Geophysical Research Abstracts
Vol. 12, EGU2010-4005-1, 2010
EGU General Assembly 2010

Balancing Storage - some very different management approaches in a water scarce Developing Country.

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Balancing storage may be found in many different forms in South Africa. The first feature is often a large reservoir fairly high up the catchment, where losses are less, or even in a neighbouring catchment. The objective is to catch surplus water for later use. Alternatives include both within basin and interbasin transfers, either pumped over a catchment divide, or fed under gravity through a tunnel. Again there may be a reservoir at the start of the transfer scheme. This may be a large reservoir or may be a balancing storage reservoir. Transfers are required to make up for a deficiency of water in the demand area of the receiving catchment. The deficiency may be intermittent or continuous. Nevertheless, whatever the nature of the deficiency, it is important not to incur losses. The water will be more expensive than if it were possible to obtain it locally from within the demand area. When undertaking river regulation, one major concern is seeing expensive water flowing out to sea. Several different schemes are contrasted. One has been developed to run almost completely by gravity, others use the topography where possible with the aid of canals, gravity tunnels and pipelines. However, in some circumstances expensive electricity is required to pump the water to be transferred. Nowadays with the ever increasing cost of electricity some way is required of reducing the cost. The usual approach is to use “off peak” electricity but river release flows do not always cooperate so there is a further risk of loss, due to the induced “peaks and troughs” in the river hydrograph as the pumps are switched on and off. Balancing storage becomes even more important in this case to act as a smoothing mechanism. Sometimes the storage may take the form of an on stream reservoir, at others a suitable site besides the river may be developed. This latter has another advantage in allowing the system to avoid abstracting the inevitably poor quality of water at the start of the first seasonal flood, or the heavily silt laden water during major floods, or polluted water from upstream pollution incidents. Other forms of balancing storage may take the form of exploiting the natural contours of the river valley so that river control barrages may be built. These may be single purpose such as irrigation transfers or multi purpose where domestic supplies are abstracted. In addition the river may be made navigable and be developed for recreation. Some form of control is required. This may have started off as a manual system operating on very simple ‘control rules’ but as either the worth of the water is increased or its scarcity develops, due to increasing demand, more sophisticated computer systems are needed. In South Africa half the water resources were originally allocated to agriculture, mainly irrigation. Now some of this water is required for industrial, environmental and domestic use. Innovative ways of making the resource go further are suggested. In addition some control concepts are developed using the “control band” approach.