Strategic Water Resources Management and Decentralised Local Water Management Organisations: Institutional Implications and Issues

Hugh Turral

INTRODUCTION

THE DEVELOPING WORLD is faced with continued dramatic increases in population and a striking shift in the balance of rural and urban settlement. 50 percent of the expected world population of 6.1 billion will reside in cities by the year 2000.

Water is becoming an increasingly scarce resource at both national and more localised scales, as competition increases to satisfy demand for domestic supply, sanitation and industry. The dramatic expansion of irrigated area that has occurred in the twentieth century is reaching a plateau but the next round of food security needs is expected to be met largely from irrigated agriculture. Irrigation is the dominant user of water resources in most developing countries (typically accounting for 90 percent of current use in Asia) and will have to conserve water to satisfy urban and environmental demand. At the same time, considerable improvements in water use efficiency are required to improve agricultural productivity under irrigation and maintain rural livelihoods.

A number of initiatives, such as IMT, seek to improve local management and productivity of irrigation at a time when the state is withdrawing from service provision. Water markets are a topical initiative to manage allocation and re-allocation water resources, but many complexities and market imperfections limit their place and potential (Livingstone 1993)

At a time when it is increasingly evident that strategic planning and transparency in water resources management are critical issues, there are a number of apparently opposing forces:

1. There are increasing numbers of autonomous water user groups with varying degrees of established legal or customary rights. Satisfying the rights and needs of diffuse users and matching strategic goals presents many institutional difficulties.

2. Water use by the state is usually highly sectoralised and co-ordinated planning, at catchment, national and river-basin levels, is rare. Incorporation of low level water users into this process is rarer still.

3. Market liberalisation has frequently led to over-exploitation of groundwater resources, especially in coastal and urban settings. Existing water law is increasingly ignored and the interdependency of surface and groundwater is rarely explicitly recognised by users.

4. Transferable water rights (at more than localised scales) require a sound institutional and physical framework in addition to an informed and participatory market. Water legislation is often criticised as being inflexible and also irrelevant to specific environments or regions (viz. forthcoming national legislation to upland Peru).

5. External pressures for environmental responsibility imply conservation rather than resource development and use.

INSTITUTIONAL FRAMEWORK IN WATER RESOURCES MANAGEMENT

Irrigation development takes place within distinct geographical and political contexts (see Figure 1) and is well known for its complex nature, influenced by food policy, land capability, water availability and socio-economic factors. The institutions of water resources management comprise processes, entities (irrigation departments, river basin authorities, urban supply utilities, water user associations, individuals and so on) and mechanisms (statutes, codes of practice, legal frameworks). The key relationships between the institutional components are either structural (responsibility, authority, power and accountability) or motivational (interests of entities, and incentives - such as tariffs, subsidies and productivity awards).

PROCESSES IN WATER RESOURCES MANAGEMENT

The processes involved in the management of water resources are outlined in Figure 2, and the aspects that particularly relate to irrigation water user associations are printed under each process heading. In an ideal world, all the processes should involve some two way interaction between all the entities involved.

NATURE OF COMPETITION FOR WATER AFFECTING WATER USER ASSOCIATIONS

The literature on the institutional aspects of irrigation water management and decentralisation concentrates on the institutional rules and development of water user associations, encompassing the direct linkages in a hierarchy between the irrigation department and the users. The relationship of multiple independent user groups to the broader water resources management, macro economic and agricultural policy environments is rarely discussed. Equity, rule development and insights from game theory are generally applied within the boundary of the WUA.

Competition for water allocation from urban and industrial demand will affect individual water user associations, either by direct negotiation to re-allocate the water rights of an association (or of some of its members) or indirectly, by regulation and negotiation with an irrigation department or water resource management agency. Other forms of competition include:

Formal (*de jure*) irrigation organisations versus customary (*de facto*) irrigators.
WUA: WUA within a large system, catchment or river basin.
WUA: Environmental Allocation
WUA: Other water user groups (eg., aquaculture, wetland farmers, upland conservation groups, rural water supply and rural industry)

A key water management problem that emerges concerns the level of use and the allocation of rights to use. Good quality data on actual use, as well as the resource available, are required: the customary and *de jure* rights of other users must be accounted for in determination of the extent of rights allocated to registered water user associations. Collection, processing and timely availability of data are therefore crucial elements in the institutional framework, and are (ironically) often neglected or rationalised in the process of corporatisation and privatisation, as has happened in the process of regionalising the Rural Water Corporation in Victoria, Australia. In conditions of extreme scarcity, where all rights have been allocated and recognised, re-allocation of water to urban use requires renegotiation of entitlements or, as is frequently suggested, a market for transferable water rights.

Water user associations are often formed with the implicit idea that they are a semi-autonomous extension of the existing irrigation bureaucracy. Most writing on the subject concentrates on the development of the membership, rights, responsibilities, representation and operational activities the WUA. Ostrom (1991) and Tang (1992) have clearly established the case for farmer's role in the collective choice rules of irrigation associations; in practical terms that means that they have the right to decide how to arrange and modify the local institutions of collective action. This may not happen in practice if blueprints of water user associations are "imposed," as in the Punjab in Pakistan, where functionality has declined within a few years of an initial enthusiastic active participation to improve water courses. The irrigation bureaucracy is far from comfortable with the idea that individual water user associations might negotiate binding contracts to supply water, or have a role to play in allocating the size and timing of those contracts between different associations within a water course and between water courses. Ostrom (1992) and Tang (1992) also emphasise the complexity of irrigation/water resources institutions and the need for multiple layers of collective choice rules and representation. The notion of higher levels of farmer representation rarely goes beyond the formation of federations of water user associations, and if these are imposed, as with the well documented case of the Super Subaks, the fabric of the component institutions may be damaged.

Scales of Water Use Efficiency

An important assumption in IMT is that farm-scale water management will improve and hence so will water use efficiency, lading to improved crop productivity and livelihoods of farmers. However, a good hydrological understanding is required, since water loss from one constituent irrigation system may provide recharge or even surface water for other users further down the system: the water use efficiency of the Nile Basin is well documented to be about 70 percent (Stoner 1994), even though individual watercourses may operate at less than 40 percent. The level of infrastructure improvement often associated with IMT can be planned and implemented in accordance with its impact on basin and catchment water use efficiency. Currently, the basic hydrological understanding of groundwater-surface water linkages and supporting data are rarely available, even in developed countries, and is compounded by the use of data hungry

and sophisticated management models (Nathan and Earl 1993). The critical factor is whether inefficiency in water use results in a degradation of water/land quality (usually through salinisation and water logging) or whether it is unconditionally available for beneficial use elsewhere and is in fact another entity's water allocation or right. The motivational relationships of water charges and subsidies and the form of regulatory policy and enforcement are quite different for these two cases.

Legal Reform, Rights and Responsibilities

Many authors (*inter alia* Livingstone 1993; Ostrom 1993; Freeman 1990) have noted that secure but flexible *de jure* recognition of the right to use water is an essential attribute of sustainable water user associations. Problems arise when long established *de facto* rights to use water are declared without legal foundation so that a new development can be constructed, a recent noteworthy example being in Northern Tanzania (Burton 1994). Upstream (catchment) rights to use water are customary and are often discounted in irrigation development (Bottrall 1992 and in preparation).

Inadequate performance of systems with explicit *de jure* organisation often leads to individual or group efforts to organise water and tend to be dominated by an influential minority (see Water Management Synthesis Project 1988).

Many government interventions to decentralise and establish functional water user associations do so with explicit intention to divest themselves of operation and maintenance expenses and improve the collection of irrigation service fees (Korten and Siy 1989). Responsibilities of the associations are usually well defined, but the attention to formal constitutional rights of association, ownership of water delivery infrastructure and *de jure* rights to use water are variable and rarely as well provided for as in the Philippines. A characteristic of the wider scope of institutional reform employed in Mexico and the Philippines has been the presence of a stock market or securities exchange with sufficient scope to register water user associations with defined charters (see also Palacios-Velez 1991).

Thangpet (1994) details how traditional Muang Faai, in the environs of Chiang Mai, have broken down as land is removed from cultivation by building and urban expansion. The ad hoc sale of individual water allocations to urban water sellers and the disinterest in maintenance activities resulted in the reformation of a new association under the auspices of the Royal Irrigation Department; the RID asserts the state's primacy in the ownership of water and has attempted to stifle transfers to other uses. This has also led to problems for higher value horticultural producers who have traditionally relied on informal transfers of water within the Muang Faai. Rights to use water are undeclared in Thailand and appropriation can be usurped easily by those with access to technology and influence, particularly where industrial use is concerned (Livingstone 1993).

One right that has been pursued by irrigation departments is that the canal infrastructure should be in acceptable condition for turnover. In Indonesia, many traditional schemes were registered under the irrigation management turnover programme, which has enabled the departments to undertake a sizeable rehabilitation programme. A number of larger schemes have also been reclassified to fit within the 500 Ha limit for the turnover programme, by sub-dividing previously aggregated small schemes.

An Example of Financial Rights and Responsibilities

In Indonesia, despite the passage of local pilot laws (Ambler personal communication) and a national policy on irrigation turnover (see *inter alia* Bruns 1991), even the right to operate a bank account is often not in evidence. In Madura, functional groundwater user associations operate and maintain their pump sets and water courses, determine and collect water charges and pay water managers, in some cases 7-8 years after official handover. However, the level of financial reserves held by even the most successful wells has declined and there is considerable doubt that replacement pump sets will be afforded when the original ones reach the end of their 15-20 year working life (Agus personal communication 1994). The right to a bank account is not recognised and farmers still have a healthy suspicion of holding assets in cash, which can easily be lost in dramatic devaluations as has happened in the past: a preferred method of savings is in the form of livestock, owned by the WUA. Attempts to organise revolving joint funds for groups of tubewells have also failed (GDC 1992) and audit procedures (for both cash and in-kind assets) have not been implemented which would have enhanced the propriety of financial management both within associations and also protect them from levies and extra legal payments to local government or its officials. The formal ownership of the pumps and supply channels has been transferred to local government but not to the user groups which therefore have no collateral against loans from banks.

The possession of financial assets and capital is considerably less clear in gravity supplied irrigation, particularly on water courses which are part of a large bureaucratic irrigation system. A.K. Mitra (1992) notes that the Japanese model of post-war irrigation development has taken place within the framework of farmer owned, but usually professionally managed, Land Improvement Districts. These multi-function organisations arose out of traditional water user associations and funding has been obtained at prefecture level by both the issue of bonds and from internal

revenue across a range of local infrastructure development projects. Mitra asserts that the LID's have heavily influenced Korea, Philippines and Taiwan.

GROUNDWATER DEPLETION—AN INTRACTABLE INSTITUTIONAL PROBLEM?

The revolution in groundwater use in the last decade in India, Bangladesh, China and to a lesser extent, Indonesia, has been welcomed on equity, efficiency and community action grounds and because it is self organising and self maintaining. Where groundwater recharge is high and water quality is good (in Bangladesh and Eastern Gangetic Plain due to flood recharge; in Haryana and Punjab due to canal seepage), almost unlimited conjunctive use is possible and is indeed beneficial in stabilising or mitigating high water tables (Dhawan 1989). In the North China Plain, water tables have recently declined an average of 1.5 meters per year (IPTRID 1992) and similar problems are found elsewhere, such as Maharasthra and Gujurat (where saline intrusion is a problem). This range of situations can occur in distinct locations within a country or river basin, or may occur in a very localised fashion, within the administrative boundary of one irrigation scheme: a single set of groundwater rules obviously have little meaning and regulatory frameworks must address the range of existing and potential problems.

Dhawan notes that the hydrological community has for a long time pressed for enactment of existing groundwater legislation in India, as well as for its overhaul: in 1989 he reasoned that even if this happened, regulation, monitoring and applying sanctions is not administratively feasible or financially possible given the enormous numbers of individual operators involved. He observes that indirect attempts to control groundwater use by electricity metering and raising electricity and fuel charges were easily circumvented and had not proven successful where introduced. Metering discharges (or total volume discharged) is similarly difficult and involves very high costs to the regulating agency. In centrally controlled, state-sponsored groundwater development (deep tubewells in Indonesia and Thailand), the density of drilling is closely regulated and water table monitoring is built into the groundwater development programme: typical ceilings for groundwater extraction are 30 percent of average annual recharge (GDC 1987). Dhawan notes that minimum spacings between tubewells are often stipulated (as in Bangladesh), but almost impossible to control in deregulated situations, or where shallow groundwater is exploited by multitudes of very small portable pumps, working in open or shallow cased wells.

The institutional lesson is that a clear technical understanding of the water resource and quality issues is needed before groundwater exploitation is liberalised, and licensing arrangements must be agreed accordingly, before stimulatory policy instruments are invoked, such as derestriction of imports of pumping equipment, energy subsidies and unregulated drilling programmes. However, licensing arrangements are equally subject to the abuses documented in the management of surface irrigation (see Repetto 1986). These points are of little relevance to already well established over-exploitation of groundwater.

The well known "prisoner's dilemma" (which shows that in competitive situations, individuals will all seek to maximise their own benefits with the result that all are worse off than they would be if all restricted their benefits to a degree) is a feature of all common property resource use. In Australia, the irrigation community was reluctant to accept the existence of rising water tables and the inevitable salinisation that results: individuals are sure that it is a consequence of *other* farmers' poor water management practice (even to the point of being a phenomenon restricted to a badly managed land holding) or canal seepage (the "government's" fault). The national Land Care initiative has included a community programme called "water table watch," to monitor deep and shallow (perched) aquifer levels on farm. This has had a fundamental effect on the attitudes towards, and acceptance of, the water table problem in areas where it is not already totally self-evident. The situation is analogous to groundwater mining: education is needed in the from of a broad community understanding of the problem before regulatory frameworks can even be discussed. Dhawan was uncertain that participatory approaches had anything to offer: the Australian experience has shown that forming and "educating" land care groups at a relevant administrative and hydrologic scale, stimulates community responsibility. Whilst the number of players is evidently much greater in developing country settings, one hope for mitigating severe inequities that are the ultimate consequence of groundwater depletion, lies with self-regulation and participation at a scale that is administratively feasible for enforcement and application of sanctions to "rule-breakers."

Poor balance between development of low level community groups and institutional re-orientation and reform, in the wider water resources context, results in functional organisations operating in a dysfunctional institutional environment, which cannot be sustained. Either the organisations break down, or adapt to the realities of the institutional setting, or the setting is belatedly modified.

REFORM AND REALIGNMENT OF IRRIGATION BUREAUCRACIES—A WATER RESOURCES PERSPECTIVE

The Dublin Declaration and Agenda 21 have coincided with a wider awareness, among consultants and public water agencies, of the importance of broader-based water resources planning and management. Water Resources

Departments have sprung out of irrigation or Public Works Departments (viz Bihar and Tamil Nadu) with a marginal change in institutional culture and perspective. Bottrall (1992) suggests that substantial reform of attitude and structure is required if public works agencies of this nature are to make a successful transition to management and service oriented functions, and points out that commitment in terms of funds, allocation of skilled personnel and in-service training are among the essentials.

A strong resistance to the privatisation of irrigation management as well as ownership was uncovered by farmer surveys in New South Wales, Australia (Pigram and Mulligan 1991). Farmers expressed a general level of satisfaction with delivery of water, but were apprehensive about the level of deferred maintenance required and the likelihood of increased water charges under self or private management. A continuing stumbling block has been agreement on standards of asset maintenance, legal liability for negligence and responsibility for environmental protection. Existing management boards (with extensive farmer representation) have been restructured in three states to increase their control over day to day operation; over a 12-18 month period they have produced business plans, which has allowed a broader community understanding of the financial and organisation requirements of self management.

The corporatisation and then regionalisation of the Rural Water Corporation in Victoria has shown that performance of public agencies can improve significantly and that the basis of performance testing of service delivery begins with the development of a business plan incorporating well defined management objectives. Many are aware that despite the deregulation of the economic and financial system and a commitment to decentralisation and self management, attitudes within large technocracies can exhibit inertia. Time, targeted training and strong motivational forces are needed to make the transition to a culture of service provision.

Easter (1993) notes that substantial internal reform of irrigation administrations in the Philippines and Maharasthra has gone a long way to providing external assurance to irrigators in terms of service delivery, operation and maintenance. He suggests that this assurance needs to extend through the institutional system to supporting government policy on agricultural commodity prices and trade. Livingstone (1993) adds that despite formalisation of irrigators rights, the information base on actual use is very far from complete in the Philippines.

The River Basin Development Authorities in Nigeria were developed as water resource management entities from inception, but the priority accorded to irrigation development quickly absorbed the skill and financial capacity of the units, with a resulting bias towards construction and large scale irrigation scheme operation. Severe neglect of important wetland farming systems is well documented (*inter alia*, Thompson 1993), but there is evidence that a number of the RBDA's are making the transition to a broader perspective to equitably manage both up and downstream portions of the River Basin, despite a widespread decline in hydrometric data collection (personal communication; Thompson 1994).

CONCLUSIONS

The preceding discussion suggests a number of institutional pre-requisites integrating local water management into a more strategic framework.

1. Existence of co-ordinating water planning groups, within or apart from local government, which provide a planning structure with defined goals, measurable missions and are subject to reviews of their performance.

2. A legislative framework and agencies with authority and willingness to implement it, concerning common property resource issues like groundwater use and direct competition for surface water. The framework must be flexible enough to allow local adaptation where required.

3. Compatible macro-economic environment.

4. A core of multi-disciplinary expertise to advise planning groups, or failing that, an integrated training programme for key players.

5. Institutional cultures within state sectoral water agencies that are adaptable to change, and are motivated to embrace participatory planning.

6. An institutional structure which allows discussion and swift exchange of priorities between the centre and local water user groups.

7. Information and data collection are an indispensable foundation of rational water resources management, which must be valued as a basic cost of any management system: market based systems have a greater

requirement for the provision and dissemination of information, although ironically, cost control imperatives in public and private agencies mean that it is often seen as an expendable luxury.

8. Good technical control over water distribution and allocation is highly desirable for sustainable self-management of irrigation.

9. There needs to be a social and cultural willingness to accept the economic value of water, whatever strategic policy pronouncements are made by development agencies and national governments. Increasing participation in day to day management and development of water resource projects plays a significant role in shaping users attitudes and perceptions.

10. Macro-economic and food policy should be congruent with decentralisation, participation and cost recovery initiatives, in providing incentives to beneficial allocation of water.

References

Bottrall A. 1992. Institutional Aspects of Watershed Management, Paper presented at ODA Natural Resources and Engineering Advisers' Conference, Southampton, UK, 13-16 July.

Bottrall A. 1992. Institutions of Water Policy, Planning and Management, Funding Proposal to ODA, ODI, London.

Burton M. 1994. Water Conflict and the Environment, in ICID (UK) meeting on Irrigation and Drainage Development in Africa, ICE, London.

Dhawan B.D. 1989. Preventing Groundwater Over-Exploitation, paper presented at the Workshop on Efficiency and Equity in Groundwater Use and Management, Institute of Rural Management, Anand, India.

Korten D. and Siy R.Y. 1989. Transforming a Bureaucracy - experience of the Philippine National Irrigation Administration. Kumarian Press, Connecticut, USA.

Bruns. 1992. From Policy to Practice: Agency and NGO in Indonesia's Programme to Turn Small Irrigation Systems over to Farmers. Paper presented at Asia Regional Workshop, NGO's, Natural Resource Management and Linkages with the Public Sector, ASCI, Bella Vista, Hyderabad, India.

Coopers and Lybrand. 1993. Institutional Framework for effective water resource management in the Middle East and North Africa. Volume 1- Summary. World Bank (METAP), Washington, USA.

Easter K.W. Economic Failure Plagues Developing Countries' Public Irrigation: an Assurance Problem, Water Resources Research 29(7), July.

Freeman D.M. 1990. Designing Local Irrigation Organisations for linking water demand with supply, in Social, Economic and Institutional Issues in Third World Irrigation Management, ed. Sampath R.K. and Young R.A., Studies in Water Policy and Management, No.15, Westview Press, Colorado, USA.

GDC - Groundwater Development Consultants Limited, 1988, Final Report, Phase 3 of the Madura Groundwater Irrigation Project (1979-1992), Cambridge, UK.

Groundwater Development Consultants Limited. 1992. Final Report on the Madura Groundwater Irrigation Project (1979-1992), Cambridge, UK.

IPTRID 1992 Peoples Republic of China Proposal for Technology Research in Irrigation and Drainage and Salinity Control, World Bank, Washington, USA.

Livingstone M.L. 1993. Designing Water Institutions, Policy Research Working Paper 1227, World Bank, Washington D.C., USA.

Mitra A.K. 1992. Joint Management of Irrigation Schemes in India, Relevance of Japanese Experience. Economic and Political Weekly 27(26).

Nathan R.J. and Earl G.C. 1993. Estimation of Regional Salt Loads in Tragowel Plains. Draft Report No. 1993/1, Investigations Branch, RWC, Melbourne, Australia.

Ostrom E. 1992. Crafting Institutions for Self-Governing Irrigation Systems. Institute of Contemporary Studies Press, San Francisco, California, USA.

Ostrom E. 1993. Design Principles in Long Enduring Irrigation Institutions, Water Resources Research 29(7), July.

Palacios-Velez E. 1991. The Mexican Experience in Irrigation District's Transfer to their Users, in Performance Measurement in Farmer Managed Irrigation Schemes: Vol. 1, Draft Proceedings 3 International Workshop of the FMIS network, Mendoza, Argentina.

Repetto R. 1986. Skimming the Water: Rent seeking and the performance of public irrigation systems. Resources report 4, World Resources Institute, Washington, USA.

Stoner R. 1994. Options for Nile Water Use in Egypt - Gerald Lacey Memorial Lecture, ICID (UK), ICE, London.

Tang S-Y. 1992. Institutions and Collective Action - Self Governance in Irrigation, Institute of Contemporary Studies Press, San Francisco, California, USA.

Thangpet S. 1994. The impact of urbanisation on the Traditional Irrigation System: a case study from Northern Thailand.Paper submitted for publication in Irrigation Management Network Papers, ODI, London.

Thompson H. 1993. Water Management in the Komadugu-Yobe Basin. Paper given at Workshop on Water Resource Management in the Hadejia-Jama'are River Basin. National Institute for Policy and Strategic Studies, Bukuru, Plateau State. Nigeria.

Water Management Synthesis Project. 1988. WMS Report 69, Vol. 3 - A tank system in Mahdya Pradesh, CSU, Fort Collins Colorado USA.

Figure 1. Context, technology and institutions of water resources management.

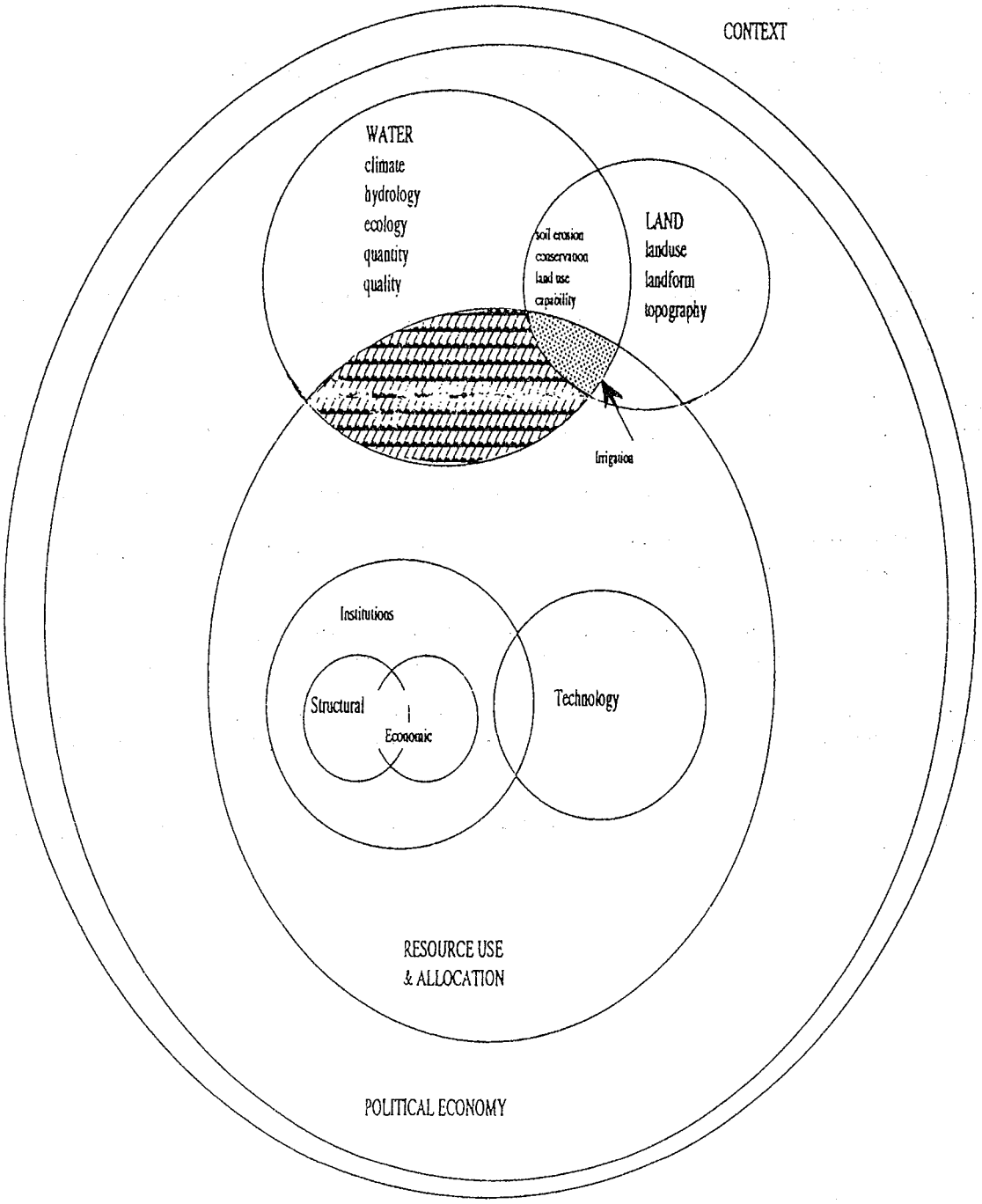

Figure 2. Processes in water resources management (Coopers and Lybrand, 1992 with modification).