# The Eco-Compensation Mechanism in Tai Lake Watershed


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Tai Lake is the third largest freshwater lake in China. Serious water pollution, especially trans-jurisdictional water pollution, problems are consistent issues in the region. To deal with these problems, four types of the eco-compensation mechanism are applied in this region: eco-compensation between governments, eco-compensation between governments and farmers, eco-compensation between governments and industry and eco-compensation among industries. This chapter analyses these four types of the eco-compensation mechanism from a legal perspective and sheds light on how the mechanism has been applied in China. It aims to provide valuable experiences for domestic water management and elsewhere in the world in protecting the provision of water-related ecosystem services.

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## 1 Eco-compensation in China

Eco-compensation (*sheng tai bu chang*) in China is mainly a public mechanism to promote environmental protection and restoration, including through the payment for ecological services (Asian Development Bank 2016). It generally creates not only incentives but also disincentives. Incentives refer to a reward or compensation for a right that is foregone in order to maintain a certain ecosystem service. Disincentives refer to charges for the loss of or damage to ecosystems and natural resources (China Council for International Cooperation on Environment and Development (CCICED) 2010; Zhang et al. 2010).

Therefore, eco-compensation in China is defined in both narrow and broad terms. The narrow definition refers to rewards for protecting the environment and natural resources; and the broad definition covers not only rewards but also environmental pollution charges (Li and Liu 2009), for example, the pollution discharge fee. As there are already a series of laws and regulations to deal with pollution charges in China, this chapter focuses on the narrow definition of eco-compensation.

In order to develop internal ecosystem services markets, China's central and local governments have rapidly expanded their environmental protection policies, especially during the past few years, largely under the heading of "eco-compensation". The first official document to stimulate an eco-compensation mechanism was a "Decision regarding Strengthening Environmental Protection" issued by the State Council in 2005, which states that the government "[…] should improve eco-compensation policy, and develop an eco-compensation mechanism as soon as possible […] pilot projects can be launched at both local and national level". Following this, many provinces enacted their own regulations and eco-compensation projects. The "win-win development" principle was later laid down as one of the cornerstones of the eco-compensation mechanism by the Ministry of Environmental Protection (MEP), which recommended carrying out pilot projects in four fields:

- Eco-compensation for nature reserves
- Eco-compensation for eco-function areas
- Eco-compensation for the development of mineral resources
- Eco-compensation for watersheds

As of 2013, three national laws—the Forest Law, the Law on the Prevention and Control of Water Pollution and the Water and Soil Conservation Law—established the principle of eco-compensation (Asian Development Bank 2016), which provide legal basis for the eco-compensation mechanism. In 2016, the State Council approved a paper entitled "Several Opinions on Establishing a Sound Eco-Compensation Mechanism and the Eco-compensation Regulations" (The State Council 2016). The opinions paper calls for the establishment of new mechanisms to promote ecosystem protection, including eco-compensation, and notes that market-based mechanisms should be further studied and introduced (Asian Development Bank 2016).

Most of Chinese experience with eco-compensation is directly or indirectly related to watersheds (Asian Development Bank 2016). The number of eco-

compensation projects in watersheds has increased from 8 in 1999 to more than 47 in 2008, with an estimated transacted value of roughly $7.8 billion, covering some 290 million ha (Stanton et al. 2010; Qingfeng Zhang 2010).

Tai Lake watershed in Jiangsu Province is taken as a case study in this chapter since it is one of the selected eco-compensation pilot schemes in China, one of the most developed and polluted regions and one of the watersheds in which few types of eco-compensation are being applied. By analysing the characteristics of the eco-compensation mechanism in the Tai Lake watershed, this study sheds light on how the mechanism has been applied in China and provides valuable domestic experiences for national water management in protecting the provision of water-related ecosystem services.

## 2 Eco-compensation in the Tai Lake Watershed

Tai Lake is the third largest freshwater lake in China. The watershed occupies an area of some 36,500 square kilometres and extends across multiple jurisdictions: Jiangsu Province (52.6%), Zhejiang Province (32.8%), Shanghai Municipality (14%) and Anhui Province (0.6%) (Monitor Center 2013). As one of the most developed regions in China, with only 0.4% of the land territory but 4.4% of the population, the Tai Lake watershed produced 10.3% of GDP; per capita GDP in this region was 2.4 times more than the national average in 2012 (Bureau of Taihu Lake Basin Ministry of Water Resources 2012). The lake connects seven large cities across East China, including Shanghai and Hangzhou, which have a population of 23.8 million and 8.8 million, respectively.

Serious water pollution has been caused by unprecedented economic growth and rapid urbanization in the Tai Lake watershed region. The entire lake has suffered from eutrophication since 1993, the most serious crisis coming in 2007 when dozens of centimetres-thick algal blooms covered the entire lake and tap water turned yellow and was foul-smelling (Liang and He 2012). Trans-jurisdictional water pollution problems are persistent issues in this watershed as it extends across three provinces and one municipality.

In 2008 alone, China's Central Government allocated more than RMB 111 billion (US $17.9 billion) to improve national lake water quality from Class V to Class IV, with an overall goal to achieve Class III status by 2020 (Liang and He 2012).[1] In 2011, the State Council issued the Regulation on the Administration of the Tai Lake Basin, which requires upstream-downstream eco-compensation on the basis of water quality (Asian Development Bank 2016). The government of Jiangsu Province—which is covered by more than half of Tai's total watershed

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

(52.6%) —has worked to improve its regulatory framework in order to improve water quality in the lake. For example, in 2014, the government issued Implementation Measures on Water Environmental Compensation in Jiangsu Province (Department of Finance of Jiangsu and Department of Environmental Protection of Jiangsu 2014), which aims to establish compensation mechanism within the province. Over the past decade, eco-compensation schemes have been significantly developed across this region.

Four types of eco-compensation have been applied in the Tai Lake watershed: eco-compensation between governments, eco-compensation between governments and farmers, eco-compensation between governments and industry (Luo et al. 2011) and eco-compensation among industries. These are explored in more detail below.

## *2.1 Eco-compensation Between Governments*

Bidirectional intergovernmental eco-compensation between upstream areas and downstream areas within one watershed is a newly developed mode of eco-compensation, aimed primarily at addressing trans-jurisdictional water pollution problems. It can motivate both the upstream and downstream jurisdictions to act jointly in protecting their shared water resources.

Jiangsu Province selected four cities—Nanjing, Changzhou, Wuxi and Zhenjiang—as pilot schemes for applying governmental eco-compensation instruments, beginning in 2007. Seven monitoring areas were selected in the four cities, where water quality standards were set by the provincial government. Using these standards as baselines, the provincial government combines the environmental protection responsibility of city governments with financial incentives. For example, in the Xu River in Changzhou City (one of the sub-watersheds of Tai Lake), a monitoring site was established by the provincial Administrative Department of Environmental Protection. The department records the water quality on a weekly basis and calculates the monthly average. If the result exceeds the baseline, meaning the water quality is below the standard set, the upstream city (Nanjing) has to compensate the loss suffered by the downstream city (Changzhou) in accordance with Jiangsu provincial regulation. The rationale for this approach is that the extra pollution caused by Nanjing City results in extra expenditure on pollution control for Changzhou City. Up to 2008, Nanjing City had compensated Changzhou City by RMB 18, 000 (US $29, 032), and Changzhou City had compensated its downstream city Wuxi City by RMB 180, 000 (US $29, 032) due to the recorded water quality results in the monitoring areas below the standard set.

In order to enhance the motivation for water quality protection, the compensation level is set at twice the pollution control cost. The compensation is incorporated into special environmental protection funds or pollution prevention and control funds for water pollution control and ecosystem restoration (Governmental Office of Jiangsu Province, 2007). In another case, if the recorded results in the monitoring areas between the upstream city and the downstream city are above the designated base-

lines, the downstream city must compensate the upstream city, which stated by the State Council, "…if the upstream cities achieve the water quality targets in the monitoring areas of administrative boundaries, the downstream regions should compensate the upstream regions" (The State Council 2011). However, the legal nature of such compensation gives rise to further discussion (see Sect. 3).

## *2.2 Eco-compensation Between Governments and Farmers*

Diffuse water pollution is a main contributor to water pollution in the Tai Lake watershed. If the total nitrogen (TN) and the total phosphorus (TP)—two main pollutants in diffuse agricultural pollution—had not been included in the evaluation of the water quality, most of the surface water in Tai Lake would have reached Class III. However, when the TN and TP are taken into account, the water quality drops to a level worse than Class V especially in Jiangsu Province.

In 2011, the State Council introduced a special regulation aimed at tackling diffuse water pollution in Tai Lake (The State Council 2011), which required local governments to take measures such as:

- "constructing an ecological protection forest within a 500-metre area around the shoreline of the lake,
- a 1500-metre area around the drinking water source protection zones, and
- within a 200-metre area along both of the river banks of the shore of the lake"
- Local county governments:
- "should provide subsidies and support to farmers who have to change their jobs due to the ban on aquaculture and livestock breeding, and the projects of returning the cultivated land or fishery to the lake"
- "should guarantee basic life for those farmers by skill training or incorporating them into the social security system"
- "should provide subsidies for farmers whose income has decreased or whose expenditure has increased due to the projects to reduce pesticide and fertilizer use"

In fact, Jiangsu Province had already formulated its own regulation in 2007 to address pollution problems caused by algal blooms (Jiangsu Provincial Government 2007). It requires the cities within its jurisdiction "to return the cultivated land to the lake, to plant forests and to remove livestock breeding and traditional planting within 5-kilometres around the first-grade protection zones of Tai Lake". This proved to be a difficult exercise in practice. For example, the East Tai Lake in Suzhou City, an 180,000 Mu (12,000 Ha.) bay on Tai Lake, was occupied by enclosed fish farms with 165,700 Mu (11,048 Ha.) (Han 2010), which accounted for more than 90% of the surface water of the East Tai Lake and more than 80% of the total enclosed fish farm area in the Tai Lake. The intensive enclosed fish farms were one of the main causes of the algal blooms due mainly to the excessive use of fish feed. In order to achieve its water quality target for 2012 (from Class V to Class IV),

the government of Suzhou City reorganized its intensive enclosed aquaculture. The City's governmental policy requires the decrease of enclosed aquaculture from 300,000 Mu (20, 000 Ha.) of water areas to 45,000 Mu (3000 Ha.) (Government of Suzhou City 2008), which resulted in significantly improved water quality.

However, problems arose since the rural fish farmers were seriously affected as a consequence of this massive reorganization. For example, in the Wuzhong District of Suzhou City, 426 fish farming families (252 professional and 174 non-professional) were directly affected when 22,521 Mu (1501 Ha.) water areas were reclassified. The government provided RMB 793.3 million (US $ 128 million) in total as compensation subsidies for those farmers who had suffered financial losses, and some of them were compensated by resettling fish farms in other locations. However, the compensation system did not run smoothly, as the actual situation was very complicated, with some unsatisfactory outcomes, discussed in more detail below (see Sect. 3).

### *2.3 Eco-compensation Between Governments and Industry*

According to the Water Environment Comprehensive Management Plan for the Tai Lake Basin, there are some 2.10 million industries in the Comprehensive Treatment Region of the lake. Of this total, around 1.04 million are in Jiangsu Province and 1.06 million in Zhejiang Province; 0.56 million of these industries belong to the six major pollution industries (textile industry, manufacture of paper and paper products, petroleum processing industry, coking and nuclear fuel processing, manufacture of raw chemical materials and chemical products and manufacture of medicines and the manufacture of chemical fibres), which also contribute significantly to the economic development in the Tai Lake region.

To control the water pollution caused by its intensive polluting industries, Jiangsu Provincial Government has implemented an approach that evaluates the receiving capacity of the surface water in water environmental function zones and applies a scheme of pollutant loading cap control and a scheme of the discharge credits paid use (is only limited to chemical oxygen demand (COD) discharge so far). The Price Bureau of Jiangsu Province set different charging standards for emission credits for different industries. Under the pollutant loading cap control system, the amount of the pollution discharge credits is limited, which means that once the government has allocated all of the credits, new applicants cannot purchase any from the government but can only either buy surplus credits from other dischargers via an emission trading platform (Sect. 2.4) or improve their own pollution prevention facilities to save credits themselves. It is a so-called bubble policy, where polluters are free, within an imaginary bubble, to offset excess emissions from one source by a reduction made in another source, as long as the overall quantity is not exceeded (Kraemer et al. 2004).

In the Tai Lake watershed, 1357 dischargers (annual emission greaterthan COD 100 tons) have been selected in the programme of discharge credits paid use until 2010. The purchase amounts of COD achieved 49,700 tons per year during 2009–2010, and the collected payments from discharge permits reached RMB 175 million (US $28.2 million) (Li et al. 2010). The revenue, which is managed as governmental nontax revenue, allocates 10% to a provincial special fund for environmental protection and 90% as local (Price Bureau 2008). This special fund is used exclusively for environmental governance, the establishment of environmental monitoring and the construction and maintenance of the emission credits trading platform in the Tai Lake watershed within Jiangsu jurisdiction.

## *2.4 Eco-compensation Among Industries*

On the basis of scheme of the discharge credits paid use, the emission trading system has been initiated in a few pilot cities in the Tai Lake watershed since 2008 but limited to COD emissions too. The governments of local cities set maximum limits on the total allowable emissions of COD and then allocate these to the governments at county levels, which allocate their credits to selected industrial dischargers for a specified period of time. After receiving a written notice from the local Environmental Protection Bureau, the selected industrial dischargers can buy discharge credits from governments which are embodied in discharge permits. With these permits comes the right to use the environmental capacity resources and to buy or sell their discharge credits.

Emission trading occurs only in one “bubble”—in which the total maximum amount of pollutants is determined, which means that purchasing from out of the region is not allowed for the city or county whose total discharge pollutants have already exceeded the control targets or where the receiving water body has failed to reach the required water quality standards. Trading can be initiated between the dischargers and the Regulatory Authority of Emissions Trading or among the dischargers themselves on a specified trading platform monitored by the Provincial Regulatory Authority. See Fig. 1.

Jiangyin City is one of the pilot cities for emission trading in the Tai Lake watershed. In 2010, 158 dischargers (annual COD emissiongreaterthan100 tons) discharged 6930.7 tons COD and paid RMB 18.7 million (US $ 3 million) for discharge permits. Among these 158 industrial dischargers, 68 received extra discharge credits by emission trading with a total turnover achieved of RMB 6.7 million (US $1.2 million) (Li et al. 2010). As well as the collection from discharge credits paid use, the revenue from the trading is used exclusively for environmental protection measures, the establishment of environmental monitoring facilities and the maintenance of the emission credit trading platform.

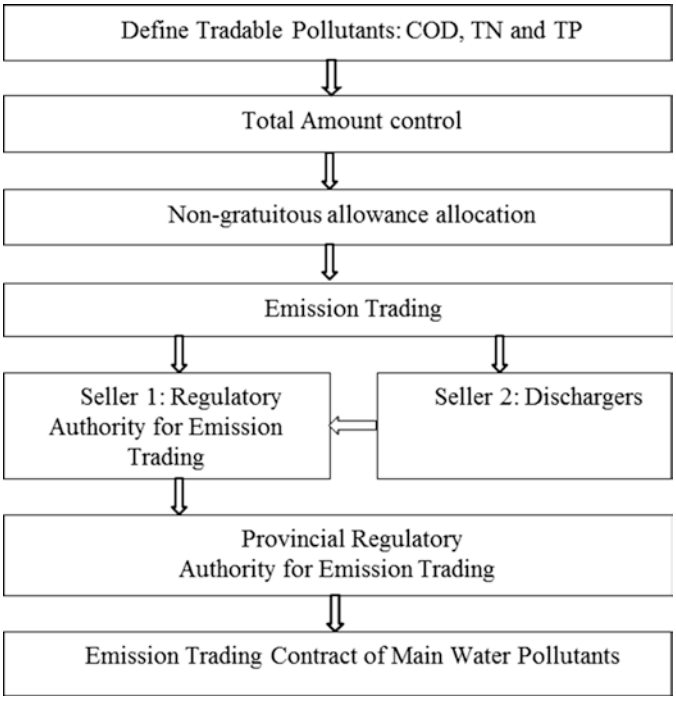


**Fig. 1** Water pollution trading scheme. (Source: Dai L 2014. Exploring China's approach to implementing "eco-compensation" schemes: The Lake Tai watershed as case study considered through a legal lens. Water Int 39(5):755–773. Copyright © International Water Resources Association, reprinted by permission of Taylor & Francis Ltd.)

## 3 Legal Issues Arising from Eco-compensation Schemes in the Tai Lake Case Study

This section considers each of the four typologies of eco-compensation implemented in the Tai Lake case study.

In the first type of scheme (government to government), the upstream jurisdiction is required by law to compensate the losses of the downstream jurisdiction when the monitoring data shows that the water quality is below the legally defined standards in the monitoring areas. This is not a true 'eco-compensation' scheme—in fact, from a legal perspective, this compensation is more akin to payments for pollutant discharge, a legal liability approach, not as compensation per se for ecosystem services.

The national Environmental Protection Law (2014) states that:

> Enterprises and public institutions and other producers and operators that discharging pollutants shall pay a fee for pollutant discharge … The fee for pollutant discharge shall be used exclusively for the prevention and control of environmental pollution…. (Article 43)

Therefore, the "designated discharge standards" are actually compulsory standards regulated by the law; polluters that discharge pollutants exceeding the standards should bear legal liability (Du and Chen 2013). Given this reading, the compensation paid by the upstream city to the downstream city is considered as narrow eco-compensation but only in a broad sense, since it does not provide rewards for protecting the environment and natural resources but only introduces pollution charges.

Under this same line of reasoning, asking the downstream city to compensate the upstream city when the water quality does not exceed the standards also lacks legal support as a true eco-compensation mechanism, because again the standards imposed are compulsory regulations—nobody should be compensated for merely abiding by the law.

One approach to transforming this approach into a true (narrow) eco-compensation scheme would be to establish a "negotiable water quality" (Du and Chen 2013) instead of referring simply to the compulsory regulatory standards. By agreeing on a certain water quality (must be better than the compulsory quality) in monitored areas, the upstream and downstream cities may voluntarily agree to an eco-compensation contract: if the recorded results in the monitoring areas are above the contractual water quality, the party who puts efforts into making this should be compensated by the other one. Through such means, supplementing and building upon the existing regulatory requirements, a more holistic and functional eco-compensatory scheme can be formulated and implemented.

For this type of voluntary eco-compensation to work in practice, however, more scientific and legal research is needed in order to address a broad range of complex issues, such as monetizing the target ecosystem services, governance mechanisms for stakeholder involvement and adequate legal frameworks, as just some of the most pertinent examples.

In the case study examining the farmer compensation schemes, the governments compensate the farmers for changing their water-use practices, which is aimed at improved water quality. The eco-compensation relationship seems to be comparatively clear—the ecosystem service buyers are the Jiangsu Provincial Government, the Suzhou City government and the related district/county governments, and the ecosystem service providers are the fish farmers. The compensation payments include compensation through direct cash payments and fish farm resettlement.

However, these schemes have proved to be problematic in practice, with apparent divergent approaches for professional and non-professional farmers. While the former category is permitted to select their type of compensation—either cash compensation or resettlement—non-local fish farmers and non-professional fish farmers have only one choice, direct cash payments. Thus, this category of farmers is required to give up their primary livelihoods. This unequal treatment led to protests by some non-local farmers, who challenged this discriminatory approach by the governments. Another shortcoming of this scheme is the fact that the city government dominated the entire compensation process, with a marked absence of market party participation, with no third-party evaluations and assessments. This

resulted in some poor decision-making—i.e. many of the newly resettled areas were not suitable for aquaculture (Han 2010). This situation meant that farmers had limited options because signing the contract was a precondition for the new farm resettlement, with the new aquaculture zones already planned by government, making the cost of reorganization too high in many respects. Given this reality, the compensation for resettlement made no sense at all for those farmers whose newly allocated farms produced substantially lower yields; it was made even worse in light of the fact that they had given up the option of cash compensation. This has given rise to new social conflicts, although water pollution has been improved to a certain extent.

Another issue relates to the compensation criteria that are used. For example, in the forest rehabilitation project in the Tai Lake region, 68.18% of the farmers interviewed were not satisfied with the government compensation, because the farmland was productive as the irrigation was sufficient and the soil was fertile. Before rehabilitation, farmers could get RMB 13, 890 /hm2 (US $2240/hm2) income per year by growing ordinary vegetables, but after rehabilitation, they could only get RMB 6, 000–9, 000/hm2 (US $968–1452 /hm2) from the government as compensation (Luo et al. 2011). This is not a minor loss for a farmer whose per capita disposable income is RMB 38, 459 (US $6, 203) in 2012 (National Bureau of Statistics 2014). If rational decision-makers are assumed to be participants, they would be unlikely to accept a payment unless it exceeds the sum of the opportunity costs they face (Wunder et al. 2008). In light of all of this, it seems that the "win-win" objective set forth in the regulations has not been achieved.

In the third and fourth typologies, the eco-compensation between the government and industry and among the industries, these have succeeded in making considerable contributions to various environmental protection funds. The scheme of discharge paid use works appears to work quite efficiently. Nonetheless, it must be noted that this system is actually different from the scheme of national pollution discharge fees. Under the scheme of discharge paid use, governments set pollutant loading cap for a "bubble" and allocate discharge credits. Dischargers buy credits guided by the principle of the "user pays"; it reflects the dischargers' right to use natural resources. Under the latter scheme of national pollution discharge fees, dischargers pay fees whether they discharge pollutants into the water in excess of discharge standards or not. The difference from the former scheme is that instead of governments setting pollutant loading cap and allocating discharge credits, dischargers in the latter scheme report to and register with the local governments about the variety, quantity and density of discharged pollutants and wait for the governments' approval. Dischargers pay fees based on the principle of the "polluter pays"; it reflects the dischargers' liability for using the natural resources.

Under the former scheme of discharge paid use, dischargers are more motivated than under the scheme of national pollution discharge fees, as once they save discharge credits, they can keep them for the following year or sell them on the market. Dischargers themselves are the main pollution control bodies; governments only design and control the "bubble". Under the scheme of national pollution discharge

fees, dischargers normally do not have enough motivation to reduce emissions if their discharges do not exceed the discharge standards approved by the governments. Governments are the main pollution control bodies. It is less cost-efficient than under the former scheme.

Although dischargers who have legally purchased the emission credits still have to undertake the legal responsibility of pollution control, the two different charges should not be repetitively collected, i.e. who buys the discharge credits should not pay pollution discharge fees. However, in practice, there are no published legal guidelines to address this problem, leaving it unclear how the governments have managed this in practice.

In the scheme of discharge paid use, the governments play the role of ecosystem service providers for the purpose of maintaining a healthy water ecosystem and ensuring that the ecosystem can provide continuous eco-services and they set the pollutant loading cap for a "bubble", monetize the pollutants and allocate the discharge credits. The selected dischargers are service buyers. In the COD emission trading system, those selected dischargers become service providers, who save discharge credits and provide certain ecosystem services by improving their pollution prevention facilities or inputting some other efforts, and those who buy credits from other dischargers are service buyers.

As new and experimental instruments, both the scheme of discharge paid use and emission trading have some shortcomings. For example, it is uncertain how the provincial governments adjust their pollutant discharge targets and how they allocate or set prices for the emissions in the next 5 years, while the central government adjusts national pollutant targets every 5 years. This lack of transparency leads to considerable uncertainties for the key actors in these schemes; as a result industrial dischargers face considerable risks in making decisions such as whether or not to buy the discharge credits or how many to buy. In addition, the current emission trading in the Tai Lake watershed within Jiangsu Province is limited to COD emissions only; while the prices for TN and TP emission trading were announced in 2011, there is not yet a specific legal regulation covering these. Furthermore, it is also very difficult to evaluate the environmental benefits from the emission trading alone as it is generally applied together with many other policy instruments. According to research, tradable discharge permits are actually among the most challenging regulatory policies in terms of both their design and implementation (Kraemer et al. 2004).

In summary, the case study undertaken here reveals that four types of eco-compensation mechanisms have been deployed across the Tai Lake region (see Table 1). The common feature in each case is the dominant role played by governments (especially in the first three types). The main financial source for compensation is governmental payment. For example, at the time of the algal bloom in 2007, Jiangsu was spending two billion RMB (US$322 million) per year to address Tai Lake's pollution problems (Liang and He 2012). Since 2008, Jiangsu Provincial Government has contributed 0.2 billion RMB (US$32 million) per year to a special fund to control water pollution in Tai Lake, with local governments asked to contribute 10%–20% (Nan 2013). Governments are the main actors in formulating

**Table 1** Types of eco-compensation mechanisms in the Tai Lake region within Jiangsu Province

| Types | Water problem | Eco-services | Providers | Buyers | Payment | Laws/regulations |
|---|---|---|---|---|---|---|
| ECM between governments | Pollution disputes | Provision of higher water quality than compulsory standards | Upstream city/ downstream city | Downstream city/upstream city | Cash, others | None |
| ECM between governments and farmers | Pollution | Improved water quality | Farmers | Governments | Cash, farm resettlement | Opinions of energy conservation and emission reduction in Jiangsu Province, No. 63 [2007]<br>Regulation on the Administration of the Tai Lake Basin, State Council, No. 604 [2011] |
| ECM between governments and industry | Pollution | Pollution control in certain cap | Governments | Industries | Cash | Implementing measures for main pollutant discharge and emission trading in pilots of the Tai Lake watershed in Jiangsu Province, No. 8 [2008] Administration for charges for credits of main pollutant discharge in the Tai Lake watershed of Jiangsu Province (trial implementation), [2008]<br>Regulation of Jiangsu Province on prevention and control of water pollution in the Tai Lake region, No. 113 [2012] |
| ECM among industries | Pollution | Improved water quality | Industries | Industries | Cash | Implementing measures for main pollutant discharge and emission trading in pilots of the Tai Lake watershed region in Jiangsu Province, No. 8 [2008]<br>Interim measures for main pollutant emission trading in the Tai Lake watershed of Jiangsu Province, No. 4 [2010] |

Source: Dai L (2014) Exploring China's approach to implementing "eco-compensation" schemes: The Lake Tai watershed as case study considered through a legal lens. Water Int 39(5):755–773. Copyright © International Water Resources Association

and implementing eco-compensation schemes. Although commercial actors also contribute to the fund (e.g. the revenue of COD trading), this amount is insignificant when compared with the level of governmental payments. The single financial source from the government might weaken the expectations of the eco-compensation projects. An example is the "Three-North" Shelterbelt Project.

## 4 Conclusions

Well-functioning ecosystems provide human beings with a broad range of important services, many fundamental to sustainable development. Effective eco-compensation schemes can contribute to the preservation of ecosystem services and lead to a more sustainable development both within and outside China.

Through examining the four types of eco-compensation schemes applied across the Tai Lake watershed, a number of observations can be made.

Eco-compensation schemes in Tai Lake watersheds are dominated primarily by governments through primarily governmental-sourced financial transfers. Although market-based eco-compensation, for example, the emission trading of COD, has been experimented with, it is still at a very early stage and needs to be further developed. The single source of governmental financial transfers might lead to a risk of a fund shortage in the future. A shortfall could, in turn, weaken the sustainability of the mechanism itself revealing a critical overall risk.

Constructing effective eco-compensation mechanisms in watersheds is a long-term project requiring multidisciplinary expertise. As has been discussed here, designing a robust legal framework capable of anchoring true eco-compensation schemes (as opposed to pollution liability regimes) requires careful consideration of a range of issues, and focusing only on the mechanism itself is far from sufficient. Attention must also be paid to the preconditions in each case, such as water management system details, the public's willingness to participate and the collaboration between or among provinces and regions and such other conditionalities that might support or impede the mechanism. Even across the legal domain, eco-compensation schemes cross a complex matrix of legal regimes—a multidimensional construct of rules, laws and regulations, including (but not limited to!) administrative, corporate, contractual, public, private, regulatory and trade matters (Wouters 2007).

Despite these challenges, the eco-compensation schemes being implemented in China provide a meaningful platform for addressing the complex issues related to ecosystem services. More legal research is required to address the gaps identified in the current domestic practice.

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