National Water User Rights System and Market

Water is one of the scarcest resources in China. The country's per capita availability of renewable water resources is only about one-third of the world average. Furthermore, its water is not distributed in the same way as population. Most of the water is in the south, whereas more than 40% of the population lives in the north. As a result, the large population in China's northern half has only 728 cubic meters per capita of water, compared to 3380 in Japan or Thailand, and much higher levels in water-rich countries such as the U.S., Indonesia, or Myanmar. Managing this scarce resource is crucial for China's further development, and without major change water will become a bottleneck for urban growth and agricultural development. A water user rights system and the creation of a market for these rights could be a way in which China manages its scarce water better.

Over the past 40 years China has made great strides in the development of water resources, particularly in regard to the implementation of infrastructure for flood control, irrigation, hydropower, and water supply and sanitation. These works have made major contributions to economic growth and the provision and use of water to meet human needs. In contrast, China's achievements in managing water resources in aspects such as allocation of water to socioeconomic uses and to the environment, and establishing and administering an effective water user rights system have been much less satisfactory. The allocation of water must be done at the river basin level, because all users within a basin need to share the same limited water resources. A water rights system needs to be managed from the level of water users such that the total water usage does not exceed the allocated amounts. Although the State Council has assigned an allocation of water from the Yellow River to each province within the basin, these allocations have not been adhered to very well because of the lack of an effective water rights system at the basin level and within the provinces, cities, counties, townships and villages of the basin. Water resources management is both a top-down (laws, regulations, policies, allocations) and a bottom-up (water rights administration, water delivery system management) undertaking.

Most counties in China have some form of a water user rights system. The system is often limited to paper records of a registry of water users and well permits, but the fact that these exist, although often incomplete and inaccurate, is an important first step to having an effective water user rights administration system. What is almost universally lacking in China is a link between the amount of water authorized for use and an allocation of water determined through appropriate water balance analyses and overall water resources planning at the river basin level. In many cases the 7 river basin commissions have undertaken good water balance and water resources planning studies. The problem is that there is no effective link between the water balance and water resources planning analyses at the river basin level and water rights administration at the water user level. A central problem is that the river basin commissions are departments

of the Ministry of Water Resources with responsibility for river basin planning. The provinces, cities, counties, townships and villages that administer water rights are not included within these river basin commissions.

Measurement and Enforcement

Linking allocations at the river basin level and water rights administration at the water user level is one step, an adequate system to measure the amount of water being utilized by each user and of enforcing/controlling water use to authorized amounts is another. Some areas in Shandong, Xinjiang and elsewhere in China have begun to implement a system whereby each water user is issued a card on which a record is kept of the amount of water used. This has proved to be quite effective, and could be expanded throughout water scarce regions of the country. However, measurement systems, in areas that utilize the card and elsewhere, are woefully inadequate, and the amounts recorded on the cards are often not very accurate. It will be necessary to greatly improve water measurement and enforcement/control of water use at all levels of water systems to have an adequate water user rights administration system.

Water Markets

In water scarce areas in northern China, continued economic growth is contingent upon water users having an assured water supply. A functioning water market, in which water users can sell their water rights to others, can be an excellent mechanism for reallocating water from lower-value to higher-value uses, and eliminating water availability as a constraint to growth. However, an adequate functioning water market requires efficient water user rights administration with all water usage being measured and controlled and with the total water rights not exceeding the allocated amounts. If there is inadequate measurement or control, then a water user could continue to use water even after having sold their user rights. If the amount of water rights allocated exceeds sustainable levels, then the purchaser could be buying into an unsustainable situation and therefore not get a guaranteed long-term supply. In Mexico in some areas, the amount of allocated water rights greatly exceeds sustainable water use levels.

Three Components of Water Rights

An added complication to all of this is that the amount of water extracted from a local water source can be divided into two parts: (i) the amount of water that is consumptively used and (ii) the amount of water that returns or is recycled to the local water system. When the allocation of water rights is based only on the amount of water that can be extracted, there is a built in incentive to use as much of the water as possible, and to minimize the amount that is recycled. Thus, a water rights system based solely on extraction amounts can result in increased depletion of water resources. Things can be done differently: in several states of the western USA, water rights are recorded with three components: (i) the amount that may be extracted, (ii) the amount that may be consumed and (iii) the amount that must be returned to the local water system. Using a similar system of water rights is important for China. This of course complicates the

water rights administration, because at least two of the three components of the water right need to be measured and controlled. However, the very recent advent of the use of remote sensing to estimate actual consumption makes it feasible to measure consumptive use. Those measurements in combination with extraction measurements permit administration of a water rights system based on the three components.

The three components of water rights are also important for a water market to function well. Without this, a water user may sell a water right with a low existing consumptive use to someone with a much higher consumptive use, and thereby increase depletions.

In addition to the amount of discharge, the water rights should also address quality requirements of the return water flows. This will enhance the benefit of the water user right administration system, reducing pollution and promoting water conservation. In the United States, there are strict requirements: water users are not allowed to discharge polluted water back into water bodies. These requirements, and their enforcement, have provided a strong incentive to industries to internally treat, recycle and reuse water to minimize the amount of water that needs to be treated. This policy has resulted in large reductions in pollution and much more efficient use of water in industry.

Agricultural water use

A good water allocation and water user rights administration system coupled with a functioning water market will go a long way towards achieving sustainable water resources management in water scarce regions of China. It will also help to ensure that water is available to sustain growth. However, reductions in overexploitation of water resources and reallocation to higher-value uses will necessarily mean less water for low-value agricultural use. Because water and not land is the limiting resource in water scarce regions, the objective should be to increase the productivity of water, and this will be particularly important in irrigated agriculture. The Water Conservation Project has demonstrated that there is considerable potential for increasing water productivity (yield per unit of water consumed) in northern China through a combination of irrigation technology, agricultural and management measures. In other words, maintaining high levels of agriculture production using much less water is entirely feasible.

So where does this leave China?

To effectively introduce water rights and a water market, Government must ensure that:

- Water balance analyses and water resources planning studies must be utilized to determine water allocations to sub-basins, administrative units (provinces, cities, counties, townships and villages), sectors (irrigation, municipal water supply, and industry) and to the environment. Total water allocations should be based on sustainable use of water resources without overexploitation.
- Water user rights need to be specified in volumetric terms and administration needs to be linked to sustainable allocations. The total amount of water rights should be limited to these sustainable allocations. River basin commissions should include

entities (provinces, counties, etc.) with administrative responsibility for water rights administration.

- Water rights should include three components: amount extracted, amount consumptively used and amount that must be returned to the local water system. This is to ensure that the total amount of consumptive use is limited to sustainable levels and overexploitation of the resources does not occur.
- Water use must be measured and controlled. Water rights must be enforced. This is a major administrative undertaking that needs to be supported with personnel and adequate financial resources.
- Water markets are an excellent mechanism for reallocation of water from low-value to high value uses, but they need an adequate water rights administration system.
- Water rights should also include strict water quality requirements for return flow discharges. This will reduce pollution and increase water conservation.
- Water productivity particularly in irrigated agriculture will need to be substantially increased in order to maintain high levels of production.