Payment for Watershed Services in China: Role of Government and Market, A Diagnostic Study[1]

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1. Introduction

In the past 25 years, Chinese economy has sustained an annual growth rate of 9.5% in average (OECD, 2005). Chinese economy became the 4th largest economy (USD$2.2 trillion in total with per capita GDP USD$1,700) in the world in 2005 after USA, Japan, and Germany, according to the World Bank (2006). The fast growing economy is accompanied by the decentralization and marketization of economic sectors though the political structure changed little, still with the powerful government and top-down approach.

Along with the blazing economic achievement from the rapid growth of Chinese economy are mounting environmental problems and development imparity. Water pollution is getting worse. About 30% of river water and 40% of lake water is so polluted that the water could not be used for any purpose and itself becomes a source of pollution according to SEPA's annual China Environmental Status Report 2005 (SEPA, 2006). Water quantity is also a problem. The Yellow River, which is the second largest river in China and runs through 9 provinces and 5,500 km from western China mountains to the East China Sea, even ran dry for 226 days before reaching the ocean in 1997. If one looks at the Chinese map, s/he will see thick network of blue route of rivers.

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But if s/he goes to the field, no water but river bed could be seen since most of the rivers have water only in the rain seasons (summer time).

So, on the one hand, people feel the scarcity of the watershed services with the supply of watershed services decreasing rapidly, and on the other hand, the demand for environmental services is increasing with the increasing incomes in the past 25 years. People begin to talk about payment for watershed services (PWS), payment for environmental services (PES), and ecological compensation (EC) and some of them become willing to pay for the watershed services, which has been taken for granted and consumed for free for the past centuries.

This research is to identify the PWS like schemes in China by review of national programs and study of local initiatives and look into the features of the PWS schemes. Based on this, we will explore the role of government and market in these PWS initiatives, paying particular attention onto dynamics of their functions in PWS.

Our research findings come from our five case studies, three policy studies, collection and review of some 20 PWS cases in China, and learning group visits and discussion. Five case studies had been carried out, respectively, in the Jinhua watershed in Zhejiang Province, Supa and Xiaozhaizi watersheds in Yunnan Province, Meijiang watershed in Jiangxi Province, and Miloujiang watershed in Hunan Provinces. Three policy studies are i) agricultural policies and their impacts on PES in China; ii) globalization and international environmental treaties and their impacts on PES in China; iii) forest ecological compensation policies in China.

2. Review of national PWS like programs in China

In the late 1990s, two major events shaped what is called “ecological compensation” in China, which bears some similarity with PWS or PES. One is the unprecedented 7-month-dry in 1997 of the Yellow River, which has nourished the Chinese civilization in history and is called Mother River by Chinese people. The other is the big floods in 1998 in 3 major river basins from south to north of China, ie. the Yantze River, the Huaihe River, and the Songhuajiang River basins.

Box 1 Natural Forest Protection Program (NFPP)

Program Areas

The aim of the program is to re-establish and rehabilitate natural forests in the main State-owned forest areas of the upper reaches of the Yangtze River, the upper-middle reaches of the Yellow (Huanghe) River, northeast China and Inner Mongolia. It involves a total of 734 countries and 167 forest industry bureaus in 17 provinces.

Main Targets

The main targets of this program are a comprehensive ban on commercial logging in the natural forests in the upper Yangtze, and upper and middle Huanghe River regions; a drastic reduction in logging volume in key state forest regions of North-eastern China and Inner Mongolian; and the protection of natural forests in other regions by local governments.

Status of Implementation

Pilot implementation started in 1998 and was then extended to all 17 provinces (autonomous regions or municipalities) in 2000. By the end of 2004, the cumulative afforested area had reached almost 4.33 million ha. The area of forests cultivated by closure was about 8.85 million ha, while the area of protected forests increased by some 90 million ha annually. The cumulative reduction in logging was at 130.83 million m^3 (estimated based on the baseline of 32.054 million m^3 in 1997 for the program region); reduction in forest stumpage drawdown was 252.07 million m^3 and some 0.74 million logging workers were relocated to new jobs.

Source: Sun and Chen, 2006.

The general public and the policy-makers accepted what the forest sector asserted that the big flood resulted from heavy soil erosion in the upper reaches of the main rivers, especially of the Yangtze River and the Yellow River, and in turn, the soil erosion resulted from deforestation in the upper reaches.

In this context as well as other economic/political context, the Central government wasted no time

to launch several national programs. One is the Natural Forest Protection Program (NFPP),

which banned, from 1998, the logging of the natural forest in millions of hectares in the upper reaches of the Yangtze River and Yellow River (see Box 1). The central government planned to invest CNY96 billion (USD$12 billion) in the NFPP in 10 years.

The other big program is the Sloping Land Conversion Program (SLCP), in which the central government provided grains and cash to farmers for them to convert their sloping cropland into forestland in ecological sensitive regions (see Box 2). It was launched in 1999 as trial stage. The central government planned to invest CNY100 billion (USD$12.5 billion) in the SLCP in 10 years.

Then the concept and idea of ecological compensation became popular in academia and political arena of China that the ecological services provided by the up stream of a watershed should be paid with a compensation fee by those who use the ecological services. The central government even launched another large program in 2001 explicitly named with ecological compensation, which is the Forest Ecological Compensation Program (FECP). FECP costs the central government CNY2 billion (USD$250 million) annually, in which the central government paid those who help sustain the forests that provide significant ecological benefits but are not covered by the NFPP project. See Box 3.

More ecological compensation programs were created by the central government in the following years.

In 2002, the central government launched a program coping with the dust storm that hit Beijing more frequently than before. In 10 years (2001-2010), the central government will invest CNY55.6 billion (USD$6.95 billion) in regions north of Beijing (dust source region) for afforestation, resettlement, and watershed management.

Box 2 Sloping Land Conversion Program (SLCP)

Project areas

The Sloping Farming Lands Conversion Program (SFLCP) is aimed at reducing soil erosion in key areas of 24 provinces (autonomous regions and municipalities) in Northwest, and parts of Northern, North-eastern and central China.

Main targets

Under the SFLCP the plan is to return 14.66 million ha of farmland to forests and afforest 17.33 million ha of barren hills and wasteland better suited to afforestation during the decade 2001-2010. When completed, the program should have increased forest and grass cover by 5% across the program area and controlled soil erosion on 86.66 million ha of affected land. Shelterbelts to control windstorms and stabilize sand dunes will have been established on a further 103 million ha.

Status of Implementation

The sloping farming lands conversion program began in 1999. By the end of 2004, 17.34 million ha had already been afforested, of which about 7.83 million ha are reclaimed farming lands and 9.51 million ha are barren lands. Over 80% of these replanted forests are in the type of shelter or ecological forests. Accumulated investment reached 63.364 billion Yuan (7.66 billion USD), and state investment was valued at 58.286 billlion Yuan (7.04 billion USD), accounting for about 92% of total investment in the program.

Source: Sun and Chen, 2006

In 2003, the central government launched a program coping with the pastureland degradation. In 5 years (2003-2007), the central and local governments will invest CNY14.3 billion (USD$1.8 billion) in 1 billion mu (67 million ha) of pastureland for changing to environmentally friendly way of grazing or no grazing.

Box 3. Forest Ecological Compensation Program (FECP)

FECP came into being after the Forest Law was revised in 1998, when a clause was added to the Law that called for the establishment of a forest ecological compensation fund to be used to support the provision of public benefits by protection forests and special-use forests. In January 2000, an implementation

regulation was issued which stated that those running protection and special-use forests have the right to receive compensation for forest service The State Council in early 2000, decided that the money for compensation will be directly allocated from the fiscal budget.

In 2001, MOF allocated CNY1.0 billion2 (or US dollars 0.12 billion) to be used annually in eleven provinces and Autonomous Regions for pilot implementation, covering 685 counties (or enterprises) and 24 national-level reserves, with 200 million Mu (13.33 million hectares) in total. Local governments in Guangdong, Fujian, Zhejiang, and other provinces have allocated similar funds and are also implementing local public forest compensation pilots. In later 2004, FECP was formally launched, and the implementation area and supporting fund was doubled to 400 million Mu and CNY 2 billion.

Table b1: Eleven pilot provinces and the funding distribution in 2004

Province/Autonomous Region	Pilot areas (10,000 Mu)	Funding distribution (CNY 10,000)
Hebei	1,900	9,500
Liaoning	2,100	10,500
Heilongjiang	2,500	12,500
Anhui	1,200	6,000
Fujian	1,300	6,500
Jiangxi	1,900	9,500
Shandong	800	4,000
Hunan	3,000	15,000
Guangxi	3,500	17,500
Xingjiang	1,500	7,500
Zhejiang	300	1,500
In total	20,000	100,000

The goal of the FECP is to promote the conservation of forests using economic incentives. It is the first

[2] 15 Mu's = 1 hectare, CNY 8 = US$ 1 in 2005

time that the Chinese Government has provided funds directly from the national budget for forest conservation. The incentives are to be paid to those organizations, collectives and individuals who manage key protection and special use forests. The compensation will be CNY5 per Mu [around US$9 per Ha] per year. Local and provincial governments are encouraged to provide matching funding.

Source: Zuo et al. 2006.

3. Local initiatives

There are also local initiatives besides the national schemes. There are two kinds of local initiatives. One is the down-sized government program, which is quite similar with the large program in terms of mechanism characterized with top-down approach, but it is designed by, serves, and operates only in one province, prefecture, county, or even one township. The other kind of local initiative is a deal between two independent and equitable parties.

3.1 Down-sized government program

A number of provinces, municipalities, and counties have launched their own ecological compensation programs in their respective jurisdictional regions. For example, Guangdong Province set up their own "Provincial Forest Ecological Compensation Program", which is quite similar with the national one but with a higher payment rate (CNY120/ha, =USD$15/ha, versus USD$9.4/ha of the national rate). Shenzhen Municipality of Guangdong Province also launched their own "Municipal Forest Ecological Compensation Program", which has an even higher payment rate of CNY360/ha (USD$45/ha). Zhejiang Province's provincial FECP has a payment rate of CNY105/ha (USD$13/ha).

Some other local governments also initiate their own so-called ecological compensation programs. For example, Quanzhou Municipal Government (2005), Fujian Province, set up a specific financial account in the Municipal Bureau of Finance, and collected money from the 6 downstream counties/districts and 2 midstream counties/districts within its jurisdiction, and used the money to

fund environmental improvement projects in 3 upstream counties/districts and 2 midstream counties/districts of Quanzhou City. Annually CNY20 million (USD$2.5 million) of money will be collected from the county/district level finance for the next 5 years (2005-2009). The county/district will contribute a larger proportion to the fund if it withdraws a larger proportion of the river water, compared with other county/district. CNY20 million (USD$2.5 million) was collected in 2005, which had been used to fund 32 projects of environmental improvement in the upper and middle reaches of the Jinjiang River. The specific fund is to be used to cover 20-40% of investment costs of the eligible projects in the upper/mid reaches.

3.2 Deal between independent parties

Water trade in the Jinhua watershed represents a PWS scheme which is very different from the top-down government one. The parties in the deal are two cities which are independent with each other. This case is in our diagnostic study areas.

The city of Dongyang is rich in water and has a reservoir, the Hengjin, in the upper reach of the Jinhua River. The city of Yiwu is in the lower reach of the Jinhua River and in severe water deficit. See Figure 1. Political endeavor to divert water from Dongyang to Yiwu failed after 4 rounds of negotiation in the past 4 decades.

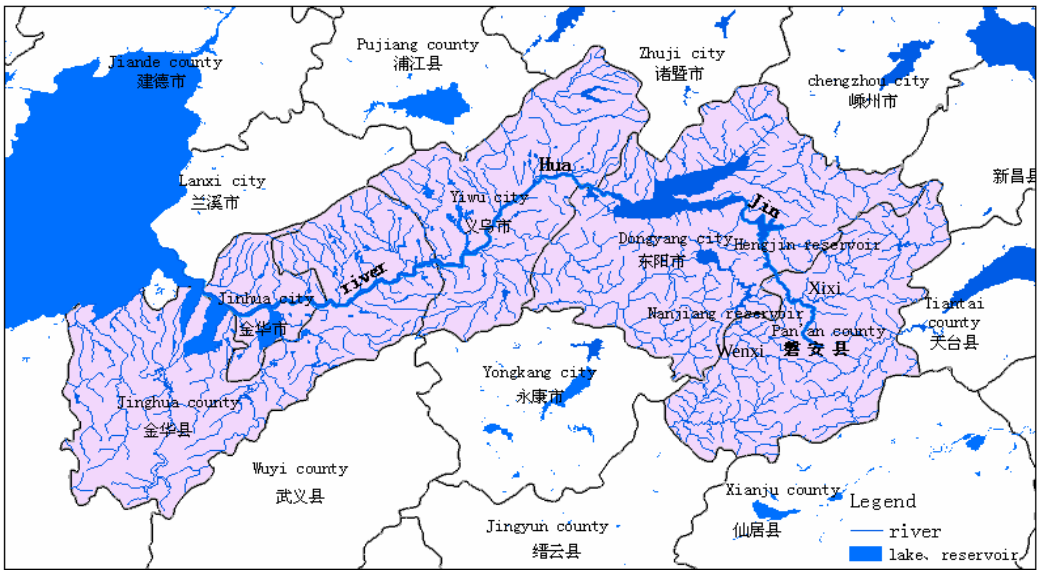

Figure 1. Water trade between Dongyang city and Yiwu city in Jinhua watershed

(Zhang et al. 2006)

In November 24, 2000, the two cities reached a water agreement, in which Yiwu paid Dongyang 200 million yuan (US$25 million) for the permanent right of annually diverting 50 million m^3 of water in the Hengjin Reservoir. The water quality was specified as national water standard class I in the deal. In addition, Yiwu will pay Dongyang for the water actually diverted for a price of 0.1 yuan (US$0.0125)/$m^3$, which is subject to change according to policies at higher levels.

4 Features of China's PWS schemes and initiatives

4.1 Large scale

China's PWS schemes are noted for its large scale. The SLCP may be the largest PWS program in the world. Since 1999 when the program began up to 2005, the central government has provided 103 billion yuan (US$12.8 billion) to 30 million households in 25 provinces for converting their 9 million ha of sloping land into forest land and planting trees in 12.6 million ha of barren mountains (SLCP Office, 2006).

4.2 Government scheme

Large scale PWS programs are launched by the central government. Most of the provincial, municipal, or county wide PWS programs are launched by the local governments. And the payment schemes between independent and equitable parties are between two local governments at prefecture, county, township, or even village level. PWS cannot do without government, as said by an local official, Zhang Aimin, division director of Zhejiang Provincial Environmental Protection Bureau.

4.3 Design problem

Opportunity Costs are poorly estimated in the SLCP. In this "grain for green" program, the payment rate is $417/ha/yr for farmers in the Yangtze River Basin, and $290/ha/yr for farmers in the Yellow River Basin. But empirical research shows that the opportunity costs of this conversion

are CNY191/mu (USD$358/ha) in Sichuan Province project areas (Yangtze River Basin), CNY43/mu (USD$81/ha) in Shaanxi Province project areas (Yellow River Basin), and CNY142/mu (USD$266/ha) in Gansu Province project areas (Yellow River Basin), which means that the payment rate is higher than the opportunity costs in most conversion cases (Xu et al., 2004). See figure 2. This results in waste of public money and rent-seeking for surplus of payment over opportunity costs.

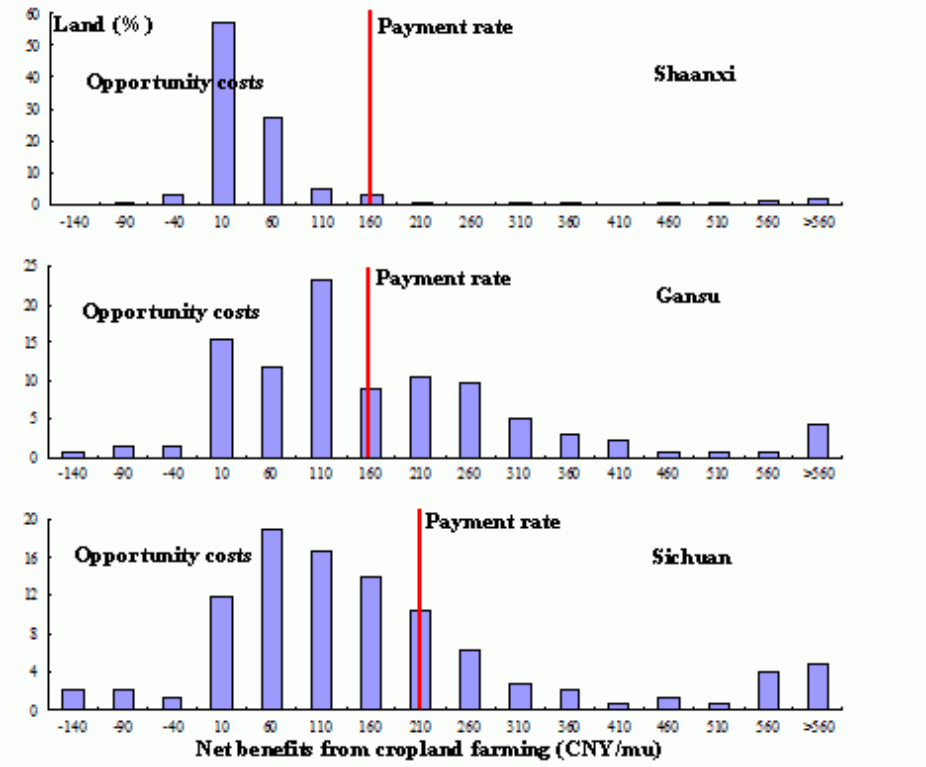

Figure 2. Payment rate vs. Opportunity costs in Sloping Land Conversion Program (Xu, 2004)

4.4 Fund leakage

Paying through the long channels from the central, provincial, prefecture, county, township down to the households provide many opportunities for fund leaking. In the SLCP, for example, empirical study shows that only 15%-90% of grain and 15%-85% of cash were paid to farmers in the due time. The CNY50/mu (USD$94/ha) for seedlings is supposed to pay the farmers, but it was transferred to the forestry department, which gives farmers seedlings in stead of money.

4.5 Diverse schemes

Most schemes are top down within jurisdiction boundary transfers, but there are schemes which are across jurisdiction boundary. There are small schemes, which are at village levels such as the water deal between two villages in the Xiaozhaizi watershed, Yunnan Province. There are large schemes such as the SLCP, which covers 25 provinces of China out of 31. Payment in some schemes is virtually subsidies while that in others may be compensation.

Payment in Quanzhou scheme is virtually subsidy. An environmental improvement project, such as a wastewater treatment plant, will be subsidized by 20%-40% of its investment costs if the project has been under construction in the upper reaches of the Jinjiang River according to Quanzhou City Government's "Directive on Financial Management for Watershed Conservation of the Upper Reaches of the Jinjiang, Luoyangjiang Rivers" (Quanzhou City Government, 2005).

Payment in the FECP is compensation. Foresters or farmers are paid USD9.4/ha for keeping forests with significant ecological benefits. In fact, such forests are categorized as Forest with Public Benefits in Chinese forest law, which are not allowed to be cut down by law/regulations. Forester/farmers have no choice of cutting it down without compensation.

5. Dynamics of functions of government and market in PWS

5.1 PWS drive: supply-side and the higher level of government

There are two major drivers that move the PWS or eco-compensation in China. One is the supply-side upstream government/communities. The other is the higher level of government.

5.1.1 PWS driver 1: supply-side upstream

China's PWS or ecological compensation is largely driven by the supply-side of the watershed services. This contrasts sharply with the PWS cases in the rest of the world where demand-side is the main driver of such schemes.

Upstream governments take the PES as a chance to get payment/money or other benefits for watershed services from the rich downstream. In March 2006, there are two law/act proposals regarding PWS which were submitted to the annual meeting of the People's Congress, China's law-making body. One supposed to establish ecological compensation scheme in the Dongjiang watershed. Representatives from the Jiangxi Province in the upstream of the Dongjiang submitted the proposal, which asked the downstream and rich Guangdong Province to help the 3 counties of Jiangxi Province which are in the upper reaches of the Dongjiang River. The other law proposal was submitted by representatives from the Anhui Province and asked the downstream and rich Zhejiang Province to help the development of Huangshan City of Anhui Province, which is in the upper reach of the Xin'anjiang River.

In our case study of Supa watershed in Yunnan Province, it is the upstream and surrounding community (local government), supplier of the watershed services, that urges the hydro-power plant to compensate for the afforestation and conservation efforts. The same also happens in the PWS case in the Jinhua watershed in our case study and in many other local schemes in our review of PWS cases in China.

5.1.2 PWS driver 2: higher-level of government

The Central Government is keen to promote the payment for watershed services provided by the upstream and western and poor provinces. Large programs such as NFPP and SLCP serve this aim. Some provincial governments such as Zhejiang, Fujian, and Guangdong's began to promote payment for watershed services provided by the upstream counties or cities within each province. Some prefectural level city governments such as Quanzhou City of Fujian Province and Hangzhou City of Zhejiang Province are active to promote payment for watershed services provided by the upstream counties within its prefecture jurisdiction. Some county governments such as Deqing County's do the same within its county boundary. It is similar at all levels that upstream is poor but provides water to the relatively rich downstreams.

PWS is getting to be used as an instrument to tackle the problem of imparity in development by the higher level of government. The central government drives PES and sees it increasingly as an instrument to help solve the development imparity problem. As the development imparity between regions is becoming a serious problem, the central government began to stress a strategy of so-called “coordinated development” of urban and rural areas, of human and nature, of rich and poor regions (CCPCC, 2003). With PWS, the rich downstream regions and cities pay upstream poor regions for the stable flow of clear water. It becomes a useful tool for the strategy. For example, the SLCP is carried out mainly in poor Midwest China, and 90% of China’s poor people get involved in it (SLCP Office, 2006). In 2006, PWS, or ecological compensation, appears in the 11th Five Year Plan for National Economic and Social Development (2006-2010), which is a development guide for the next 5 years in China (State Council, 2006).

5.2 Livelihood impacts: regional level vs. household level

Most eco-compensation programs have no livelihood impacts at the household level but might have welfare impact at the regional level. Other programs do have livelihood impacts.

5.2.1 Regional level impacts

In programs that are explicitly called eco-compensation programs such as that in Quanzhou City of Fujian Province and in Deqing County of Zhejiang Province in our PWS case collections, those who get the payment from PWS schemes are not households but the upstream government or the one who runs a specific project (e.g. build a wastewater treatment plant) that contributes to the control of water pollution or flood etc. In such programs, livelihood impacts are negligible at both household level and the community level. In terms of number of PWS cases, this kind of schemes account for the majority of all PWS cases in China. Small communities and individual farmers are left behind groups in such PWS schemes. They do not take part in the negotiation process nor benefit from the scheme. In our case study in Jinhua watershed, payment by the downstream Jinhua City is made to the government of the upstream Pan’an County, and the Pan’an County is supposed to use the money for the purpose of watershed conservation in various forms. Most Pan’an farmers

in the watershed even do not know there is such a PWS deal.

In the above PWS cases, fund is diverted to the upstream in whatever way. This is what the upstream governments pursue and welcome, and is believed to benefit the upstream counties as a whole i.e. at a regional level. This regional scale welfare impacts might exist if i) the upstream government takes seriously the legal responsibility that a local government is responsible for sustaining a good environment in its jurisdiction; ii) the upstream government does use public fund to sustain the environment; iii) the payment by the downstream substitutes for some of the public fund; iv) the saved public fund is used in programs which promote public welfare such as programs of public health, education, employment etc.

5.2.2 Household level impact

In other PWS schemes such as the large programs of SLCP, there are livelihood impacts at household level. Money and/or in-kind is given to households for change of land use patterns.

In the SLCP, the payment rate is higher than opportunity costs of conversion in most farms (Xu, 2004), which means farmers could have a net benefit by converting cropland into forest land provided that farmers get the full payment timely, which is rare in reality. Government official appraisal of the livelihood impacts shows a very positive result. A field survey by the Shaanxi Provincial Statistical Bureau showed that the SLCP contributes 23.7% to the farmers' income growth (Sun, 2006). But the likely big benefits are undermined by two factors. One is the rent-seeking. Local government officials and/or departments share some of the benefits by rent-seeking, which is widely reported. The other factor is that farmers get the payment for conversion only for 5-8 years in SLCP. Farmers are encouraged to change their livelihood patterns in the buffer period of 5-8 years. But if the change in livelihood patterns is still not successful in year 6-9, farmers probably convert back to cropland.

5.3 Property rights and its relations with the role of government and market

Property rights issue underlies the role of government and market in PWS.

3.3.1 Property rights and role of government

It is widely accepted in Chinese academia and policy-making arena that government should dominate the PWS schemes because of the public goods nature of the watershed services. But our study shows that government's dominance of PWS schemes in China results from two major reasons. One is that ambiguity of property rights of the land or forest which provides environmental services. Most Chinese land and forest are collectively owned by Chinese law. The property rights are unclear. The ambiguity of property rights could render prohibitively high transaction costs for any market deal. But government-led PWS deals could surpass the problem. The other reason is that Chinese government is a powerful government with plenty of resources (financial/institutional/political) under its disposal. This could lower the transaction costs in PWS schemes. A policy or program could be carried out in large areas in short time such as the SLCP.

Although a powerful government could lower transaction costs, there might be other problems with it such as fund leakage and rent seeking, which are shown in our study.

3.3.2 Property rights and role of market

Our study indicates that market has a role to play where the watershed is relatively small, involved parties are limited, services could be well defined, and the demand-side downstream party has a clear willingness to pay. This happens in our case studies of Jinhua watershed (water trade between Dongyang andYiwu cities), and the Xiaozhaizi watershed (water trade between two villages). The potential of using market mechanisms is even greater when dealing with newly provided rather than existing services, which is more difficult to define because of the property rights ambiguity.

In all other cases, the introduction of market-based mechanisms seems unworkable. Introducing market-based mechanisms to such transactions simply risks covering up the reality of ambiguous property rights, leading to serious rent-seeking behavior, which merely transfers wealth rather than

creates it, and which would further impoverish and marginalize disadvantaged groups, like what happens in auction of Sihuang (4 kinds of wastelands).

The space for the market to play in PWS schemes in China is generally limited.

5.3.3 Workable property rights

The ambiguity of property rights of land and other natural resources that provide environmental services could help explain why the demand-side of PWS is absent in China. Each party thinks itself is entitled to use the watershed services and why I have to pay for something that I have rights to use. This is explicitly expressed by government officials in Zhejiang Province (the downstream of Xin'anjiang River) and Guangdong Province (the downstream of Dongjiang River) in our field visits.

In Chinese laws, rural land is collectively owned and many other natural resources belong to the state. But much work needs to be done to define the property rights in detail and make it workable and legally practicable. For a river, for example, it deals with water quality and water quantity. There is compulsory "Surface Water Quality Standard" (GB3838-2002), in which water is classified into 5 classes. What needs to be defined is what class should be sustained in a specific river or its specific section. For the water quantity, the higher level government should negotiate with the upstream and downstream government/communities a share proportion, which defines a proportion of the water quantity for each party in the watershed. Following the run-dry of the Yellow River in 1997, the Central Government has negotiated such a share proportion of the Yellow River water for each of the 9 provinces that the Yellow River runs through and Hebei Province and Tianjin City in 1999. The quota system provides a basic institution for the 11 provinces to trade water. See table 4.

Once the water quality and water quantity is negotiated with the facilitation of higher level government, downstream and upstream governments or other entities have a clear reference point, with which the downstream parties could have a legal expectation of what it could have from the

Table 4 Quota for each province in the Yellow river basin to use the Yellow river water (unit: billion m^3/year)

Province	Qinghai	Sichuan	Gansu	Ningxia	Inner Mongolia	Shaanxi	Shanxi	Henan	Shandong	Hebei	Total
Water quota	1.41	0.04	3.04	4.00	5.86	3.80	4.31	5.54	7.00	2.00	37.00

Source: Yellow River Basin Commission official website : http://www.yellowriver.gov.cn/lib/zlcp/2004-07-06/jj_09554897227.html, accessed 2006-9-10

upstream. If the downstream has a higher expectation (e.g. clearer water, more water than the negotiated), it should pay to acquire it from the upstream. The role of government then is to monitor the water quality and quantity in a timely and transparent manner, and deals with litigation resulting from the deal, which in essence is to guarantee the well defined use rights/property rights.

5.4 From national to local

Large public schemes are facing financial constrains and other limitations. In the “grain for green” program of SLCP, farmers were given 1,500kg/ha (Yellow River Basin) or 2,250kg/ha (Yangtze River Basin) of grain for them to convert the sloping cropland into forestland. But from October of 2003, the market price of grain increased rapidly by some 40%, and the national grain deposit hit the record low level. This imposed the SLCP a heavy burden of funding. The central government decided to cut down the scale of the SLCP by 80% from 50 million mu (3.33 million ha) in 2003 to 10 million mu (0.67 million ha) in 2004. The scale of SLCP was further cut down to 4 million mu (0.27 million ha) in 2006 (SLCP Office, 2006).

Large government PWS schemes are often bundled with many objectives. Once one of the objectives is no longer government priority, the schemes will be undermined. One of the objectives of the SLCP is to cut the grain surplus and support the grain price and farmers’ income. There was a huge grain surplus in China in 1998 after 4 years of successive good harvest (1995-1998). The grain price hit the record low, which decreased farmer’s income. The other objective of the SLCP is

to save the state-owned grain enterprise, which suffered great loss from having to buy the surplus grain. In SLCP, the central government bought grain from the state grain enterprise for a very good price. In 1999 when SLCP was launched, SLCP seems to be a silver bullet that could shoot down all the troubles. But from 1999 onward to 2003, grain production had been decreased continuously for 5 years, which not only killed the former surplus but also sparked the grain price hike in October 2003. Several objectives of the SLCP had been reached up to then no matter how they were reached. With this background, it is not difficult to understand why the central government cut down the project scale of SLCP by 80% in 2004.

In contrast, local PWS initiatives usually have the sole objective ie. payment for watershed services. The water trade between Dongyang and Yiwu in the Jinhua watershed, Zhejiang Province is solely a water deal and has worked well since it started in 2000.

5.5 Factors that support the development of local market led initiatives

3.5.1 WTO accession and globalization

China's accession to WTO in the end of 2001 and globalization have 3 positive impacts on the development of local market led initiatives of PWS. First, it is a marketization process and will promote the formation of markets of various kinds. Second, China could save more marginal land from crop growing and import relatively cheap grains and other agricultural products from the international markets. This provides the preferable environment for the development of local market led initiatives. Third, accession to the WTO will facilitate a clearer definition of rural land property rights in China. The basic WTO principles of non-discrimination, transparency, free trade and fair competition will affect the public institutions of land management in China; and Intensifying international competition after accession will strengthen domestic willingness to reform in China.

These factors together should contribute to a process of clearly defining property rights over land, thus opening the way to more clearly defined rights over watershed services. Nevertheless, even if

the central government becomes committed to serious rural land reforms because of intensified global competition, there will be enormous resistance from interest groups that have long benefited from the existing arrangements. Whilst this resistance may well delay the process of strengthening property rights we feel that in the long-term changes will be introduced which strengthen and clarify individual rights over rural land.

But the positive impacts are limited since food sufficiency is still an important policy. The reduction by 26 million tons of grain in total production in 2003 following the successive poor harvest in the previous 4 years have helped the policy maker make up their mind to cut down the scale of the SLCP in 2004 (China Statistical Bulletin 2003).

5.5.2 International environmental treaties

In the past 20 years, China has been one of the signatories of over 50 international treaties on environmental protection, eg. Kyoto Protocol, the Montreal Protocol on Substances that Deplete the Ozone Layer, Convention on Biological Diversity, Convention on Desertification Control, Convention on Wetland Protection (State Council, 2006a). Joining in the treaties will induce more demand for environmental protection in general.

The Clean Development Mechanism of the Kyoto Protocol has brought forest environmental services to the market place. It offers Chinese forestry an enormous opportunity to realize greater value for the services it provides.

China has a particularly good potential to develop carbon sequestration projects because it has large areas of waste lands suitable for afforestation, and an enormous on-going afforestation and forestation program. According to the CDM carbon credit implementation rules, only new plantings and reforestation after 1990 can qualify for CDM carbon credit projects, and the accounting of carbon storage shall begin only from Year 2000. Massive forestation in China began in early 1980s and starting from 1990s this effort was further expanded. Through the Three North Shelterbelt Program, the Middle and Central Yangtze River Shelterbelt Program, the Coastal Shelterbelt Program and other key ecological forestry program, China has developed an

outstanding man-made forest of 46.66 million ha, accounting for 29 % of total forests in China. This is the largest plantation forest in the world, and it accounts for 26% of the global total. In the next 50 years forest coverage rate would increase from 16.6% of today to over 26%, with a planned net increase of forest area of 90.66 million ha in China (Wang, 2003). These figures illustrate the huge potential for CDM development and financing in China.

5.6 Factors that constrain the development of the local market led initiatives

Ambiguity of property rights of land, forest, water and other natural resources is the biggest obstacle for market development in China, as discussed above.

It is stipulated in the Chinese Environmental Protection Law that governments at various levels are responsible for keeping the environment in their respective jurisdiction up to a standard which is specified in national environmental quality standard. Since government takes all the responsibility and obligations, there will be small room left for market to play in this area.

Agricultural policy and environmental policy often conflict with each other. When food security becomes a concern of policy makers, resulted agricultural policies often do harm to the environment. In 2004 when food security and grain sufficiency concern the policy makers, several agricultural policies were made, which include i) subsidies to grain farmers (CNY20/mu, =USD$37.5/ha); ii) subsidies to fine seed of grain; iii) subsidies to farmers who buy agricultural machines; iv) exemption of agricultural tax (State Council and CCPCC, 2004). This encouraged farmers to farm on more land, which might be extended to the marginal land.

6. Conclusions for the future

6.1 PWS vs. Poverty alleviation

More research is needed on the livelihood impacts of PWS before PWS could be regarded and used as an important policy instrument to tackle the poverty problems and development inequality

problems.

6.2 National program vs. local initiative

Government-launched large scale national programs predominate in PWS schemes in China. It is not unusual in the phase of transformation from planned economy to market-oriented one. But some of them encountered funding constraints, others with poorly defined environmental services.

Successful PWS cases in China are mostly local initiatives. Local initiatives show more robustness and independence of macro-environment of economy and politics. Marketization and WTO accession lend PWS more momentum to develop the market-based schemes.

6.3 Government vs. market

Market-based schemes are diverse as against the government programs. The participatory nature of market makes the market based schemes more dynamic and creative and responsible to local needs.

But market has a small room to play its role if the ambiguity of property rights keeps unchanged. The role of government in eco-compensation schemes should be changed from a buyer to a facilitator. Facilitation work includes i) define the property rights and make it workable and legally practicable; ii) monitor and measure the environmental services in a timely and transparent manner, and iii) deal with litigation and enforce the PWS deals.

Large government programs could learn from the market based initiatives if it has to remain. It could be implemented in a more decentralized way and could be tailored to a specific context.

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