

# Eco-compensation and Harmonious Regional Development in China

LIU Chunla<sup>1,2</sup>, LIU Weidong<sup>1</sup>, LU Dadao<sup>1</sup>, CHEN Mingxing<sup>1</sup>, Michael DUNFORD<sup>1,3</sup>, XU Mei<sup>4</sup>

(1. Institute of Geographic Sciences and Natural Resources Research, Key Laboratory of Regional Sustainable Development Modeling, Chinese Academy of Sciences, Beijing 100101, China; 2. University of Chinese Academy of Sciences, Beijing 100049, China; 3. School of Global Studies, University of Sussex, Brighton BN1 9QN, Sussex, UK; 4. College of Tourism, Central South University of Forestry and Technology, Changsha 410004, China)

**Abstract:** Harmonious regional development poses difficult problems, especially in so far as the harmonious regional development of ecological resources is concerned. China has explored several eco-compensation models, and in each province eco-compensation has different characteristics. These methods have had significant impacts. The aim of this paper is first to examine the meaning of eco-compensation and to present a framework for analyzing it. Next the development of eco-compensation in China is examined. Finally, four typical models of eco-compensation are compared: the government financial transfer payment compensation model; the ecological resource exploiters' payment compensation model; the ecological destruction compensation model; and the ecological resource tax collection compensation model. Each model has its own unique feature and potential to contribute to harmonious regional development.

**Keywords:** eco-compensation; harmonious regional development; China

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## 1 Introduction

In China, harmonious regional development has been problematic for researchers, government officials, and the public (Lu and Liu, 2002; Lu and Fan, 2012), as it is not confined to harmonious development between regions, but also refers to harmonious relationships between economic development and the sustainable exploitation of ecological resources (Scott *et al.*, 1998; Mäler, 2000; Yang, 2004; Straton, 2006; Fan, 2007; Sun, 2007). Especially in the 21st century, we face the challenge of dramatically transforming the way we view and interact with our eco-resource systems. Healthy eco-resource systems have their own potential market values (Millennium ecosystem assessment, 2005), and healthy eco-resource system services are essential for the main-

tenance of harmonious regional development.

Eco-compensation is a response to growing environmental pressures and the possibilities of using markets, and market-like instruments to grapple with them. The implementation of such ecological environmental policies and methods can help coordinate regional development relationships (Mao *et al.*, 2002; Wu *et al.*, 2003; Mao and Zeng, 2006; Qin and Kang, 2007; Yang *et al.*, 2007; Dai *et al.*, 2012; Xu *et al.*, 2012). In recent years greater accessibility and greater regional interdependence have led to greater interest in inter-regional eco-compensation (Liu, 2007). In an interdependent world a lack of eco-compensation can result in imbalanced regional development (Zhang, 2007), and appropriate eco-compensation measures can facilitate the coordination of regional relationships (Wang, 2009). Many re-

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Corresponding author: CHEN Mingxing. E-mail: chenmx@igsnr.ac.cn

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searchers in China have discussed the influence of eco-compensation on harmonious regional development considering this relationship from a variety of angles (Wu *et al.*, 2003; Zhang, 2007; Wang, 2009; Hou *et al.*, 2011). These studies show that eco-compensation greatly affects regional development, while this research into the relationship between eco-compensation and regional development is reflected in the overall design, implementation, and evaluation of eco-compensation projects (Hou *et al.*, 2012).

The relationship between eco-compensation and regional development has already attracted widespread attention of the scholars and practitioners. Major study fields and subjects are as follows:

(1) eco-compensation and regional ecological resources and environment. Researches have shown that the implementation of eco-compensation projects is a primary factor influencing ecologically sustainable regional development. Generally, in the period of the implementation of eco-compensation projects, the local ecological environment quality was improved greatly. But once the eco-compensation project was discontinued, the situation confronting the local ecological environment was much more hazardous (Wunder and Albán, 2008). How to maintain the positive effects of completed eco-compensation projects on the local ecological environment is the key point for practical work and theoretical research in future.

(2) Eco-compensation and the farming household economy. The implementation of eco-compensation projects reduced the labor input in the crop growing and animal raising industries (Zhi *et al.*, 2004), and enlarged the scope of farming household economies, as farmers can search for other ways to increase income, such as migration, doing second jobs, developing ecological tourism, *etc.* (Pagiola, 2008; Johnson and Maxwell, 2011). But owing to differences in peasant household income and undifferentiated eco-compensation policies, there are two opposite influences on the farming household economy. For low income farmers, their new income will increase greatly their overall income after they accept eco-compensation. For high income farmers, the new income will not be sufficient to prevent a considerable reduction in their overall income after they accept eco-compensation. In this second case the protection and preservation of the ecological environment leads to profits loss from the production of agricultural

products and animal by-products (Muñoz-Piña *et al.*, 2008).

(3) Eco-compensation and the regional economy. Generally, eco-compensation accelerated the readjustment of industrial structures in project regions, optimized and reallocated resources, and improved industrial restructuring efficiency and the share of intensively-farmed land (Bennett, 2008). In poor regions, owing to transfer payment from the national/provincial exchequer, eco-compensation greatly increased local finance (Muñoz-Piña *et al.*, 2008), although eco-compensation also, of course, had negative effects on the regional economy (Pagiola *et al.*, 2005; Locatelli *et al.*, 2008).

(4) Eco-compensation and social development. On the one hand, eco-compensation alleviated poverty, and offered more social welfare to poor people. By providing a fund, technology, medical treatment, material objects, education, *etc.*, eco-compensation increased poor people' economic and non-economic income (Pagiola *et al.*, 2005; Tschakert, 2007; Bennett, 2008; Muñoz-Piña *et al.*, 2008; Pagiola, 2008). On the other hand, eco-compensation also adversely affected social fairness and efficiency (Pascual *et al.*, 2010; Somerville *et al.*, 2010). Eco-compensation increased the size of the idle rural labor force (Hou *et al.*, 2011), and generated some problems.

In all, current research into eco-compensation and regional development is not so voluminous in quantity, is mainly qualitative and descriptive, and mainly comprises case studies. Studies summing up theoretically the relationships of eco-compensation models and harmonious regional development are few, but are of great significance. Studying the overall framework of eco-compensation, analyzing its relationship with regional development, exploring current practice and identifying four typical models of eco-compensation are therefore important tasks for researchers and policy makers and implementers.

The major objective of this paper is accordingly to analyze the nature of eco-compensation and typical models for harmonious regional development in China, then examines the meaning of eco-compensation and its relationship with harmonious regional development, and outlines the main developmental situations in which eco-compensation issues have arisen in China and outlines some typical examples, lastly identifies four typi-

cal models of eco-compensation. The findings provide useful insights into the quest for harmonious regional development.

## 2 A Conceptual Framework for Analysis of 'Eco-compensation'

### 2.1 Concept and meaning

Different researchers have employed various terms for eco-compensation. Some of these terms are listed in Table 1.

All of these terms can be classed into two categories. One stresses marketization and the concept of payment, such as payments for environmental services (Wunder, 2005; Muradian and Rival, 2013), environmental services payments (Bienabe and Hearne, 2006; Kalacska et al., 2008), compensation for ecosystem services (Zheng and Zhang, 2006), environmental services payments (Bienabe and Hearne, 2006; Kalacska et al., 2008).

The other is more general, not only containing the marketization concept of payment, but also the moral and social equity notion of compensation of eco-benefit losers, such as eco-compensation (Mao et al., 2002; Yang et al., 2013), ecological compensation (Cuperus et al., 1999; Brown et al., 2013), ecology compensation (Wang and Ma, 2002; Mao et al., 2008), and environmental compensation (Cowell, 1997; Rundcrantz and Skärbäck, 2003). This concept derives from welfare economics. The idea is that the use of ecosystem services is not paid for and so is associated with a range of externalities. To internalize these externalities losers can pay the gainers not to undertake actions with undesirable side effects, or gainers can compensate the losers so that an activity can go ahead without making the losers worse-off.

**Table 1** Eco-compensation terms

Term	Researchers
Eco-compensation	Mao et al., 2002; Yang et al., 2013
Ecological compensation	Cuperus et al., 1999; Brown et al., 2013
Ecology compensation	Wang and Ma, 2002; Mao and Wang, 2008
Payments for environmental services	Wunder, 2005; Muradian and Rival, 2013
Environmental compensation	Cowell, 1997; Rundcrantz and Skärbäck, 2003
Compensation for ecosystem services	Zheng and Zhang, 2006
Environmental services payments	Bienabe and Hearne, 2006; Kalacska et al., 2008

As to the problem of what eco-compensation intrinsically is, academics have also not given uniform answers (Cuperus et al., 1996; Babcock et al., 1997; Cuperus et al., 2001; Sara et al., 2002; Jenkins et al., 2004; Pagiola and Platais, 2007; Engel et al., 2008). To sum up, there are following viewpoints.

(1) Resources economy theory. Eco-compensation mainly eliminates the negative effects of externalities on resource allocation, and aims to realize ecological resources' economic value (Coase, 1960; Wunder, 2005; Engel et al., 2008; Ma et al., 2012).

(2) Benefit game theory. Eco-compensation mainly seeks to coordinate and solve the conflict between the protection of the eco-environmental rights, subsistence rights and development rights of different interest groups (Cowell, 1997; Merlo and Rojas Briales, 2000; Murray and Abt, 2001; Mao et al., 2002; Wunder, 2005).

(3) Environmental protection theory. Eco-compensation aims to solve ecological environmental problems, and to promote ecological environmental protection (China Ecological Compensation Mechanism and Policy Research Team, 2007; Li et al., 2009; Hou et al., 2012).

(4) Social justice theory. Via eco-compensation, the inequality between environmental resources property rights and development rights can be redressed (Wu et al., 2003; Li et al., 2007).

(5) Regional development theory. Eco-compensation can promote the integrated development of urban and rural areas, and of different regions (Pagiola et al., 2005; Kosoy et al., 2007; Li et al., 2007; Sun and Zhou, 2008; Zhang et al., 2010).

(6) Policy theory. Eco-compensation is an institutional arrangement, which aims to promote a harmonious relationship between environmental protection and the regional ecological economy (Cowell, 2000; Pagiola et al., 2005; Li et al., 2006; Pagiola and Platais, 2007; Yang et al., 2007; Dai and Zhao, 2010; Pan et al., 2010). As can be seen from the survey of Chinese research, most scholars use the phrase 'eco-compensation'. As this paper also deals with the Chinese case, it will also use the phrase 'eco-compensation' which concisely describes the purpose and is easy to comprehend.

### 2.2 Basic framework and features

Eco-compensation encompasses rewards for protecting ecological systems and natural resources, payments for

losses caused by damage to eco-systems and natural resources by environmental polluters and compensation for losers (China ecological compensation mechanism and policy research team, 2007). Assuming valuation problems can be resolved, eco-compensation is an effective way to transform the external, non-market environment value into real financial incentives, and aims in this way to encourage the participants to provide sustainably more ecosystem services (Engel *et al.*, 2008). Eco-compensation differs from general environmental economic policies and command and control environmental policies. Traditional methods emphasize environmental internalization and negative externalization and help to prevent environmental damage behavior, but they do not encourage people actively to protect the environment. Eco-compensation addresses the internalization of environmental externalities, and environmentalists receive benefits; positive incentives are offered to protect the environment, and can result in increased public support and cooperation (Sven *et al.*, 2008). Who complements whom, how much compensation should be provided, and how to provide compensation are the core problems of eco-compensation (Mao *et al.*, 2002; Wu *et al.*, 2003; Engel *et al.*, 2008; Hou *et al.*, 2011; Xu *et al.*, 2012) (Fig. 1).

First, eco-compensation can promote harmony between regional eco-resource utilization and a region's bearing capacity. The promotion of harmonious regional development relies on the rational development and utilization of natural ecological resources, and this requires the coordination of natural and ecological re-

source development, carrying capacity, and utilization load pressure. The ecological development and construction activities of humankind must occur within the boundaries set by the ecological carrying capacities of the resources concerned. By implementing eco-compensation and realizing the balance between ecological resources and carrying capacity, ecological resources can be used sustainably.

Secondly, eco-compensation can promote harmony between regional developmental needs and the exploitation and utilization of ecological resources. China is one of the world's largest countries in terms of types and quantities of ecological resources, but its per capita ecological resources are relatively small, and the regional distribution of ecological resources is very uneven. To continuously meet the needs of human social development, every region must constantly develop and utilize new ecological resources. However, there are great resource endowment differences among various areas in China. Eco-compensation is an important means by which to maximize the value of eco-resource utilization and to optimize the allocation of different resources, in order to promote harmonious regional development.

Third, eco-compensation can promote harmony between related, eco-resource development benefit groups. Due to the imbalance of temporal and spatial eco-resource distribution, and the mobility of some ecological resources and pollutants that arise during the development process, regional effects vary widely during the development of ecological resources. For example, because of the mobility of water ecological resources,

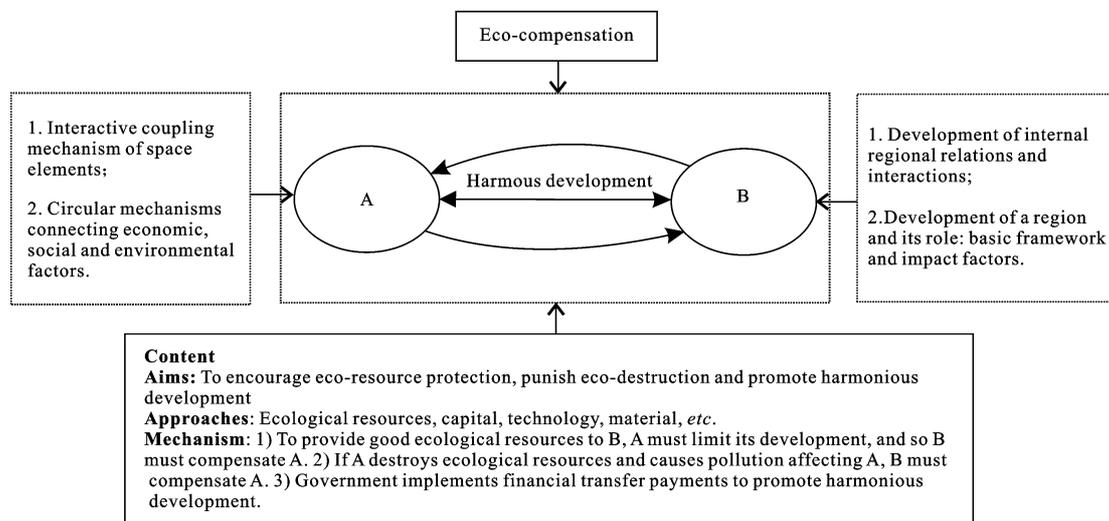


Fig. 1 Basic elements of eco-compensation

there will be eco-resource benefit differences between upstream and downstream areas. These differences need to be regulated and controlled by eco-compensation. In this way harmonious regional development can be achieved.

### 3 Eco-compensation Situations in China

#### 3.1 Overall situations

The overall eco-compensation situation in China can be summarized by five points. First, many eco-compensation projects were implemented by the government. Spontaneous compensation is much more limited. Central, provincial (municipality, autonomous region) and local governments were the dominant powers in eco-compensation. National eco-compensation financial transfer payments, enterprises' eco-compensation penalties, and related ecological resources taxes were all controlled and coordinated by government bodies. For example, the Chinese central government established a central government forest ecological benefits compensation fund system, a grassland eco-compensation mechanism, a water resource and soil conservation eco-compensation mechanism, a key ecological function zone transfer payment system, *etc.*, and formed 'draft eco-compensation rules'. Many provincial (municipality, autonomous region) and local governments also introduced policies. Examples include 'Shanghai establishing and perfecting eco-compensation mechanism opinions', 'Zhejiang Province People Government perfecting eco-compensation mechanism opinions', 'Guangdong Province eco-compensation method', 'Henan Province water environment eco-compensation interim procedures', 'Shanxi Province ecological environment compensation rules', 'Three river source region eco-compensation trial rules', 'Hainan Province central mountainous area eco-compensation trial rules', *etc.* But there were few reports of person to person, collective to collective, business to person, or other spontaneous forms of eco-compensation.

Second, eco-compensations were mainly paid by the central government, with few cases of compensation from local sources, although some contributions from the central government are combined with contributions from province (municipality, autonomous region) governments. Local governments are still the main recipients of eco-compensation, and they share the funds with

farmers and herdsmen. According to statistics, from 2001 to 2012, the Chinese central government's key ecological function zone transfer payment amounted to  $1.101 \times 10^{11}$  yuan (RMB), the central government's forest ecological benefits compensation fund expended  $5.49 \times 10^{10}$  yuan (RMB), the central government's grassland eco-compensation fund amounted to  $2.86 \times 10^{10}$  yuan (RMB), the central government's water and soil conservation fund came to  $2.69 \times 10^{10}$  yuan (RMB), and the central government's mine geological environment special fund reached  $2.37 \times 10^{10}$  yuan (RMB) (Xu, 2013).

Third, many eco-compensation payments are made within provinces, with fewer inter-provincial compensation payments. Inter-provincial eco-compensation is limited by administrative competition, and the lack of related, national-level operational policies. Inter-provincial eco-compensation is still in an experimental stage. At present, there are just a few trans-provincial eco-compensation cases, such as Weihe River management eco-compensation scheme between Shanxi Province and Gansu Province, and the Xin'an River Basin eco-compensation between Zhejiang Province and Anhui Province.

Fourth, many eco-compensation payments were transfer payments, with relatively few compensation payments and penalties. In China's current vertical management system, the central government is still the principal player in the field of eco-compensation. According to statistics, from 2001 to 2012, the total eco-compensation capital investment from Chinese central finance stood at  $2.50 \times 10^{11}$  yuan (RMB), increasing from  $2.3 \times 10^9$  yuan (RMB) in 2001 to  $7.8 \times 10^{10}$  yuan (RMB) in 2012 (Xu, 2013). It remains difficult to implement eco-compensation between different direct interest-related subjects except via a market mechanism.

Fifth, many eco-compensation projects are implemented in rich areas, with fewer occurring in poor provinces. Relatively speaking, eco-compensation payments were greater in Beijing, Shanghai, Guangdong, Tianjin, and other wealthy provinces than in Anhui, Tibet, and poorer provinces. Taking the national public welfare forest eco-compensation payment standard as an example, in Xinjiang, Qinghai, and other poor provinces it averaged 75 yuan (RMB) per year per Ha, whereas in Beijing, Shanghai, and other wealthy provinces it reached 150–269 yuan (RMB).

### 3.2 Ways of eco-compensation in each province

After an inductive statistical study of the typical ways of eco-compensation at home and abroad, about 40 ways of eco-compensation were identified. In China, from the provincial angle, only Beijing implemented comprehensive compensation by constructing an ecological conservation area. Forest eco-compensation is the most common way of eco-compensation. Nearly every province (municipality, autonomous region) has implemented it. To Shanxi, Hebei, Liaoning, Jiangsu, Anhui, Shandong, Henan, Hunan, Hubei, Jiangxi, Guangxi, Guizhou, Yunnan, Shaanxi and other relatively developed river-basin provinces (municipality, autonomous region), river basin eco-compensation accounted for a major proportion. Shanxi, Hunan, Yunnan, Shaanxi, Qinghai, Xinjiang and other provinces (municipality,

autonomous region) have implemented mineral eco-compensation. Wet land eco-compensation was implemented in Tianjin, Heilongjiang, Jiangsu, Jiangxi, Guangdong, Qinghai and other provinces (municipality, autonomous region). Ocean eco-compensation was implemented in Liaoning, Shandong and other coastal provinces. Tianjin municipality was the first to implement garbage disposal eco-compensation. Grassland eco-compensation was implemented in Xinjiang, Ningxia, Qinghai, Gansu, Tibet, Heilongjiang, Jilin, Inner Mongolia and other provinces (municipality, autonomous region). Jiangsu Province and Hunan Province implemented landscape and famous scenery (nature protection area) eco-compensation. The ways of eco-compensation in each province are summarized in Table 2.

**Table 2** Ways of eco-compensation in each province in China

Province	Eco-compensation way
Beijing	Construction of eco-conservation development areas, mountain eco-compensation
Tianjin	Forest, wetland, and garbage disposal eco-compensation
Inner Mongolia	Steppe and forest eco-compensation and eco-migrants
Shanxi	Coal mining, pollution, forest, and interprovincial watershed eco-compensation
Hebei	Watershed and forest eco-compensation
Liaoning	Watershed (including interprovincial watershed eco-compensation), forest, and ocean eco-compensation
Jilin	Forest and grassland eco-compensation
Heilongjiang	Forest, wetland, and grassland eco-compensation
Shanghai	Water source area and public welfare forest eco-compensation
Jiangsu	Watershed, forest, south-to-north water diversion, ocean, wetland, and famous scenic area eco-compensation
Zhejiang	Regional and forest eco-compensation
Anhui	Watershed (including interprovincial watershed eco-compensation) and forest eco-compensation
Fujian	Watershed (upstream and downstream) and forest eco-compensation
Shandong	Ocean, watershed, and forest eco-compensation
Henan	Watershed, forest, water environment, and south-to-north water diversion eco-compensation
Hunan	Diversification
Hubei	Forest, water and soil conservation, and south-to-north water diversion eco-compensation
Jiangxi	Wetland, forest, and watershed eco-compensation
Guangdong	Eco-functional region, forest, and wetland eco-compensation
Guangxi	Forest and interprovincial watershed eco-compensation
Hainan	Reservoir, city water source, and mountain eco-compensation
Chongqing	Forest and local public welfare forest eco-compensation
Sichuan	Forest and local public welfare forest eco-compensation and eco-conservation demonstration zone' construction
Guizhou	Water pollution' prevention and control, public welfare forest, forest, and watershed eco-compensation
Yunnan	Mineral resources exploitation, river and watershed, and forest eco-compensation
Tibet	Steppe and forest eco-compensation
Shaanxi	Provincial level watershed, water and soil conservation, and coal exploitation eco-compensation
Gansu	Forest, steppe, public welfare forest, and fishing engineering eco-compensation
Qinghai	Three rivers' source area, primary minerals, public welfare forest, steppe, and plateau wetland eco-compensation
Ningxia	Forest and steppe eco-compensation
Xinjiang	Forest, steppe, and resource exploitation (coal, oil) eco-compensation

## 4 Typical Models of 'Eco-compensation'

Based on the practice of eco-compensation and regional development in China, drawing on existing research results (Sun *et al.*, 2006; Hu, 2007; Yu and Ren, 2008; Sun *et al.*, 2009; Xu, 2011; Zeng, 2012), and in the light of the type, method and name attached to eco-compensation programs, four typical models of eco-compensation and harmonious regional development can be identified in China (Fig. 2, Table 3).

### 4.1 Government financial transfer payment compensation model

To protect forest, grassland, and other basic strategic ecological resources of the country and promote the construction of an ecologically and environmentally friendly society, the central government plays a lead role, and the province governments (municipality, autonomous region) draft relevant policy documents, designate ecological resources (national level, provincial level, *etc.*), and pay certain amounts of eco-compensation money for resource protection areas every year in the form of financial transfer payments. The eco-compensation money is mainly used to pay the wages of the ecological resources manager, local government management fees, and other essential infrastructure construction and administrative costs. The essential characteristic of this model is that the government maintains and improves ecological services by means of financial transfer payments, direct investments, subsidies,

preferential tax policies, *etc.* The eco-compensation recipients are the eco-service providers (individual or company) who protect and manage ecological resources. This is the most common eco-compensation model in China at present. Implementing this model needs vigorous government financial and administrative support. The main method is the key ecological function zone transfer payment.

### 4.2 Ecological resource exploiters' payment compensation model

Resource scarcity, national political authority, and social, moral, and civic awareness results in public recognition of the value of ecological resources and the establishment of an ideological understanding and a social value concerning the payment for the use of ecological resources. The resources collected by the government from resource exploiters and users provide the necessary funding for eco-compensation after resource exploitation. The essential characteristic of this model is that the administrative power of the state enables it to require ecological resources exploiters (enterprises) first to pay the resource exploitation security deposit and eco-resource recovery fee prior to getting permission to exploit ecological resources. Implementing this model needs sound environmental policy and government power, and, at the same time, needs ecological environmental awareness on the part of ecological resources exploiters. Typical examples are the resource funds collected for the development and utilization of mineral and ocean resources.

**Table 3** Characteristics and applicability of typical eco-compensation models

Model name	Characteristic	Applicability
Government finance transfer payment compensation model	The eco-compensation provider is the government. The eco-compensation recipient is the eco-service provider (individual or company) who produces and manages ecological resources. The methods of eco-compensation government financial transfer payments, direct investment, subsidies, preferential tax policies, <i>etc.</i>	The most common eco-compensation model in China at present.
Ecological resource users' payment compensation model	The eco-compensation provider is the ecological resources exploiter (enterprise). The eco-compensation recipient is eco-resource protector and repairer, local residents and the government. The method of eco-compensation is the payment of the resource exploitation security deposit and eco-resource recovery fee which the company is charged.	Mineral and other ecological resources exploited in a resource-centred region.
Eco-environment destroyer compensation model	The eco-compensation provider is the ecological environment destroyer. The eco-compensation recipient is those who suffer benefit loss due to the destruction of the ecological environment. The method of eco-compensation way is negotiation.	Trans-regional environmental pollution, the subject that causes ecological damage and the subject that suffers damage (upstream and downstream in the same drainage basin).
Ecological resource tax collection compensation model	The eco-compensation provider is the user of ecological resources. The eco-compensation recipient is the commonly-owned ecological resources developer and administrator (represented by the government). The method of eco-compensation way is the collection of the eco-resource tax.	Collection of water tax, gas tax, petroleum tax, <i>etc.</i>

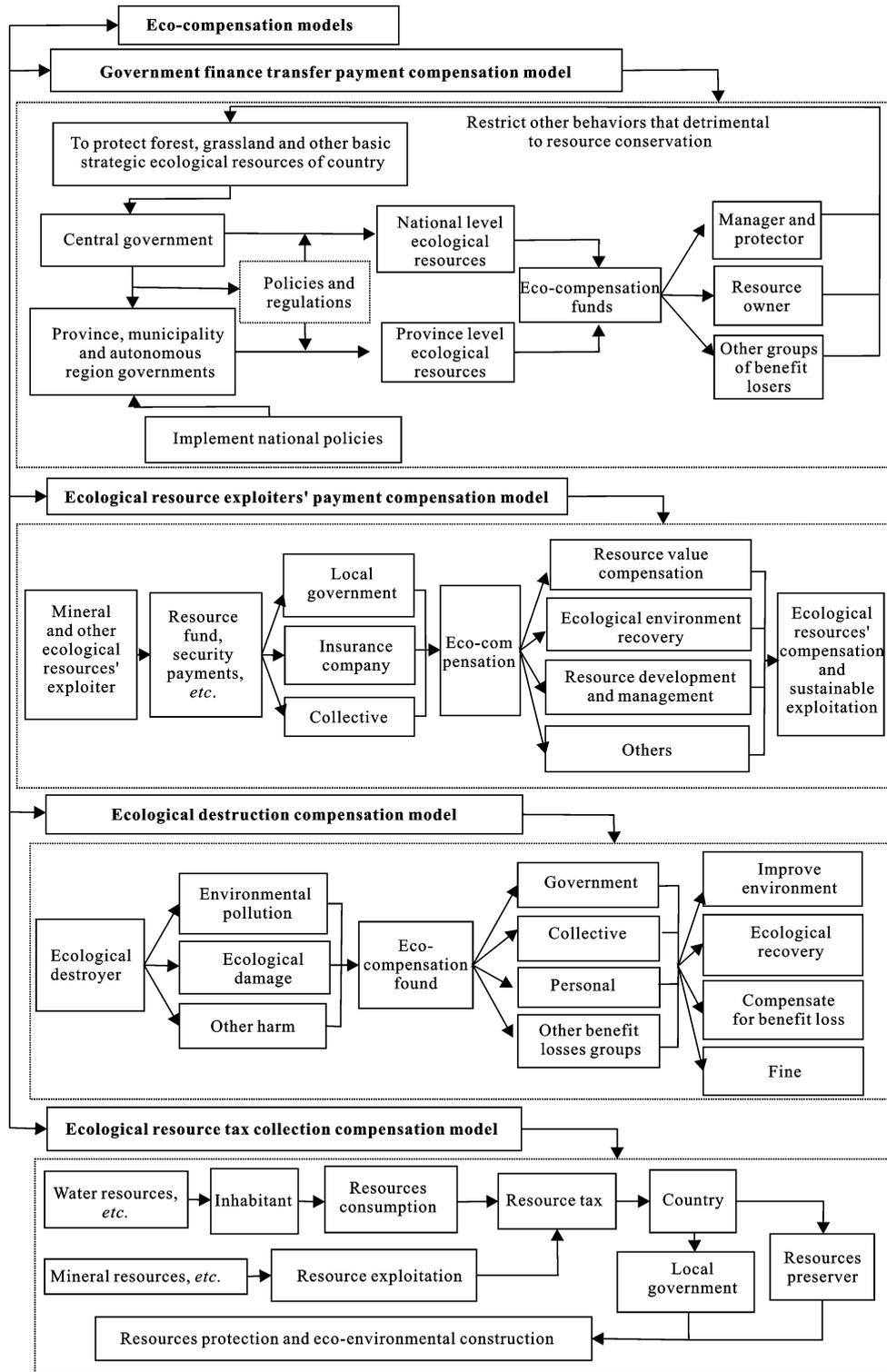


Fig. 2 Basic framework of four typical eco-compensation models

### 4.3 Ecological destruction compensation model

Because of the mobility of some ecological resources (water, air, etc.), behavior that causes eco-environmental destruction not only causes environmental pollution,

results in ecological damage and has other negative effects on ecological resources, but also gives rise to conflicts of interest between different groups with respect to production, life and ecology. To solve environmental

problems, the eco-environment destroyer should compensate other groups for benefit losses, and should pay certain eco-environment compensation funds to those who suffer from environmental damage. Implementing this model requires negotiation between ecological environment destroyers and benefit losers, and also requires negotiation between ecological service providers and potential users, who then make a deal or reach a compensation agreement. Typical examples are environmental pollution problems involving upstream and downstream areas, interprovincial watershed eco-compensation, etc.

#### 4.4 Ecological resource tax collection compensation model

For water, energy, and other strategic natural resources, governments collect coal, oil, natural gas, minerals and other resource taxes. These taxes reflect the chargeable use of state-owned natural resources with the aim of adjusting differences in profitability derived by taxpayers with differential access to natural resources and of promoting effective resource development and sustainable use. As a result society can provide the necessary eco-compensation for resource exploitation. Operating in the context of the functioning of market mechanisms and on the basis of market rules, the government represents the ecological service supplier, and collects taxes from the suppliers which are reflected in the prices charged to users of the services the resources provide, and carries out ecological compensation work for the eco-resource beneficiaries. In the implementation of this type of eco-compensation model, market mechanisms guaranteed by government power are the basis. Typical examples are water tax, natural gas tax, petroleum tax, etc.

### 5 Conclusions and Future Prospects

(1) Eco-compensation is a response to growing pressures from eco-resource damage and pollution and can help promote harmonious regional development. How nature and natural resources should be valued and therefore how much compensation is appropriate, who should compensate whom (who pays what and who receives what), and how compensation payments should be made are the core problems that still remain to be addressed.

(2) Eco-compensation in China has had significant

impacts. In each province in China, there are different key areas of work in relation to eco-compensation. Many eco-compensation projects are led by the government; spontaneous compensation is much less frequent. Similarly, eco-compensation is mainly paid for by government, with fewer funds coming from local sources. Most eco-compensation transactions occur within rather than between provinces. Transfer payments are more common than compensation payments and penalties. Finally, eco-compensation is more common in richer areas than in poorer ones.

(3) China has explored several eco-compensation development models. Government financial transfer compensation payments, ecological resources exploiters' payment compensation, ecological destruction compensation, and ecological resources tax collection compensation are the four primary development models. Each model has its own features and norms.

(4) In practice, eco-compensation has made a positive contribution to harmonious regional development in China. However, there is a lack of an overall framework for the development of eco-compensation, and there is no consensus regarding the scientific propositions underpinning eco-compensation models. In particular, studies of the relationship between harmonious regional development and eco-compensation models are still lacking, making it difficult to understand the differences, similarities, complementarities and conflicts between them. This paper has provided an initial theoretical and empirical clarification of some of the issues involved, opening the way to further investigation and analysis.

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