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The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support training and research in environmental and resource economics across its 10 member countries: Cambodia, China, Indonesia, Laos, Malaysia, Papua New Guinea, the Philippines, Sri Lanka, Thailand, and Viet Nam. Its goal is to strengthen local capacity for the economic analysis of environmental problems so that researchers can provide sound advice to policymakers.

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Water Worries : The Hidden Costs of Water Conservation in China

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One of the obstacles many conservation strategies face is the amount of time and money it actually costs for people to be involved in their implementation – in other words, their “transaction costs” (TCs). A new study from China has looked at how these costs have affected an innovative market-based water conservation system. ➡

A summary of EEPSEA Research Report 2005-RR7, *Transaction Costs In Water Markets In China's Heihe River Basin* by Junlian Zhang, College of Resource and Environment, China Agricultural University, No.2 Yuanmingyuan West Road, Beijing, 100094, China.

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“Transaction costs are a ...

➔ The study found that TCs are a significant barrier to proper functioning of the system. It also found that these costs are linked to key social and administrative obstacles. In light of this, the study advises that to reduce TCs – and improve the implementation of the water conservation system – these social and administrative problems must be tackled head on.

covers six counties. The main challenge facing the people living here is that they are in one of the driest zones in the world, the Heihe River basin. Almost all the water from the Heihe River is currently extracted for farmland irrigation and this has caused widespread desertification and has severely hampered development.

country. The aim of the scheme was to reallocate water resources efficiently using market-based instruments. Under the WUR system, every water user gets a water quota fixed by the government. Water quotas are allocated to water users based on their respective historical usage. Water users get water according to their quotas by paying fees to the water agencies. These

quotas can be sold, temporarily or permanently.

Unfortunately, the system has proved hard to implement and WUR quota trading has not been popular. The main problem has been that farmers are not sticking to their quotas for groundwater extraction and are simply withdrawing enough water from

The classification of transaction costs

Transaction Costs (TC)	Component
TC of WUR System Implementation	Ex-ante costs: (1) Research and information costs (2) Bargaining and decision/contracting costs (3) Accommodation, transportation, advertising costs, etc.
	Ex-post costs: Monitoring and enforcement costs.
TC of WUR Trading	Ex-ante costs: (1) Research and information costs, and (2) Bargaining and decision/contracting costs.
	Ex-post costs: Monitoring and enforcement costs.

Source: adapted from Williamson (1975)

Water Woes

This study focused on the rural area of Zhangye City in Gansu Province. The city is 42,000 km² in size and

To do something about this problem, the Chinese Ministry of Water Resources initiated a tradable Water Use Rights (WUR) system in 2002 – the first of its kind in the

underground sources to meet their irrigation needs. As a result, Zhangye City's aquifers and oases are shrinking and wells are drying up. It is clear that the WUR system is not

significant barrier to the system. ”

achieving its water conservation goals.

Are High Costs Sabotaging The System?

The performance of the WUR system is significant for China's overall water conservation efforts. Because of this, Junlian Zhang, from the China Agricultural University in Beijing, set out to see why the system was failing. Transaction costs have been highlighted by many researchers as a key problem in the implementation of projects that require community negotiation and involvement. Zhang wondered if this was also true of the WUR system. He looked at TCs for both WUR system implementation and WUR trading, separately.

Data was gathered from secondary sources and from surveys in five selected irrigation areas. One area – Hongshuihe – was specially selected as an area for analyzing the TCs of WUR quota trading. It was chosen because a pre-survey had shown that its WUR system was operating well (a vital prerequisite if trading is going to happen at all). Around 800 farmers and 300 water agency officials were interviewed for the study. Information was gathered on the characteristics of the irrigation areas and farmer households. Farmers and local officials were also asked for their opinions about the WUR system and on WUR quota trading and whether they were willing to accept the system. Finally,

respondents were asked which barriers they thought were most important in holding up the system's implementation.

The Costs Under Consideration

A number of different specific transaction costs were investigated. Of particular interest was the time it took officials and local residents to establish the WUR system and to develop the WUR trading system. Also under the microscope were the costs that local governments and water agencies have to bear to maintain the WUR system (and the process of WUR transfer from seller to buyer) through the monitoring and enforcement of the system's regulations.

From the outset, it was clear that a large percentage of the TCs consisted of the time officials and farmers spent at various meetings and on transactions. It was, however, difficult to value the opportunity costs of this time as most of the meetings had occurred sporadically over the past few years and few meeting records had been kept.

Because of this, most of the TCs were analyzed using qualitative rather than quantitative methods. However, the costs of monitoring and enforcing the WUR system were estimated quantitatively from the water fee that is paid to local water agencies by water users. As non-profit organizations, Chinese water agencies merely recover their costs. Therefore the monitoring and enforcement costs of

the WUR system were equal to the water fee minus the production costs. These monitoring and enforcement costs were further analyzed to see how they were affected by issues such as terrain and population.

The Causes Of The Costs

It was found that the TCs related to the establishment of the WUR system were increasing in areas that had poor surface water resources because of various social and administrative problems. The main issue contributing to these costs was the fact that farmers in Zhangye City are poor and have little or no social security support from the government. They are therefore not willing to adhere to water quotas if they do not get enough water for their crops and therefore extract groundwater over and above their quota levels.

Monitoring of this activity was not a major priority for water officials because they were concerned that monitoring and constraining farmers' irrigation water use would lead to conflicts and disturbances – as had already occurred.

All in all, bargaining to implement the WUR system was still necessary among all levels of government, water agencies, and water users, including irrigators. This has led to high TCs.

It was found that the costs of monitoring and enforcing the WUR system were relatively high in comparison with the price of water. For example, the average transaction

cost of monitoring and enforcing the WUR system in the Hongshuihe irrigation area was about CNY 0.076 per cubic meter. The water price itself was CNY 0.2 per cubic meter. It was found that these costs were significantly affected by factors like terrain, population, irrigated area, and the type of WMU (Water Management Units) in each region.

What About Water Trading?

The main cause of high bargaining TCs in WUR quota trading was the fact that most farmers in the area own relatively small parcels of land. To obtain large amount of water, large buyers would therefore have to negotiate with many different sellers. This obviously increased bargaining costs and the related TCs were therefore found to be very high. In comparison, once a deal had been struck, operational TCs for the WUR trading were found to be generally very low. WUR trading involves the transfer of water quotas from seller to buyer within the same irrigation area; the operational process of such trades is therefore easy and almost costless.

How To Cut The Costs

The high transaction costs associated with the WUR scheme provide the focus for action that could improve its implementation. For example, if the social and administrative barriers that are increasing the TCs associated with the establishment of the system could be reduced, then costs could be reduced and the WUR system could become easier to establish. To overcome social barriers, Zhang recommends that a social security system for the rural local community be set up; to overcome administrative barriers, he suggests that local water management institutions could be reformed and that farmers' water quotas should be fixed for a long term period. This should stabilize the system so that farmers have more confidence in it.

The results of a regression analysis on the monitoring and enforcement costs of the system indicated that they could be mitigated by a number of means: through reducing the population of a WMU; establishing water user associations; and democratically electing the leaders of

each WMU. Zhang suggests that a good way to reduce the population of a WMU would be to encourage some farmers to quit farming and thus, surrender their land and water resources.

In a similar vein, there are a number of actions that could be taken to reduce the TCs associated with WUR quota trading: Zhang suggests that the government should introduce policies to encourage farmers to either enlarge their landholdings or quit farming and migrate to urban areas for non-agricultural jobs. This should merely speed a process that is already starting to happen: the urbanization rate in Zhangye City is currently very low but a number of studies show that many farmers are expected to migrate from rural to urban areas in the future.

Overall it is clear that the problems - and high transaction costs - associated with the WUR system are linked to wider problems in the Zhangye City area and that if the system is to succeed - and the costs brought down - these problems must be addressed.

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