have realised outstanding achievements in the development, utilization, conservation, or management of water resources, or in the prevention and control of water disasters shall be rewarded by the People's Governments.

Annex 4 Basic and supplementary measures of the WFD

WFD Directive 2000/60/EC		Protecting and enhancing the status of all EU waters	RBMP PoM	
PoM	Basic Measures	Nitrates Directive Directive 91/676/EEC	Reducing water pollution caused by nitrates from agricultural sources.	Codes of good agricultural practice
		Regulation on the placing of plant protection products on the market Regulation (EC) No. 1107/2009	Ensuring a high level of protection for both human and animal health and the environment.	Precautionary principle
		Directive on the sustainable use of pesticides Directive 2009/128/EC	Achieving a sustainable use of pesticides by reducing the risks and impacts of pesticide use on human health and the environment.	Integrated pest management; Specific measures
		CAP	Providing market stabilization, a fair standard of living for farmers and increased productivity in agriculture ensured by common market organizations.	Rural development
		CAP	Providing market stabilization, a fair standard of living for farmers and increased productivity in agriculture ensured by common market organizations.	Cross-compliance
	Supplementary Measures	CAP	Providing market stabilization, a fair standard of living for farmers and increased productivity in agriculture ensured by common market organizations.	Cross-compliance