Accounting and Use of All Kinds of Water Resources

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Water resources used within the boundaries of a drainage basin are abstracted from surface and underground sources. One problem is that the different organizations are responsible for the assessment and record keeping of water resources in these sources. However, a more serious problem is that the different organizations control and manage the use of these water resources without the necessary coordination. Such a practice results in chaos in collecting of data on water resources status, and failures of equality and equity in water use. This problem is especially obvious in dry years.

Mr. Sorokin has clearly shown the shortcomings of existing water monitoring and record keeping in the Syrdarya River basin by analyzing of the water shortage situation in 2007 (the project CAREWIB). Figure 1.4, adopted from this analysis, shows that water releases from the Toktogul Reservoir (a major regulator of river flows) considerably differed from target indicators. Under these conditions, national water management organizations, and accordingly water users, were receiving water with high deviations from target amounts, approved by the ICWC as their water use limits (quotas), due to the following factors: unreliable forecast of water releases from the reservoirs, inaccurate information on flow rates, and lack of data on drainage water disposal into the river.

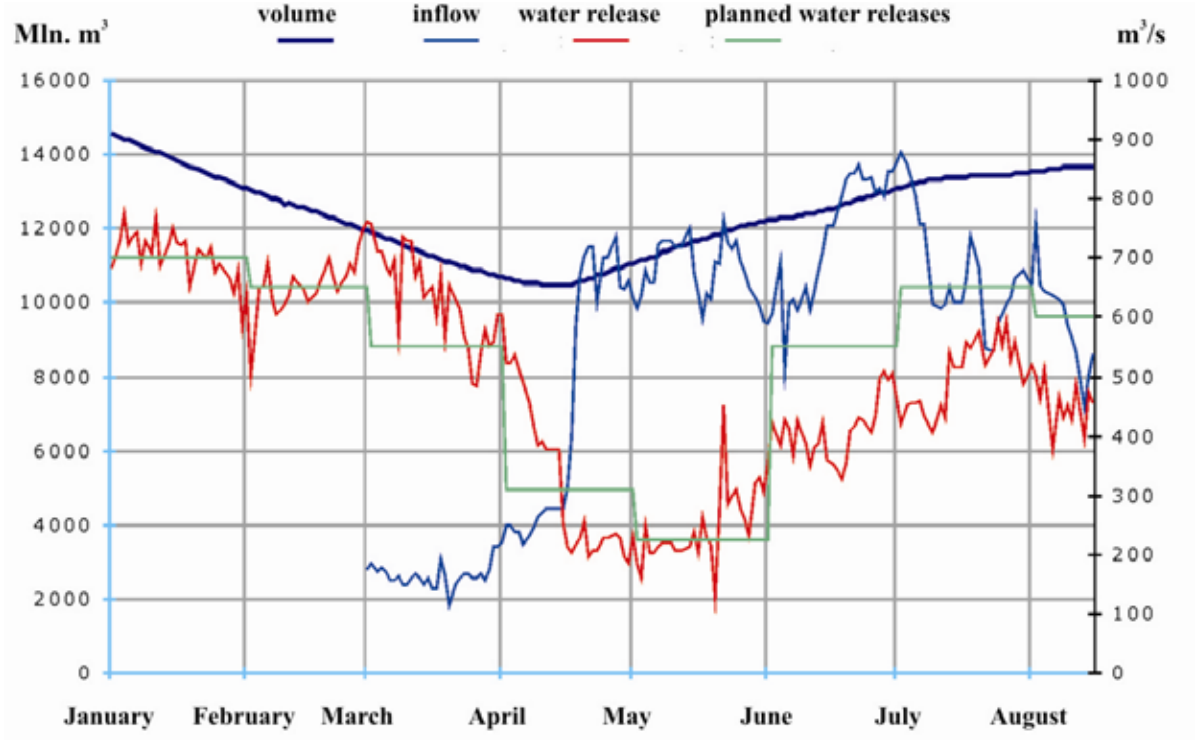

Figure 1.4 Deviations in Water Releases from the Toktogul Reservoir against the Planned Regime

You can image the constrained circumstances of a water user who knows that he will receive less than a planned amount of water, but doesn't know how much and when. Naturally, he tries to adjust his water needs but he does not have a forecast of weather conditions (temperature, rainfalls etc.) for revision of his irrigation schedule.

We do not think that the united system of forecast and record keeping can be today provided by one organization for the entire region (such an attempt was undertaken in the USSR by means of introducing the special statistical reporting in the Ministry of Water Resources: the Form "2-TP Vodkhoz"). The main idea is to establish: a) a monitoring and record keeping system that will meet standard requirements and be adopted by all states in the region; b) an information exchange system, using standard indicators and prescribed accuracy of data; c) access to all databases on all kinds of resources; and d) a reliable system for forecasting the flow rates (based on joint activity of all national hydro-meteorological services in Central Asia).

Most of naturally renewable water resources are formed over the surface of a catchment area and drain into the river network. Formation and transformation of run-off along the rivers are monitored by national hydro-meteorological services. Water management organizations are in charge of delivery and distribution of the water, diverted from rivers, among water users. Small water sources are under the jurisdiction of local authorities.

Another component of renewable water resources is groundwater, which according to its genesis can be divided into two types: groundwater is naturally formed in mountains or over a catchment area; and groundwater is formed due to infiltration on irrigated areas. Groundwater resources within the basin are assessed based on hydro-geological exploring, and following it, useful groundwater resources that can be used are approved. Ministries of Geology are in charge of assessment and use of useful groundwater resources without sufficient co-ordination with water management bodies.

Return water that is formed after primary use of natural run-off makes up part of waters used within the boundaries of river basins. It is formed due to releases of excess water from fields and by natural or man-made drainage. Owing to its high salinity, return water is the major source of contaminating water objects and the environment as a whole. Under current conditions in the river basins with an arid climate, 90% of return water consists of drainage water disposed from irrigation land, and the remaining part is waste water from industrial enterprises and public utility companies. Water management bodies and hydro-meteorological services are mainly responsible for monitoring and record keeping of return water, however, nobody practically controls the reuse of these waters. Although many research and promotional works were implemented to assess the possibility of return water use, up to now there are no comprehensive normative documents and regulations for its use. As a result of the haphazard use of return water for irrigation, land salinization takes place, resulting in a considerable decline in land resource productivity.

In addition, it is necessary to bear in mind that return (drainage) water within an irrigated area is a by-product of irrigation; and in the process of improving or changing management methods its volumes can be correspondingly reduced, and at the same time, water salinity will increase.

On the one hand, accounting of all water sources is very important in order to meet the requirements of water distribution in an equitable manner but, on the other hand, from the point of view of controlling water quality, management of return water has great implications, since return water formed under all kinds of uses is the major source of polluting natural waters. At the basin level, tools for controlling groundwater and return water are the following:

- Record keeping of renewable groundwater, linked to zones of their replenishment, and estimating allowable amounts for their use as well as quotas (water use limits) for water abstraction depending on annual water availability. At the same time, it is very important to apply the

principle of artificial groundwater recharge in wet years in order to use water reserves during average and dry years. During devastating droughts in 1974 and 1975, in the Fergana Valley more than 1,000 water supply wells, drilled in shallow freshwater aquifers, helped reduce water scarcity in this zone. In areas of its use, groundwater tables have steeply dropped; and underground inflow into the river has decreased, but in subsequent years, when water supply wells were put out of operation, the regular groundwater regime has been restored;

- Regulations on drainage and waste water disposal into international and national rivers and sinks including restrictions for releases of pollutants taking into consideration water availability in rivers; and

- Regulating drainage water quality, including aspects of its intra-system use - the utmost permissible salinity of drainage water may be an indicator to specify the rationality of its use for irrigation.

It is very important to select proper tools for planning and management at the irrigation system level. Applying the Geographic Information System (GIS), areas if possible, economically and technically, using groundwater and drainage water (water abstracted from irrigation and drainage tubewells) need to be specified for each irrigation system, taking into account the texture of soils and water salinity. In order to specify additional water sources, overlapping of thematic maps with water demand zoning maps (thematic layer of the GIS) has to be carried out. These data are included in water use plans to ensure more equitable water allocation. Particularly favourable conditions for return water use at the level of farm, WUAs or main irrigation canals are formed in inter-mountain valleys within cascade location of irrigated areas when return water from upstream irrigated areas can be delivered to canals in downstream irrigation systems by gravity

The use of industrial sewage for needs not requiring a high- quality treatment is an effective method of water resources reuse. In the irrigation sub-sector, such an approach is applied in Australia and Israel for cascade irrigation of salt-tolerant crops, where drainage water formed after irrigation of grain and forage crops is subsequently used to irrigate first sunflower plots, and finally plantations of trees and bushes.