GROUNDWATER AND DEVELOPMENT IN BRAZIL

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Background and Management Objectives

The Brazil is reasonably well endowed with water when compared to many other countries. Average annual rainfall over 90% of the territory ranges between of 1000 to 3000 mm, which results in a significant water surplus. The average river discharges of 177,900 m^3/sec represent about 35,000 m^3/yr per capita (Rebouças et al, 1999). Moreover, aquifer recharge rates of 2522 km^3/yr - stored volume of 112,000 km^3 - represent a sustained water resource of at least 5,000 m^3/yr per capita (Rebouças, 1988).

However, groundwater in Brazil is generally obtained from about 200.000 uncontrolled drilled wells frequently considered to be a "local" resource, serving domestic and rural needs. In the huge urban which population vary between around one million up to more than sixteen million inhabitants, some twenty thousand of uncontrolled private wells provide significant supply for hotels, hospitals, residences and industries. Whether shortages of water are a result of lack of service in the area, groundwater use contributed substantially to reducing water charges, particularly in relation to the growing prices of water of the public service.

Because global market key word is to get more money per available drop water under sustainable conditions - ethic, ecology and economy - groundwater is increasing in importance in Brazilian water supplies, in part as a response to the growing costs and other constraints in storing and treating surface water and partly because the advantages of groundwater are now better understood. The importance of groundwater to national development is, however, not yet fully appreciated, certainly because it is not as photogenic as surface water reservoirs and others extraordinary constructions. Nevertheless there is a considerable variations between and within regions in water quantity, quality and use, thus groundwater may be important source for urban and livestock water supplies, base flows to rivers, and in contributing to lake and wetlands water balance and ecology. An efficient water use and the deterioration of its quality are still factors that threaten to constrain economic and social development in many regions of Brazil.

Comprehensive Management

The management objective for groundwater resources should be long-term efficiency. This means that its quantity and quality should be maintained at an economically, socially and environmentally optimal level, taking into account the long-term uncertainties and the real long-term costs of controls on its use, protection and treatment of surface water available resources.

There is now a degree of recognition at various levels of the federal government and in a number of states that at present groundwater management lacks cohesion and comprehensiveness. The indirect approaches which until now have characterized groundwater management – addressing the issues as a set of unrelated problems – cannot fulfill the policy objectives and should therefore be changed.

For this purposes, using legislation, regulations and instruments in place state governments in consultation with regional and local bodies should initiate reform to bring about a comprehensive framework for groundwater management.

Managing Groundwater Use

Within the overall framework of water management and given the importance of water demand, there is a need now for governments to develop specific strategies for efficient use of groundwater resources. There are two aspects to this (i) to direct the supply to groundwater to appropriate uses and (ii) to re-allocate private rights in a way consistent with high-value demand.

There should be a strategy for conjunctive use of surface and groundwater and within this strategy full account should be taken of alternative water supply sources, their quality and their relationship within the hydrological cycle. Taking regional characteristics into account, high quality groundwater would be reserved for drinking water and other high quality uses. In choosing between alternative uses the economic and environmental implications of increasing scarcity of high quality supplies in the longer run should be considered. The consumers and polluters of groundwater should pay for its use and the pricing method of full social cost pricing should be applied for all users of groundwater. The resource pricing principle where all consumers and polluters pay for the services received should be applied.

To achieve this objective, permit systems for abstraction, whatever the extent of public control and the form of private use right, should be carefully designed. They can be made to determine quantity and terms of use (including priority, if any, of time and/or type of use), terms of transfer and loss, and the extent of public authority control.

For this purpose, first, each permit system must vest in water users some fairly clear right to abstract certain quantities for a known term. Second, terms under which rights to use may be reassessed and transferred should also be specified with the decision representing a choice between relative permanency in abstraction right and efficiency of water use. Thirdly, the rights of

existing groundwater users need to be protected depending on the severity of threat to the aquifer.

Finally, in all permit systems a substantial degree of public control should remain. This public control should include: the authority to revoke and reassess the private right to use under certain conditions to protect social and environmental values; limits on waste of water; revocation of rights to discharge waste; requirements to preserve the quantity and quality of river discharge contributions; and the facilitation of and permission for recharge of groundwater.

Water authorities should promote the appraisal, reassessment and transferability of abstraction rights (permits) among users under conditions that are consistent with the purposes and values of the water management system, particularly bearing in mind the possible social and environmental consequences of some transfers.

Prevention and Remedial Actions

A variety of measures, mostly in the forms of independent strategies have been taken either to prevent or as remedial measures. But irrespective of these strategies further action is now required from governments particularly to protect drinking water supplies.

These measures are still in the present by and large of a remedial nature and consisted of action at the surface, management the source pollution, abandonment of a heavily and irreversibly polluted source coupled with search for new water supplies.

Al these strategies have been applied with various degrees of efficiency and at increasing cost. In the future governments will have to continue to apply these remedial strategies as the threat to groundwater resources becomes more and more evident. What will be important is that governments use the appropriate instruments in implementing these strategies. The selection of the strategy and instruments will vary with the locality and the severity of the pollution.

There is now an urgent need for governments to develop cost-effective prevention strategies to be implemented in line with the policies dealing with uncertainties. The distinctive character of groundwater creates a level of uncertainty in management that significantly differs from, and in many ways exceeds, that encountered in surface water management. Comprehensive management is therefore made considerably more difficult by extremely imperfect knowledge of the groundwater occurrence conditions.

But, because the high cost of remedial actions makes groundwater pollution effectively permanent, implementation of a comprehensive groundwater protection program should not be delayed until all information is available.

Thus, management efforts should be accompanied by focused research based on clear priorities, so that the information necessary to management efforts will be available for those efforts.

In light of the great variability in the occurrence, characteristics, uses of and knowledge about groundwater, and the consequent conditions of uncertainty in which groundwater management must operate, more information is needed on several aspects of groundwater management.

Because there are numerous complex aspects of groundwater that need investigation, and because research into the behavior of groundwater tends to be quite costly, national and even international co-ordination of research is an important concern for many program.

Conclusions

Considering that groundwater is a high – value scarce resource subject to serious over-use in some areas and increasingly threatened by pollution from different sources: (i) recommends that federal and state governments develop comprehensive groundwater policies for the efficient, sustainable development of groundwater resources and for their long-term protection from pollution and over-use. (ii) recommends that in developing comprehensive groundwater policies, federal and states governments will pay particular attention to the following aspects: the establishment of appropriate administrative and legal arrangements for integrated management with surface water and other resources and sectors; the use of pricing and other policies to menage demand; the establishment and enforcement of pollution control programs to protect groundwater from point and diffuses sources of pollution; the provision of effective advisory education and professional training services; the continuation of research programs for better understanding of groundwater occurrence conditions and pollution processes.

References

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