Water International

ISSN: 0250-8060 (Print) 1941-1707 (Online) Journal homepage: https://www.tandfonline.com/loi/rwin20

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To cite this article: L. Dai, W. J. van Doorn-Hoekveld, R. Y. Wang & H. F. M. W. van Rijswick (2019) Dealing with distributional effects of flood risk management in China: compensation mechanisms in flood retention areas, Water International, 44:5, 607-621, DOI: 10.1080/02508060.2019.1620014

To link to this article: https://doi.org/10.1080/02508060.2019.1620014

Published online: 13 Jun 2019.

WATER INTERNATIONAL
2019, VOL. 44, NO. 5, 607–621
https://doi.org/10.1080/02508060.2019.1620014

Routledge
Taylor & Francis Group

RESEARCH ARTICLE

Dealing with distributional effects of flood risk management in China: compensation mechanisms in flood retention areas

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ABSTRACT

One of China's flood protection strategies is to create flood retention areas. This article focuses on how China deals with the infringements of property use rights caused by the creation and use of flood retention areas. It describes the legal framework of flood retention areas, the associated compensation mechanisms and other mechanisms that may be used in the future to offset the adverse consequences of the rights of individuals in flood retention areas.

ARTICLE HISTORY
Received 10 November 2018
Accepted 14 May 2019

KEYWORDS
Flood retention areas; compensation; distributional effects; inundation; flood protection; China

Introduction

China has been frequently hit by severe floods and suffered from flood disasters. From 1985 to 2014, 33,007 deaths and US$ 618,433 million in economic losses were caused by floods (Han, Liang, Jiang, Ma, & Zhang, 2016). This demands strong flood management strategies. One of the measures used to protect large areas in China is flood retention areas, which, according to the Flood Control Law, refer to 'low-lying lands and lakes beyond the back scarps of dikes, including the flood diversion outfalls, used for temporary storage of floods' (Article 29). These areas, which temporarily inundate to prevent flooding of other areas, are large. They use space that is occupied by citizens and firms, with the risk of adverse consequences. The burdens of the few benefit the larger group.

This article focuses on the infringements of rights of individuals for the benefit of a large group (of others). The way to deal with this infringements depends on the interpretation of distributive justice. In China, the utilitarian philosophy is the basis of theories of justice. It favours actions if their total consequences are determined to be more beneficial than harmful (Rozell, 2018), and this underpins the creation and use of flood retention areas. The benefits to the collective may override the rights of individuals. This article studies how China deals with the infringements of (property use) rights caused by the creation and use of flood retention areas. This is still an open research topic; therefore, this article is descriptive in nature, tackling the legal framework of flood retention areas, the associated compensation mechanisms and other mechanisms that may be used in future to address the adverse consequences for the

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rights of individuals in flood retention areas. The article also strives to analyze whether the compensation mechanisms are in accordance with theories of justice existing in China.

Following this introduction, the next section sets the scene. The third sections provides a theoretical framework. The fourth investigates the regulatory framework of compensation in flood retention areas in China. The fifth scrutinizes the status of other compensation mechanisms applied to natural resource development and conservation in China to see whether the established compensation mechanisms could apply to flood retention areas as well. This analysis, together with the problems of the current compensation regime in flood retention areas and potential solutions, is addressed in the sixth section. The last section concludes.

Setting the scene

The development of storage and retention basins (henceforth: retention areas) to handle extraordinary floodwaters is one of the country's flood protection strategies. There are currently 98 designated retention areas in China, in six river basins. The total area of these retention basins is around 35,000 km^2 (Central Government, 2006). When there is a danger of severe flooding in the region, the designated areas are opened, to minimize the damage to the surrounding key human settlements. According to the most recent available statistics, from 1950 to 2005, the retention areas nationwide have been used 458 times, and they have stored around 123 km^3 of floodwater, significantly mitigating damage from flooding in the surrounding areas.

But besides protecting against flooding, each retention area is also home to tens of thousands to millions of people, depending on its size. The total population in all the basins is around 18.1 million, and there is around 25 million mu (1.7 million ha) of farmland (Central Government, 2006). The population protected by the retention areas is much bigger, though there are no specific statistics. Many of the designated areas are economically less developed than their surroundings. And this poverty is often not caused by natural circumstances but imposed by the government through space planning, since the retention areas are either restricted-development zones nor prohibited-development zones, according to China's Territory Development Plan.

The Chinese central government has acknowledged that 'the management of flood retention areas has become the weakest link in the management of river flood control and disaster reduction systems, since conflicts between the function of floodwater retention and the desire of economic development in the areas are rising' (Ministry of Water Resources, 2019). To address the inequality imposed by the development restrictions and to reduce conflicts, the central government has created a compensation mechanism for the flood retention areas.

Theoretical framework: distributional effects of flood risk management

Flood risk management measures, especially those which fall under the risk prevention (active spatial planning to prevent future damage by avoiding hard development in flood risk areas) or flood protection strategy (reduction of the likelihood of floods and/or the impact of floods through structural and non-structural measures, such as dikes and flood

retention areas), often require vast areas (Hegger et al., 2013). These areas may already have a function, such as agriculture. The rights of individuals are connected to this existing function. Hence changing the function affects the existing rights and the distributional effects of flood risk management. This change can be considered under the concept of distributional effects of flood risk management, which van Doorn-Hoekveld (2018) defined as 'the positive and negative consequences of governmental actions in the field of flood risk management for individuals and firms'. Legal rules or governmental action in general can affect the distribution of risks, rights and obligations (Driessen & van Rijswick, 2011; Francot-Timmermans & De Vries, 2013; van Doorn-Hoekveld, 2018; Vries, 2014). This means that measures taken for flood risk management can provide benefits for and impose burdens on (groups of) people. The benefits consist of greater safety and lower flood risks in a certain area. The burdens are the specific personal losses or adverse consequences of the measures: restriction of development possibilities and infringement of rights, such as devaluation of property or loss of income.

Flood risks are unequally divided among areas. To redistribute these risks, measures are being taken that inherently disadvantages – small groups of – individuals to benefit a large group of individuals. To re-establish distributive justice, some of these disadvantages need to be compensated. Wright (1992) explains: 'All individuals in the political community are measured against some distributive standard (e.g. merit or need), and goods and advantages are allocated to different individuals in the same proportion as their respective measurements.' What the distributive standard looks like depends on the context of the country – or region – in a specific period (van Doorn-Hoekveld, 2018).

Philosophers have different theories of justice. The libertarian credo is that 'the law should allow individuals to pursue their own ends, as they individually define them, with a minimum amount of state interference' (Ellickson, 1986). At the other end of the philosophical spectrum, the utilitarian theory of justice 'asserts that the best social policy is the one which gives the greatest total welfare to the individual members of society, where "total welfare" is measured by summing utility numbers for all individuals' (Myerson, 1981). Utilitarianism has gained legitimacy during the rapid socio-economic development in China in the past few decades. Uneven distribution of costs and benefits as well as rights and responsibilities are accepted to maximize group efficiency, provided that a redistribution and compensation mechanism is in place to address the inequalities stemming from the utilitarian principle of governance (Wang et al., 2017).

The creation of flood retention areas distributes benefits and burdens. The retention areas reduce risks in surrounding areas and thus benefit a large group of citizens, while imposing restrictions of the use of land in the designated areas, burdening the holders of land use rights and infringing the existing distributional standard. To re-establish a just situation, compensation is required. The extent to which a state provides compensation for infringed rights depends on the interpretation of distributive justice. In many countries, compensation is laid down in law.

In Europe, for example, the First Protocol of the European Convention on Human Rights provides a general compensation regime, which forms a minimum basis for compensation in case of deprivation or regulation of possessions. The compensation itself is imbedded in the domestic law of the member states. This leads to different compensation standards in different states (van Doorn-Hoekveld, 2017; van Doorn-Hoekveld et al., 2016). The First Protocol requires that excessive burdens be

compensated (Article 1). In the United States, some infringements of property rights can be placed under "regulatory" takings. Also in the US, property owners should receive just compensation when property is taken for a public use (Nolon, 2013; Saxer, 2018; Tarlock, 2011), which is similar to European compensation regimes in general, although the requirements for compensation are interpreted differently in the US.

Regulatory framework of flood retention areas and the compensation regime

Flood retention areas in China

The creation of flood storage and retention areas is an important flood protection strategy in China. Based on their status and role in the flood protection system, utilization rate, dispatching authority and geographical location, they can be categorized into three groups: Important, General, and Reserved.

Different restrictions, such as restrictions on land use and development, industrial layout and project construction, apply in the different categories. In general, all categories should meet the requirements of flood protection and ensure the retention capability of the area.

Regulatory framework of compensation for use of flood retention areas

The central government has often proposed to strengthen the regulatory framework of construction and management of flood retention areas; for example, in its Opinions published in 2006 and 2009, a ministerial regulation for flood retention areas was proposed twice. But, more than a decade later, there is still no such regulation in place. The current regulatory framework which applies to flood retention areas is limited, especially when it comes to compensation mechanisms (Figure 1).

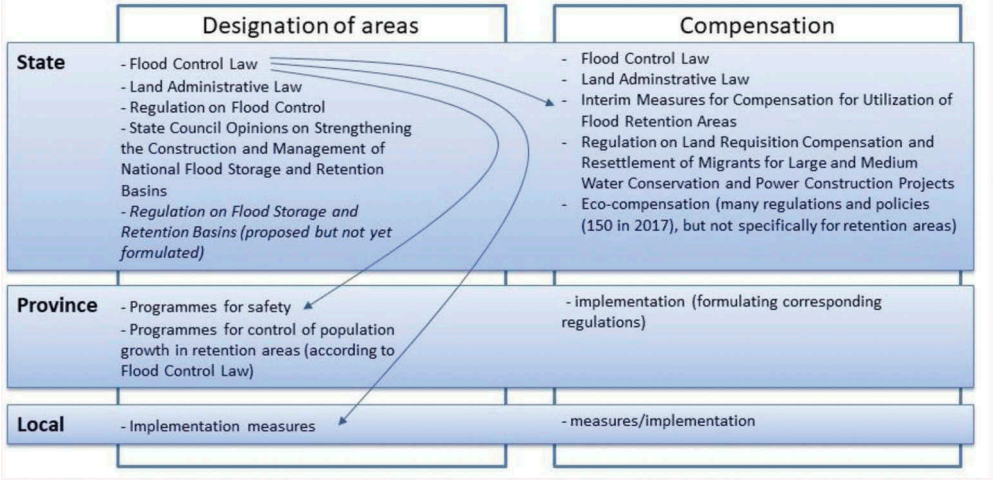

Figure 1. Regulatory framework of flood retention areas in China.

Compensation for flood retention areas has two stages: before and after inundation. Currently, there is no law on compensation before the inundation of flood retention areas, for example, when designating the areas. Though the reason is unclear, we think that compensation was not an issue since most of the retention areas were designated in 1950s, when hardly anyone lived there.

At the national level, the Flood Control Law gives the legal basis for retention areas. It states that the designation and use of these areas must be laid down in flood control plans (at both the national and local level), together with other aspects of management of rivers and lakes and the construction of flood control facilities in the corresponding river basins. The flood control plans must be in accordance with the general land use plans, according to the Land Administrative Law. The Ministry of Water Resources is responsible for the technical designation of flood retention areas. It has produced technical guidelines, but they are not publicly available.

The local governments of areas in which the flood retention areas are located are responsible for policies to implement the national laws and for tailored measures to suit their local conditions. Provincial governments have the responsibility to formulate programmes for safety as well as the control of population growth in their flood retention areas. This requires policies to stimulate or eventually force residents to move out of frequently used areas.

According to Article 7 of the Flood Control Law, provincial governments have the responsibility, together with the State Council, to set up support systems, including compensation and relief mechanisms: 'Governments at various levels shall give support and help people living in the flood retention areas, giving them compensation or relief … *after inundation*.' It does not elucidate the types of loss that should be compensated but restricts the compensation to damage caused by actual use of the retention area, that is, after an inundation has occurred.

The Interim Measures for Compensation for Utilization of Flood Retention Areas (henceforth: the Interim Measures) and their supporting measures are a national regulation which specially guides the compensation issues after the inundation of flood retention areas. The formulation of the Interim Measures was triggered by the 1998 flood disaster, when the central and southern parts of the country were battered by more than 60 days of heavy flooding, and 223 million people were affected (UNDAC, 1998). The Interim Measures were adopted in 2000. Before their adoption, people were fully dependent on incidental emergency supplies and assistance from the central government and society in case of flooding. To develop a compensation regime, a flood prevention fund and flood insurance system were tested in the Huai River basin before the Interim Measures were adopted. Under the system, the insurer was a commercial insurance company; the central government (35%), provincial governments (35%) and local residents (30%) were jointly the policy holders; and the insurance covered the loss of summer and autumn crops to floods. But this system was not promoted on a large scale, because the premium was a heavy burden for both the governments and residents.

The Interim Measures (Article 12) provide a legal basis for compensation for the following losses from inundation of flood retention areas.

- Loss of crops, professional breeding and forest for commercial use are compensated at 50–70%, 40–50% and 40–50%, respectively, of their average annual production values over the three years before the flooding.
- House losses are compensated at 70% of losses.
- Loss of family farm machinery, livestock and major household consumables are compensated at 50%.

Compensation in flood retention areas after inundation is meant to ensure the residents' basic living conditions, benefit the resumption of agricultural production, and meet the financial support capacity of the state. The compensation fund is provided only by governments. It is borne by both the central authority and the provincial authority where the flood retention area is located. To be specific, the central authority usually bears 40–70% of the compensated damage. To avoid problems in the implementation of the Interim Measures, such as misuse and corruption of the compensation fund, two measures were added to the compensation regime in 2006 and 2007, respectively: the Measure on the Administration of Funds Application and the Measure on the Verification of Compensation. The aim of these two measures was not to substantially revise the Interim Measures but to better implement them. To date, the Interim Measures have been in force for 18 years without revision.

Existing compensation mechanisms for natural resource development and conservation in China

Compensation after inundation does not involve constraints on land use rights or land property rights, nor does it cover *potential* losses due to the *risk* of flooding. In other words, the scope of the Interim Measures for flood retention areas is both limited and inadequate. In this case, one might wonder if there exist other compensation mechanisms, in a broader context of natural resource development and conservation, which can address or provide insight into the unequal benefits and responsibilities created by the redistribution of flood risks. This section addresses this question by briefly reviewing the existing compensation mechanisms indirectly related to flood retention areas in China.

Compensation for land expropriation in the public interest

The designation of flood retention areas is closely related to land use rights and land property rights. It implies a partial transfer of rights, from land users to the state, in the name of the public interest. In this sense, a deeper understanding of the compensation mechanism for flood retention areas requires clarification of China's urban/rural land system, which distinguishes urban land owned by the state from rural land owned by rural collectives (generally a single village, sometimes several villages), as stipulated in Article 10 of the Constitution:

> Land in the cities is owned by the state. Land in the rural and suburban areas is owned by collectives, except for those portions which belong to the state in accordance with the law;

> house sites and privately farmed plots of cropland and hilly land are also owned by collectives.

On urban (state-owned) land, the local government, on behalf of the state, has the right to sell, transfer and lease in the urban land market for a variety of development activities (Huang, Huang, Zhao, & Liu, 2017). On rural land, the peasants, as members of the community, have two types of land use rights (Lin & Ho, 2005). One is to use a relatively small amount of land as a private housing site: entitlement to a homestead. The other is to contract farmland from the collective for agricultural production under the household responsibility system, which ensures long-term stability (30 years) of contracting and subcontracting the farmland for the peasants.

The designated flood retention areas are mostly collective-owned land, which therefore draws a property boundary between a small group of individuals and the state. In many cases where the state needs to convert collective-owned land to state-owned for regional socio-economic development, the Constitution entitles the state to 'expropriate or take over land for public use, and pay compensation in accordance with the law' (Article 10). According to the Land Administration Law and the Property Law, for instance, compensation fees for farmland expropriation include land compensation fees, resettlement subsidy and compensation for ground attachments or green crops on the land. The land compensation fees are usually 6–10 times the average output value over the three years preceding the expropriation. The resettlement fees for each agricultural person to be resettled are 4–6 times the average annual output value for the three years preceding the expropriation. The standards for compensation fees for land fixtures and seedlings are regulated by local governments. The local government can increase the resettlement fees if the land compensation fees and the resettlement fees together are not enough to maintain the farmers' original quality of life. But the combined land compensation fees and resettlement fees shall not exceed 30 times the average output value for the three years prior to the expropriation (Land Administration Law, Article 47). These compensation fees are paid to village collectives or farmers via financial transfer or direct cash payment. Despite the clauses in the legal documents, great complexity and uncertainty is involved in land expropriation, as it concerns the fundamental livelihoods of a great number of rural people. The local governments have made increasingly ad hoc arrangements for compensation to ensure social stability, and the practice of land expropriation compensation varies considerably by region.

Within the wide range of 'public interest', the construction of water conservation and hydro- (and thermal) power projects is unique, and subject to a specific set of regulations on land expropriation compensation and migrant resettlement (Regulation on Land Expropriation Compensation and Resettlement of Migrants for Large and Medium Water Conservation and Power Construction Projects). The principle of this regulation is to ensure migrants' quality of life by combining early-stage compensation and subsidies with follow-up support. The regulation states:

> The land expropriation compensation and migrant resettlement fund includes the land compensation fee, resettlement subsidies, relocation of rural residential areas, relocation of urban (market) towns, and relocation of industrial and mining enterprises, as well as relocation of particular facilities or rebuilding compensation (including compensation for the fixtures of the land), indemnities for the personal properties of migrants (including

indemnities for the fixtures of the land and young crops) and moving subsidies, subsidies for cleaning the bottom of the reservoir, and subsidies for the protection of cultural relics in the submerged areas, as well as other expenses as prescribed by the state.

In spite of their comprehensive rules and wide applications in China, the compensation mechanisms for land expropriation are not fully applicable to flood retention areas because the latter restrict the function of land but do not require permanent changes of land ownership. To explore mechanisms for functional control, we move on to consider eco-compensation.

Eco-compensation mechanisms for functional control and spatial planning

Eco-compensation mechanisms, which are being promoted nationwide by the Chinese central government, are not directly associated with land expropriation but are an incentive-based governance approach to facilitate equitable and efficient distribution of natural resources. The foundation of eco-compensation can be traced back to state-led functional control and spatial planning with the aim of maximizing collective utility (Wang et al., 2017), which resembles the designation of flood retention areas.

Development is a continuous process. Planning is a policy instrument which is imposed at a certain time in the process of development. After the planning phase some areas have to slow down, whereas others might get more opportunities. According to these functional control and spatial planning measures, the state might impose constraints on certain areas and jurisdictions, which are usually of ecological and environmental significance, to achieve greater group socio-economic outcomes through further development in other areas. As a result, eco-compensation arises as an institutional arrangement promoted by the Chinese government to balance economic interests among ecological protectors, beneficiaries and destructors under various distributional principles, such as beneficiary pays or provider gets.

Inter-provincial and inter-municipal water eco-compensation is a salient case, which has been gradually mainstreaming in China's water policy agenda (Wang, Ng, Dang, & Qi, forthcoming). This is mainly due to inter-jurisdictional inequalities stemming from unequal costs and responsibilities imposed on different upstream and downstream actors, of which the former must take on a significant role in water conservation whereas the latter receive most of the economic benefits. These inequalities have caused great grievances and conflicts among heterogeneous stakeholders, impeding effective cooperation and coordination in inter-provincial and inter-municipal water governance. To respond to this problem, water eco-compensation has been proposed by the Chinese government to provide economic incentives for those who contribute more to water conservation. According to most of the water eco-compensation arrangements, upstream actors may receive a reward on the condition that the water quality at a transboundary intersection meets a previously agreed standard. Moreover, water eco-compensation mechanisms usually operate in the form of inter-governmental agreements, where fiscal transfer between upstream and downstream jurisdictions is the main method of compensation.

These types of water eco-compensation do not involve direct land expropriation but are associated with state aspirations to pursue greater social benefits through policy instruments which constrain certain resource users and areas while promoting the

development of others. Although it is regarded as necessary, 'sacrifice' for development is an important discourse in the Chinese political agenda. Proper compensation for those who made the sacrifice is also justified by parallel discourses such as 'serving the people' and 'social equality'.

Analysis and discussion

This section analyzes the deficiencies of the current compensation regime regarding the inundation of flood retention areas and discusses how far it reflects the underlying values of distributive justice in China. We will also discuss the applicability of the two existing compensation mechanisms to flood retention areas, since the central government has acknowledged that compensation mechanisms for flood retention areas must be strengthened.

Compensation regime for flood retention areas

At present, the Interim Measures are the only regulation guiding compensation for flood retention areas after inundation at the national level. However, without sufficient policy and academic attention, the Interim Measures have major deficiencies in practicality and scope.

First, the implementation of the Interim Measures is difficult in practice as they do not reflect the changing demographics of rural China, which is characterized by great population mobility. For example, residents in flood retention areas often migrate to cities as temporary workers and rent their farmland to farmers who did not register in the household registration system, which identifies a person as a resident of an area. In this case, those who rent the land and who suffered the loss cannot be compensated after an inundation because, according to the Interim Measures, only people who are registered as living in the retention areas have the legal right to compensation.

Second, the compensation scope is too narrow. According to the Interim Measures, agricultural crops, professional breeding, forest for commercial use, houses and so forth can be compensated. Some other losses, for example, non-professional small-scale breeding, and crops for business (e.g., flowers), cannot be compensated, though they might be the main sources of household income in that area.

Third, the compensation standards are low. After the inundation, the residents of the retention areas are only partially compensated for their direct losses, such as losses of houses and agricultural crops, due to the floodwater storage. Indirect losses – for example, soil degradation due to the storage of floodwater, property losses due to burglary or lack of maintenance after the property holders have been moved, or psychological trauma – are not considered.

Fourth, the current regime does not clearly delineate the responsibility of compensation provision among different stakeholders. A study estimated that the central government and the local government need to provide RMB 1.5 billion (USD 240 million) and RMB 1 billion (USD 160 million) in compensation, respectively, if a flood retention basin of 1,358 km^2 is used (Zhang, 2004). This enormous financial burden currently falls on the central government and the local government of the flood retention area. But this contradicts the principle of beneficiary pays, which is reflected in the Flood

Control Law: '[Who] benefits directly from the flood storage and retention areas shall make compensation . . . for these areas.' With the current regime, the surrounding areas, as the direct beneficiaries, whose flood risks were mitigated by the flood storage and retention areas, have not developed direct compensation mechanisms that directly contribute to those who bear the burdens.

In summary, although the Interim Measures, with their two supporting measures, have to some extent contributed to the compensation management in flood retention areas, the losses caused by the inundation, i.e., the burdens imposed by the government, are not fully compensated by the government. And the beneficiaries have no responsibility to compensate those at whose expense the benefits are provided. This leads to inequality and is not in accord with the general compensation system as laid down in the Flood Law. It is also not in accord with the Chinese philosophy of fairness, which emphasizes reciprocity and fair reward for individuals who sacrifice for the group.

Our analysis shows that distributional issues associated with flood retention basins have not been adequately accounted for in China's current compensation mechanisms, though retention areas are an important instrument of flood risk management, and these areas cover large areas of land, so that both designation as a flood retention area and inundation affect a significant portion of the population. Damage is caused by limitation of development opportunities because of the designation as a flood retention area, and through direct and indirect losses from inundation. This negligence received some policy attention in 2016. The State Council proposed that the mechanism should be further developed for important river basins and flood retention basins, and that compensation standards should be raised as well. But there has been no further development in practice.

Table 1 summarizes key aspects of compensation in China's current flood retention basins.

The applicability of existing compensation mechanisms

This section discusses the applicability of the existing compensation mechanisms to flood retention areas. We want to see whether the established compensation system, which is already being implemented in land expropriation and inter-jurisdictional water conservation, can be used to address the deficiencies of the Interim Measures.

Compensation for land expropriation is also associated with resettlements. This mechanism is relatively sophisticated, as the state and governments at various levels have established rules and compensation standards that can be applied to different scenarios. Numerous empirical cases have been carried out, as the rapid development of the country requires the conversion of collective-owned land into state-owned land (Lin & Ho, 2005; Liu & Lin, 2014; Xu, Yeh, & Wu, 2009; Yeh & Wu, 1996).

In practice, this type of compensation is also applied in flood retention areas when flood-defending engineering works need to be constructed. In that case, the collective-owned land first needs to be converted to state-owned land first; i.e., land expropriation, compensation and resettlement take place. But it is impossible to use this type of compensation for a whole flood retention area, mainly because flood retention areas are too big. According to the Land Administration Law (Article 45), any farmland expropriation larger than 35 hectares requires stringent assessment and approval from the State Council. The area needed for flood retention is thousands times bigger than

Table 1. Key aspects of compensation in flood retention areas.

	Designation of flood retention basins	Inundation of flood retention basins
Competent authority for designation of retention area	Central and local governments	Central and local governments
Competent authority for compensation	None	Central and local governments
Cause of loss	Spatial plan (designating the retention area) Project plan (realization of area) Development plan (restrictions on development)	Duty to tolerate (inundation of area)
Loss	Devaluation of property (restrictions on use) Potential losses (restrictions on development)	Real damage to property (direct loss, e.g. loss of house, harvest) Indirect losses (e.g., transport cost)
Damaged party	Rural collectives Farmers	Rural collectives Farmers Businesses
Relevant principle	Beneficiary pays (not implemented)	Ensure residents' basic living conditions, aid the resumption of agricultural production, meet the financial support capacity of the state
Legal compensation regime	None	Partial compensation for losses of crops, professional breeding and forest for commercial use, houses, family farm machinery, livestock and major household consumables
Loss that remains for individuals	Not clear	Not clear
Who benefits from the loss-causing measures	People in the areas protected against flooding	People in the areas protected against flooding

that. Such large-scale permanent land conversion, from farmland to land that serves non-agricultural purposes, would seriously contradict China's stringent land policy, which is based on strict protection of farmland for the nation's long-term grain security.

And even a small-scale farmland expropriation would require huge capital investments. For example, the compensation standard for agriculture crops after inundation of flood retention areas is only 50–70% of the loss, while compensation for expropriation is usually 30 times the average output value for the three years prior to the expropriation. In addition, the land user (which is the state in the case of flood defending projects) must provide full payment for the farmers' social insurance. The Ministry of Land and Resources specifically emphasizes that it is forbidden to replace the social insurance by new rural endowment insurance when paying insurance for farmers. In comparison, the governments pay much smaller subsidies for the residents in the flood retention areas, who are mostly insured by an urban endowment insurance or a new rural endowment insurance.

The water eco-compensation mechanism has some similarities to the required compensation mechanism for flood retention areas in the sense that both are concerned with functional control and spatial planning. This type of compensation mechanism has received increasing academic and policy attention and is mainstream in China's environmental conservation agenda (Liu, Li, Ouyang, Tam, & Chen, 2008; Liu & Yang, 2013; Xie, Pang, Li, Zhang, & Hu, 2013; Yang et al., 2013; Yin & Zhao, 2012).

In the meantime, eco-compensation in water governance has mainly focused on upstream–downstream interactions regarding water quantity and quality. Although flood risk management measures such as the designation of flood retention areas can be considered a functional control and spatial planning approach, which therefore fits with the general principles of water eco-compensation, they have yet to be incorporated into the institutional framework for water eco-compensation.

The analysis of compensation mechanisms for flood retention areas shows that the scope of the current compensation mechanism for flood retention areas is fairly narrow. It provides only limited compensation for direct losses in cases of inundation, and it does not cover indirect losses from inundation or the losses caused by the designation of flood retention areas. In other words, losses stemming from being handed the responsibility to 'sacrifice' when necessary are not fully compensated, because neither indirect losses nor losses from limitation of development possibilities are part of the current compensation mechanism. To address this problem, it seems that water eco-compensation might be an appropriate mechanism into which compensation for flood retention basins could fit. In essence, the designation of flood retention basins also involves the functional control and spatial planning of a specific area (e.g., imposing the function of flood risk prevention on an area and thus restricting its development) for greater group utility. As discussed earlier, eco-compensation is not a new approach in China's environmental governance system. In previous cases of water eco-compensation between upstream and downstream jurisdictions, the downstream actors have been required to compensate the upstream ones for potential losses due to development restrictions imposed on them to ensure, for example, good water quality on the watershed.

'Taking care of the few who sacrifice for the many' has been reflected in the current legal framework for both flood risk management (e.g., the Flood Protection Law: '[who] benefits directly from the flood storage and retention areas shall make compensation ... for these areas') and fairness. In this sense, eco-compensation for flood storage and retention areas is well justified. But closer examination reveals that eco-compensation for flood retention areas cannot simply duplicate the way of working common in watershed eco-compensation for various reasons.

First, unlike compensation for land expropriation, fiscal transfers between upstream and downstream jurisdictions are the main method of eco-compensation in watersheds. In other words, eco-compensation in watersheds only involves inter-governmental relations, and the needs of peasants are not yet met. This is however exactly what needs to be addressed in flood retention areas.

Second, there is a relatively narrow but clear definition of what is compensated in eco-compensation mechanisms in watersheds, namely, the quality or quantity of water. Yet in flood retention areas, what should be compensated, and by how, much remains to be clarified. The 'good water quality' in eco-compensation mechanisms for watersheds is the ecosystem service at stake, and this service is more concrete and measurable than the 'flood protection' in the eco-compensation pattern between the flood retention areas and their surrounding areas. It is likely that the willingness to pay for good water quality or a specific quantity of water is easier to motivate than for flood protection, as the latter is more abstract and harder to measure.

Third, the service providers and the beneficiaries in watershed eco-compensation are clear. The former usually refers to upstream jurisdictions, and the latter to the downstream ones. This is in line with previous findings that in China at this stage eco-

compensation is mainly conducted by governments, not by the direct beneficiaries (Dai, 2014).

Fourth, eco-compensation in practice requires the intervention of an overarching authority to coordinate the compensation agreement between two jurisdictions at the same political level. Those who reside in retention areas could be identified as service providers, but who should compensate them is subject to debate.

Last but not least, watershed eco-compensation is operated by governments. But flood retention areas are not necessarily restricted by administrative boundaries, although retention will mainly take place within the same river basin. Floods in one jurisdiction might have huge impacts on other jurisdictions, and even in a different river basin (e.g., the downstream of the Yellow River). With river basin organizations having limited power and inter-jurisdictional cooperation remaining to be effectively established, the accountability and mobilization of such a compensation scheme would be a challenge.

We conclude that at the moment no established mechanism in the Chinese environmental governance system can properly address the problem of compensating the people residing in flood retention areas.

Conclusion

This article has highlighted the deficiencies in the current regulatory framework in China of flood retention areas, particularly regarding damage compensation after inundation, and it has reviewed the existing compensation mechanisms related to land expropriation, functional control and spatial planning. Outlining an unclear, insufficient and ad hoc compensation mechanism for flood retention areas, we have considered the gaps that exist in each of the existing compensation mechanisms when applied to flood retention areas. Considering also theories of distributional justice, it provides insights into the challenges to developing a just compensation regime for flood retention areas that fits Chinse philosophy and culture.

The flood retention areas play a dual role in China. They are designated for flood protection use, but they are also farmland and residential areas for a large population. The restrictions on land use that follow from designation as a retention area have led to burdens on the residents. These losses do not fall within the current legal compensation regime. This gap needs to be addressed to comply with the general approach of distributional justice that follows from Chinese philosophy in general and from the Flood Protection Law in particular. The same applies to the limited scope of compensation for direct and indirect losses that follow from a retention area being used for inundation. The existing compensation mechanisms, particularly the eco-compensation model, could serve as a source of inspiration for a compensation regime for flood retention areas, though practical challenges such as the measurement of ecosystem services and the identification of proper payment methods remain to be addressed in future research.

Acknowledgments

This article contributes to the EU COST Action network LAND4FLOOD: Natural Flood Retention on Private Land (CA16209, www.land4flood.eu).

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the China Postdoctoral Science Foundation [2018M643355]; National Natural Science Foundation of China [41801132]; and Natural Science Foundation of Guangdong Province of China [2018A030313964]. The article is also supported by the project "Preparing urban private property for floods: resilience and recovery in built up areas" of the "FUTURE DELTAS" programme of Utrecht University, the Netherlands.

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