論文（*Article*）

Economic Measures to Promote Wetland Conservation and Restoration

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The fundamental reasons of wetland destruction are information failure, market failure and policy failure in the process of wetland protection and utilization. Several key issues of using economic tools to accelerate wetland conservation and restoration are discussed, including clarifying property right of wetland resources, providing compensation or tax preference for wetlands conservation and restoration, collecting taxes or charging for wetland destruction and resources utilization, establishing markets of wetland ecosystem services, and establishing the financial mechanism.

Key Words : Wetlands; Conservation; Restoration; Economic Policy

As one of the most critical ecosystems on the earth, wetlands are able to provide multiple goods and services for human being, possessing high value. Also, wetlands are recognized as the greatest threatened ecosystem at present. Because of reclamation and transformation, pollution, excessive use of biological resources, sediment deposition and unreasonable utilization of water resources, and so on, more and more wetlands have degenerated and disappeared, lead to the sharp decrease of biodiversity, aggravated soil erosion, frequent flood and drought, which would bring tremendous economic loss and even the threat of human health and lives.

Wetland conservation and restoration can relief pressures on wetlands, which could conserve and restore wetland functions and values to some extent, providing economic development with potential foundation and motivation. In order to promote wetland conservation and restoration, the government should adopt a series of effective policies to identify the responsibilities and duties of all the stakeholders, and make the land owners and users choose behaviors beneficial to the wetlands conservation. Also, it would unify public and personal benefits, realizing the effective allocation of resources.

1. FAILURE OF WETLAND CONSERVATION AND UTILIZATION

The fundamental reasons of wetland destruction prove to be the information failure, market failure and policy failure in the process of wetland conservation and utilization. The information failure means to be lack of comprehensively assessment for the benefits of wetland conservation. Driven by benefits as well as the idea of wetland resources having no value, market failure and policy failure also appeared.

The market prices of various wetland natural resources are not capable to reflect real social cost. Once the individual benefits disagree with the social benefits, market failure would appear. Several wetland products, such as land, fishery, industrial raw material, energy and so on, have market prices, which could realize the direct use value of wetlands in a certain degree. However, a large number of wetland functions of ecological services, like water supply, flood control, soil erosion control, pollution control, climate change mitigation, biodiversity maintenance and so on, can be characterized as public goods, without market or with an extreme low market price. If only depending on market regulation, the land user would choose the land use pattern with maximum benefits like real estate development or agricultural reclamation etc., ignoring wetland conservation and restoration.

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Policies encouraging wetland conversion or being lack of integrated management of wetland resources, as well as the disagreement of policies between different departments, would lead to wetland loss and degradation and policy failure. China's policies encouraged wetland conversion for a long time. The Sanjiang Plain in Heilongjiang Province, called as "great northern wild" before, had areas of marsh wetland reaching more than five million hectares. Since 1949, the troops and youth's reclamation, as well as the current policies such as government investment, foreign investment, wild land contract policy and so on, the land use right have been transferred at quite low prices to individuals or enterprises for wetland development. Several times of wetland reclamation upsurges led to the reduction of wetland rate from 80% to 20% in Sanjiang plain (Liu, 2002). Even though the wetland reclamation is not encouraged by present policies, people can not gain benefits from wetland conservation and restoration. Since lack of necessary economic stimulation to correct the market failure, market failure and policy failure exist commonly. For instance, wetland and lake restoration policies have not been implemented effectively in most wetland areas.

Table 1 Main Classification of Failure of Market and Intervention

Classification	Reasons
1 Pollution	
A) Extraterritorial air pollution	Over standard of S and N, leading to damage of species diversity
B) Intra-domain water pollution	Excessive N and P caused by sewage and agricultural reasons; some industrial (poisonous matters) pollution
C) Extraterritorial water pollution	Pressure from agriculture and entertainment industry
2 Public Assets	
A) Groundwater loss	Excessive exploitation (inter/extra-domain) of surface water and groundwater, leading to deficiency of wetland supply
B) Intra-domain congestion cost	Entertainment pressures compared with wetland endurance
3 Incoordination of Inter-department Policies	
A) Competition factors of department output price	Agriculture pricing followed by land requirements
B) Competition factors of inter-department input price	Tax changes or outdated tax items related to agricultural land use; tax changes related to housing of industry; tax changed related to forestry capital; low interest loan aiming to owners of farm; transformation subsidy (drainage, embankment, flood prevention, flood insurance); subsidy given to other agricultural input; research and exploitation of intensive farming methods with plate-direction
C) Policies of land use	Division; regional exploitation policies; directly preferential policies for wetland transformation; agricultural fallow planning; waste disposal policies
4 Wetland Policies with Adverse Effect	
A) Ineffective policies	Policies lacking of long-time structure
B) Organization failure	Lack of monitoring and investigating abilities; poor information transmission; divergent organization structure

Sources: OECD,1996.

2. ECONOMIC MEASURES TO PROMOTE WETLAND CONSERVATION AND RESTORATION

The policy tools of wetland administration are comprised with command control measures and economic stimulating measures. The former establishes wetland nature reserves, adopting administrative measures to manage wetlands by formulating laws, regulations and standards related to wetland conservation; while the later would promote people to protect and restore wetlands by stimulating measures like price, tax and charge. These two policy tools should complement each other and neither is dispensable. In Table 2, the policy tools for wetland management are classified, and the pros and cons of the various tools are listed. Adopting relatively flexible economic policies can promote the activities of individuals and enterprises to protect wetlands and decrease external diseconomy, and unifying individual and social benefits.

Table 2 Policy Tools of Wetland Administration

Policy tools	Connotations	Advantages	Disadvantages
Legal measures	laws, regulations, standards etc.	Possessing general binding characters, strictly compulsory, definitely normative, comparatively stable	Imperfect legal system; weak operability and supervision
Administrative measures	Injunctions, divisions, classifications, time termination, permits, standards,compulsive techniques	Authoritative, direct and effective; easy to be operated and with low implementation cost	Compared to legal measures, lacking of long-time stability
Economic measures	Price, tax, charge, loan, financial subsidy, mortgage, award or penalty, etc.	Stimulation measures instead of forcing by administrative regulations; supervisees have options, more flexible	Hard to identify property right
Propaganda and education measures	Medias, schools	Fundamental measures, benefit to long-time conservation	Long period and slow effect

The economic measures of wetland management include “Pigou measures” and “Coase measures” (Ma, 1996). Pigous measures refer to levying tax or charge for land use conversion of wetlands, or offering the land users who conserve wetlands corresponding compensation and stimulation. Coase measures, on the other hand, refer to establishing trade markets by clarifying the property right and realizing wetland benefits in the market by offset trading. The common ground of these two kinds of measures is that market mechanisms are used by both of them. The difference is that the former applying the existing market to regulate, while the later crating a new market. Emerton(1998) classified the economic measures which can be used to promote wetland conservation and restoration (Table 3). If the economic measures for wetland management are adopted, the principles of “polluter pays; developer protects; destroyer restores; user compensates” should be followed.

Table 3 Economic Measures Classifications to Promote Wetland Conservation and Restoration

Classifications	Direct Stimulations	Indirect Stimulations	Negative Stimulations
Property right	Identify ownership, access and property right clearly		Deprive the ownership of use right of wetland
Livelihood	Increase efficiency and sustainability of wetland use	Diversification of rural development and livelihood	
Market	Promote and develop wetland product market	Exploit various wetland products	Injunction or quota for wetland products
Finance	Provide subsidy or tax for sustainable wetland		Products of use tax of wetland
Banking	Provide awards for wetland conservation; provide compensation for suspension of unsustainable activities	Allocate benefits of wetland us; provide loan, grant and credit for exploitation	Demand penalty for utilizing resources unsustainably or illegally

Sources: Emerton, L., 1998.

2.1 Clarifying Property Right of Wetland Resources

Wetlands have the property of public property, lacking of definite property ownership. The key point of the economic measures applying to wetland management is clarifying property right through some necessary institutions. Only by regulating definite, exclusive, transferable and safe ownership and use right of wetlands, the external diseconomy brought by wetland destruction can be internalized, and the optimum allocation of resources would be realized.

The property right of wetland resources should be identified on the basis of its externality and characteristics of public goods. The rare and critical wetland resources with large externality and natural monopolistic features, such as endangered wild animals and plants, large area of natural wetlands, the core areas of wetland nature reserves, wetland ecological water requirements etc., should be identified their ownership in the form of public property. On the other hand, the wetland resources with obvious exclusiveness and competitiveness, such as urban small-area wetlands, artificial wetland, wetland park etc., can be obtained by individuals and enterprises with land use right, managed by introducing market mechanism. These kinds of property right are guaranteed by laws and policies, which should be stable and persistent, so that the constant long-term benefits can be assured.

The property rights of various wetland resources like land, water, animals and plants, mines etc. are difficult to be identified, especially for the land property. The land ownership belongs to the nation and collectives in China, while individuals and enterprises can obtain land use right during a certain period by a contract. Private land contractors might choose land use patterns harmful to wetland conservation, such as transforming wetlands into farmland, over withdrawal of groundwater, applying fertilizers and chemicals excessively and so on.

In order to restore the wetlands transferred into farmland, farmers may be compensated by purchasing the land use right for a certain period. In the U.S. Wetlands Reserve Program, for an instance, the wetlands were restored by purchasing the permanent easement of these lands.

2.2 Ecological Compensation for People Devoted to Wetland Conservation and Restoration

Since wetland conservation, restoration and reconstruction need to occupy land, the land users should be compensated. The encouragement or compensation for protectors or restorers can be in the way of subsidy or tax preference. For instance, in the Environmentally Sensitive Areas (ESAs) in Britain, in signing up to a management agreement with the Department, farmers receive an annual payment on each hectare of land entered into the scheme (Zhu, 2004). In China, policies such as "conversion of cropland to forest, grassland, or lakes" provide subsidy for protectors of forest, grassland and wetlands. In the U.S., the land trust system are induced for restriction of wetland exploitation, that is once the land owners deliver the exploitation right to the government or nonprofit environmental protection organizations, they could gain some tax deduction.

To effectively encourage land users to protect and reasonable develop wetlands, the one who convert cropland into wetlands should be paid. However, since ecological compensation policies in China are not very specific and extensive, the funding sources, objects, standards and ways of compensation should be further determined. Theoretically, to recover reclaimed farmland to wetlands, the opportunity cost should be calculated according to the net income from agriculture in the area. The minimum amount of compensation should be more than the net income loss caused by participating wetland conservation and restoration projects.

The cropland in the core area of wetland nature reserves should be restored in priority while the farmers should be compensated reasonably. On the other hand, the small blocks of wetlands distributed wildly in the farmland, which have functions like pests control and pollination, and would maintain the ecological balance, should be conserved through signing up to the management agreements.

2.3 Tax or Charge to Wetland Destroyers and Resources Users

To avoid the environmental costs caused by wetland transformation and utilization, and internalize the external cost, wetland transformers and resources users should pay. The paid use system should be established so that the collected fees can be used for the projects of wetland conservation or restoration, such as levying ecological compensation fees for using resources in wetlands such as land, water, wood, living things, fishes, mines, or selling tickets to tourists. The income from wetland nature reserves should be used for construction and daily administration in the reserves.

Wetland pollution can be controlled by levying tax or charge to polluters. Pollution from point

sources may be controlled by more strict license system, while for the non-point sources pollution control, we should restrict pesticide and fertilizer use by abolishing subsidies, or levying tax for the use of pesticide, or adopting mortgage system to recycle pesticide containers.

Cancelling the unreasonable subsidies for developers of agriculture, water conservancy, road, entertainment, real estate development and forestry would also be able to correct policy failure. For example, "Swampbuster Provisions" in the Food Security Act of 1985 in the U.S., state that a person will be ineligible for all or a portion of certain USDA program benefits, including loans, subsidies, crop insurance, and price support programs, if the person produces an agricultural commodity on wetland that was converted (Zhang, *et al*., 2003).

For developer of wetland resources, mortgage insurance system could be adopted as well, which means charging insurance to the developers according to the evaluation of all the social costs of wetlands development. If the social costs are lower than the evaluation results, the insurance fee can be returned back to the developer, otherwise it would be used in the wetland restoration projects.

2.4 Establishment of Market Mechanism of Wetland Ecosystem Services

The establishment and improvement of market mechanism of wetland ecosystem services can guide users of wetland resources to transform depleting utilization (such as filling lakes, draining wetlands, peat mining etc.) to sustainable utilization, promote wetland conservation and restoration, meanwhile, increase employment and raise income for the residents around wetlands. As a result, the social benefits and private benefits can be coordinated.

At present, there are broad prospects of ecosystem services market in the fields of watershed protection, biodiversity, climate change, emission right etc. in the world. For instance, the Wetland Mitigation Banking in the U.S. was built as a market mechanism, for the purpose of promotion of wetland restoration and reconstruction. The entrepreneurs who restore or reconstruct wetlands can gain wetland credits in the Wetland Mitigation Banks, while the developers who damage or destroy wetlands have to purchase the wetland credits to mitigate their impacts on wetlands. According to statistics in 2005, there were 500 Wetland Mitigation Banks in the U.S. and from January 1st, 2000 to April 30th, 2005, 47 transactions have been completed, whose trading volume reached US$289,659,866, and 9,229hm^2 of wetland were conserved and restored[2].

In China, although many kinds of ecosystem services cannot be managed through market channel now, large potential markets of wetland ecosystem services still exist. Some of the wetland goods and services have markets, which need to be further developed and improved; some of them have no market now but could establish the markets. Currently, wetland ecosystem services which have huge potential markets mainly focus on animal and plant products from wetlands, ecotourism and sewage disposal etc. These potential markets can not only promote local economic development, but also be favorable to wetland conservation and restoration (Liu, 2007).

2.5 Financial Mechanism to Promote Wetland Conservation and Restoration

The fund of wetland conservation need to be raised by central and local government, wetland conservation projects financed by related departments (forestry, agriculture, water conservancy, environmental protection etc.) or international organizations, as well as private or enterprises investment for reasonable use and conservation of wetlands.

Wetland conservation is mainly financed by the central and local governments. Since the maintenance costs of wetland nature reserves are not brought into the budget of central and local governments, most of the nature reserves in China are facing serious financial shortage, which inevitably results in lack of necessary management in nature reserves and aggravation of wetlands destruction. Wetland conservation funds should be established and wetland conservation and ecological restoration should be brought into the national public financial budgets as one of the main parts of the national ecological construction, and planned entirely. In national nature reserves, not only infrastructure but also daily management and wages should be financed by the central budget.

On the principle of "protectors and investors can get benefits", we may as well conduct and encourage social public and private investment for wetland conservation. In a word, wetland conservation must be combined with local economic development, protecting the interests of wetland protectors. The conservation and restoration of wetlands won't

2 http://ecosystemmarketplace.com/pages/marketwatch.overview.transaction.php?market_id=4

succeed, unless the local economy is prosperous and people's living condition is improved.

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