SIWI

Comprehensive assessment of water management in agriculture

water for food, water for life issuebrief#4

Opening up options in closing river basins

Many of the world's river basins are either 'closed' or are 'closing', as water use within them exceeds or is approaching the amount of renewable water available. And, if environmental water needs are factored in, then far more basins fall into this critical state than is generally recognized (Fig. 1). Basin closure means scarcity and more frequent water crises, many of which are artificially created by over-committing water resources.

As basins close, water management becomes more complex—because the water cycle, aquatic ecosystems and water users become more interconnected. For example, withdrawing additional water for human use within closing basins can cause irreversible losses of species and ecosystem services valuable to society. Yet these effects are often not considered, let alone included, in environmental impact assessments and cost-benefit analyses.

Box 1. New management approaches for river basins

In open basins: Avoid past mistakes made in other basins

Scrutinize proposed infrastructure projects—they may be politically attractive, but environmentally damaging and, in the long run, not economically viable.

Create a three-tiered allocation system—one tier for basic human needs and the environment, one for productive water for the poor, one for other productive uses (e.g. industry and agriculture).

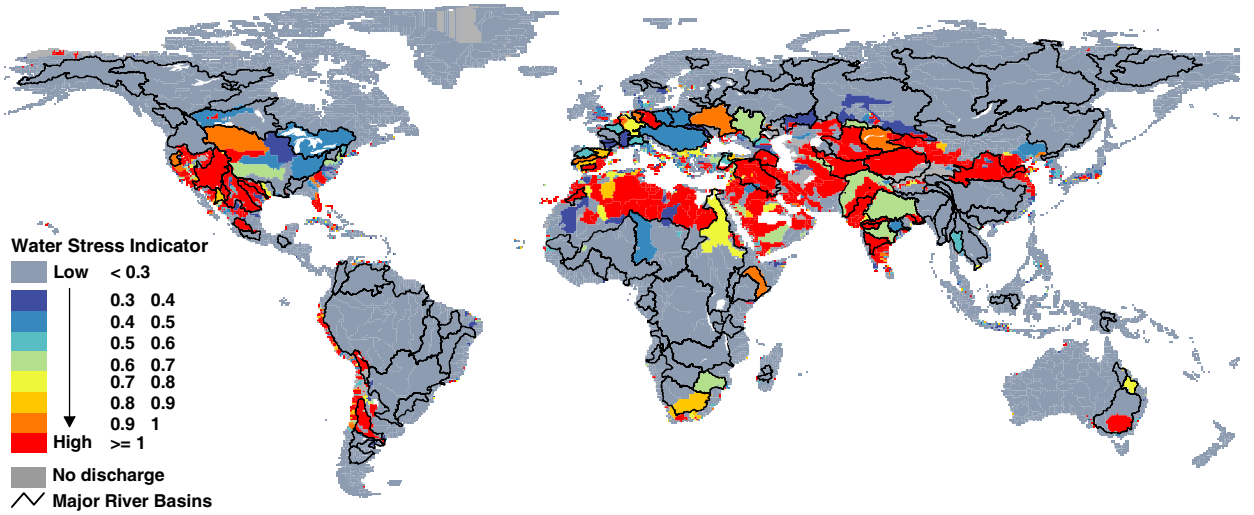
In closed or closing basins: Do more with the water there is

Create a three-tiered allocation system—as above.

Consider alternative basin-governance models—river basin organizations (RBOs) may not be suited to new management challenges; it may be better to develop, manage and maintain collaborative relationships between stakeholders, building on existing organizations, customary practices, and administrative structures, than to concentrate and centralize power within one single RBO.

Recognize that not all water problems can be solved at the river-basin level—water-quality and flooding may need local action; coordinated watershed initiatives or wider agricultural or trade policy measures may be best.

Fig. 1 A new view of water scarcity



A map of a water stress indicator (WSI) which takes into account environmental water needs—the amount of water required to keep freshwater ecosystems in a 'fair' condition. Red areas show 'closed' basins where these needs aren't being satisfied, because too much water is being withdrawn.

Source: Smakhtin, V., C. Revenga, P. Döll (2004) Taking into account environmental water requirements in global-scale water resources assessments. Comprehensive Assessment Research Report 2. Colombo, Sri Lanka: Comprehensive Assessment Secretariat.

In addition, withdrawing more water in one area of the basin is likely to mean less is available for people in other areas. Similarly, well-intentioned conservation measures may not actually save water at the river-basin level. Reducing water 'losses' upstream can mean that the people and ecosystems relying on this 'wasted' water downstream lose out—unless strong regulations are in place to ensure that the water 'saved' is allocated to these users. So, the outcome of water 'conservation' in closed basins is in reality reallocation or reappropriation—often unintended.

Water policies and interventions therefore need to take into account the social, political and hydrological aspects of this 'interconnectedness' within basins. More coordinated and consultative approaches to river basin management are needed. And allocating water to the poor and the environment should be a priority (Box 1).

Closed basins: the issues

In closed basins, people divert, control and use more water than is environmentally sustainable. These basins are characterized by rivers that dry up before reaching the sea, groundwater overdraft, seawater intrusion into estuaries and coastal aquifers, and degraded wetlands. Water pollution and competition for water is high—leading to conflicts.

A typical example of a closed basin is the Zayandeh Rud in Iran, where upstream dams have been built, wells dug, and agriculture and urban areas expanded. As a result, traditional 'qanat' groundwater-supply systems have dried up, and water quality has declined drastically, causing problems in people's health and the environment. In addition, the internationally important Ramsar-designated Gakhvouni Swamp downstream has lost much of the water needed to sustain it.

In closed basins, the development of infrastructure often outstrips available water resources. This is caused by a disregard for environmental water needs, incomplete hydrological knowledge, fuzzy water rights, and politically motivated infrastructure projects based upon a weak economic rationale.

The Lerma-Chapala Basin (Mexico) is another closed basin. Overuse of both groundwater and surface water there mean that water depletion exceeds annual renewable water by 9% on average—even without including the water needed by the environment. Because of the interconnections between water users in this large basin, water management is very complex, and the subject of intense political debate.

Recognizing this interconnectedness in closed basins is vital. Otherwise, as has already happened around the world, policy-makers' and planners' responses to basin closure may do more harm than good.

Capturing more water: short-term gains but long-term problems

Too often, the first response to water scarcity and growing competition in closing basins is to capture more water (a 'supply-side' response). This includes boosting supplies by capturing more river water (by building new dams) and more groundwater (by sinking more tubewells), and by diverting water from neighboring basins. However, in closing basins, such efforts only intensify the pressure on water and speed up the closing process. They also often result in people tapping into the water that sustains ecosystems. This causes loss of valuable wetland resources and far-reaching and often unexpected environmental problems.

In closed basins, responses like dam-building and the capture of water from other basins may make problems worse and shift costs to the 'giving' areas (e.g. upstream or in the donor basin). Yet these social costs, and costs to the environment, are rarely acknowledged. Planners also bow to political pressures to develop large-scale infrastructure, some of which demands more water than the basin can sustainably provide. They urgently need to recognize—and avoid—the pressures which lead to over-development of basin resources.

Overall, therefore, river basin management needs political reform and a commitment to more open, accountable, and inclusive governance. At present, potentially controversial new dams and inter-basin transfer schemes are often planned behind closed doors, with little public consultation. Instead, in both open and closing basins, informed decisions need to be made about whether more infrastructure is needed, where, and of what type. Public scrutiny of the cost-benefit analyses and environmental impact assessments commonly used to evaluate such schemes should also increase, for example by making them systematically available on the web. Plus the costs of water resource development should be fully accounted for, and full compensation given to people who suffer losses.

Water 'conservation'—real water savings or just re-allocation?

Water conservation involves improving water-use efficiency without increasing supply. However, as basins close, decision-makers need to recognize that the scope for water savings is often smaller than people think. Why? Because of the interconnected nature of water resources in a basin and because local users facing scarcities will already have begun to conserve and re-use water, and tap into additional sources like groundwater and drainage water in irrigation schemes.

As a result, well-meaning interventions by line agencies and water managers—such as lining canals to stop leaks and managing dams more efficiently—can deprive water users elsewhere in the basin of water they are already using and badly need. Decision-makers need to find out what people are doing to cope with water scarcity at the local level and get a clear picture of water flows in the basin. Otherwise local actions can clash with wider policies at the basin and national level, and may even make them irrelevant.

All of this means that the actions and needs of all stakeholders have to be taken into account when planning water-conservation measures in basins. Planners and managers need to avoid applying off-the-shelf water-conservation techniques that are often based on misconceptions (Box 2). Instead, their responses should be based on solid hydrological analyses that will allow them to accurately judge whether water can actually be saved or whether it is already being used and the only option is redistribution. Decisions should involve water users affected. Particularly in the case of redistribution, there need to be appropriate mechanisms for negotiation and conflict resolutions.

Fair and efficient allocation is critical

How best to share scarce water supplies between competing users—and between users and the environment—is the core issue in closing basins, and more attention needs to be paid to it. Water can be re-allocated between users and sectors to raise water productivity, or to enhance food security, redress inequities, or restore natural river flows, for example.

Water can be allocated by the state or within a user group in small systems (e.g. tanks in India). Water markets can also be used to allocate water—users have tradable rights and can sell some or all of their allocation of water. In terms of equity, economic efficiency and

Box 2. Water use and conservation myths

Return flows are water losses

Many people consider water that flows back into the environment to be a loss, but often this water sustains natural processes or gets used downstream. Improving water efficiency, thus cutting down on such 'return flows,' results in water savings at the basin-level only if the water would otherwise flow to a saline 'sink' and be lost, or is of a low quality (and shouldn't be allowed to run downstream). While increasing water efficiency can have benefits, particularly if the water 'saved' is costly to extract, treat or supply, there is often less scope for water savings in a basin than thought. Measures to reduce return flows, such as canal lining, should be taken with an eye towards users who may depend on them.

Micro-irrigation is always a good conservation measure

Micro-irrigation systems can drastically cut the amount of water a grower uses, by ensuring that crops evapotranspire almost all the water applied and thus reducing return flows. This can mean less water for groundwater recharge or less for users downstream, particularly, if, as often happens, farmers use the water saved to irrigate more of their land than before.

Groundwater is an additional renewable source of water

Water that filters into the ground tends to return to the surface, through springs or as base flow to rivers. So, whatever is withdrawn from an aquiferusually translates into a corresponding drop in its outflow into the environment.

Forests retain and release water like ecological 'sponges'

Many people believe that forests absorb excess water (controlling flooding) and then release it in the dry season. But in reality trees consume water—they do not produce it. Yet, decision-makers are still making large investments based on this sponge myth, without critically examining local conditions and whether or not forests help regulate the hydrological regime.

Winners and losers in the All-American Canal water savings. The lining of the All-American Canal in the US's Imperial Valley Irrigation District enabled 'saved' water to be diverted to Los Angeles and San Diego. But it has also decreased the amount and quality of groundwater available for the Mexican farmers across the border, with the negative impacts likely to affect an area of 33,400 ha.

environmental sustainability, each allocation method has certain requirements, advantages and drawbacks. Water markets, for example, only work equitably in countries with strong hydrological knowledge, fair political systems and strong regulatory systems. Without these things, markets can allow the strong to capture more than their fair share of water.

Allocation arrangements also have to take into account the fact that water availability varies between areas and years. They need to clearly spell out how to 'share scarcity' in times of shortages. For example, mechanisms to compensate farmers should be planned in advance so that during severe droughts they can release water for other uses. In the long run, arrangements may also be affected by changes in land use, runoff patterns, or societal values. So, they need to be adaptable.

To ensure equitable water distribution in river basins, allocation must take customary rights into account. Otherwise, policies will fail to allow for the needs of poor users, and stakeholders may work against any non-compatible policy introduced.

In river basins, a three-tier system should be used to allocate water (Box 1). However, for this system to be socially acceptable, stakeholders must be given a voice and encouraged to participate in designing flexible water entitlements. These can be adapted in the future as the water-rights system used becomes formalized.

Better governance for basins

Water governance in river basins is challenging, because water users, the water cycle, and aquatic ecosystems are all interlinked. A holistic, dynamic and adaptive approach is needed. However, technical, social and political realities have limited the application of standard concepts of integrated river basin management (IRBM) and integrated water resources management (IWRM).

Where basin planners have tried to implement IRBM, they have faced challenges because basin and aquifer boundaries rarely coincide with provincial and district boundaries, and conflicts exist between the line agencies and policy fields concerned. Other difficulties include erratic financing (e.g. subsidies and user or polluter fees), and lack of hydrological data or technical capacity. What is more, a single body such as a river basin organization (as promoted under IRBM) may not be the best manager of a basin faced with complex problems due to conflicting social values and sheer pressure on resources.

Instead, management should focus on consultation and collaboration—bringing together existing bodies, coordinating them, and making sure that local actions in individual watersheds mesh with basin-level priorities. Empowering marginal groups who have so far had little say in managing water, and strengthening their representation, should be a top priority.

For more information, email: comp.assessment@cgiar.org **Visit: www.iwmi.cgiar.org/assessment**

CA - The Comprehensive Assessment of Water Management in Agriculture (CA) is a five-year initiative to analyze the benefits, costs, and impacts of the past 50 years of water development and management in agriculture, to identify present and future challenges, and to evaluate possible solutions. The main Assessment report Water for Food, Water, for Life: A Comprehensive Assessment of Water Management in Agriculture (forthcoming) is being published by Earthscan. More on the CA donors, co-sponsors (CBD, CGIAR, FAO, Ramsar), process and publications can be found at: www.iwmi.cgiar.org/assessment

SIWI - Independent and Leading-Edge Water Competence for Future-Oriented Action. The Stockholm International Water Institute (SIWI) is a policy institute that contributes to international efforts to find solutions to the world's escalating water crisis. Many SIWI experts are part of CA writing teams.

Swedish Water House - Building Networks for Water Sustainability. The Swedish Water House supports international policy development and co-operation through knowledge generation and dissemination and partnership building primarily within the areas of sustainable river basin management and integrated water resources management. It supports the Ecosystem component of the CA.

References

This Brief is based on the book *Water for Food, Water for Life: A Comprehensive Assessment fo Water Management in Agriculture* (2006). In particular, it draws on Chapter 17, 'River Basin Development and Management' by F. Molle, P. Wester and P. Hirsch.

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Zayandeh Rud Basin Short Profile. Comprehensive Assessment of Water Management in Agriculture.

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