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THE FRAMEWORK OF WATER MANAGEMENT WITH SPECIAL REFERENCE TO THE ORGANISATION OF WATER RESOURCES ALLOCATIONS

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INTRODUCTION :

1. The aim of this note is to introduce and stimulate discussion on water management tasks; their influence on the form of management institutions; and the instruments used for allocating water resources among organisations, individual users and purposes. The institutions and instruments in different countries are so various and have been evolving so rapidly in recent years that there would be no point in attempting a general survey. The establishment or modification of a particular structure can be usefully considered only in the context of local problems and history, political and social pressures (a development imperative; or the re-adjustment of priorities in a mature and stable system) and of the resources, especially of manpower, available. Nevertheless there are some common trends and issues which may throw light on the options in Jordan.

2. Water management can be defined as the art of maintaining a satisfactory balance between the (often conflicting) demands of users and the natural resources of a country or region - with an eye, of course, to the longer term interests of the community. The instruments and practices which reconcile demands with resources include laws and regulations, charges and subsidies, together with engineering works and

operations based on combinations of storage, conveyance and treatment. Natural water resources vary tremendously from place to place, depending on average rainfall, rainfall variability, other climatic factors, topography and geology. Demand characteristics depend on population intensity and distribution, industrialisation, irrigation development, affluence, energy sources and the degree of environmental concern. Almost every country has some unique feature or custom, so there are unlikely to be any universal recipes for good management.

3. Resource and demand characteristics have interacted with history and political structure to produce numerous legal codes and management patterns. Nevertheless two broad trends of water law are commonly defined. One recognises formal rights and priorities sanctioned by the state or arising from some initiative in the diversion and useful application of water (prior appropriation). The other treats rights in natural flow as a facet of land ownership (riparian rights) and on the whole does not countenance their appropriation at the expense of other landowners, but recognises some important rights (especially navigation) as attaching to the state. Not all traditions fall cleanly into one of these categories but many of the systems of regulation which have superseded these traditions of resource allocation can be recognised as adaptations of one or the other.

4. One can also identify two typical sets of water management problems loosely associated with the areas where these two traditions prevailed. In arid areas or those with prolonged dry seasons and hence big consumptive demands for irrigation the problems are those of sharing out inadequate quantities or extending them by storage, giving established users a secure right of supply and coping with salination. In many such areas irrigation supported by massive over-year storage has been seen as the key to major new developments and has been a major preoccupation of government often applying central funds through a single-purpose agency or an ad-hoc regional authority. On the other hand in humid countries where congested population and industry have generated pollution and mutually interfering types of use there are very complex options in water management although often no intrinsic problems in generating adequate flows. Public water supply and removal of liquid wastes are among the many services needed to support development; a response rather than a lead. They generate comparatively little political interest most of the time, although environmental issues have kindled public interest in recent years.

5. Some of the larger countries have both sets of problems in good measure. Many of the countries which have been revising their management arrangements most vigorously in recent years (for instance Britain and neighbouring countries) fall into the second group. Whatever the

pressure of immediate problems Jordan's longer term concerns presumably bring it into the first group, for whom the effective exploitation of the national water resource(i.e. of all available flow and storage within some economic limit) is a vital long-term objective. These distinctions are fairly obvious but it is important to bear them in mind when appraising and devising management machinery.

6. Nevertheless there may be some interest in discussing management structure and instruments in countries with different problems. There will be some references, for instance, to the current set up in England and Wales not only because it is the one most familiar to the author but also because it represents an extreme of simplification of structure and integration of management functions, and thus in a sense a point of reference. There the 1973 Water Act brought into being ten regional water authorities, within river basin boundaries, having exclusive or substantial responsibility for all the functions set out at b, c, d, e, f, h, j, and k in paragraph 7 below. But elsewhere almost every feasible permutation of these responsibilities has been considered or tried at some time, often complicated by differing arrangements at federal and provincial levels of government, and most of them have been made to work.

ARRANGEMENT OF MANAGEMENT FUNCTIONS :

7. Different structures of water management are different ways of grouping an array of tasks, which might be identified as:-

a) Development and enunciation of national water policy: (division of responsibilities, broad priorities, sources of funds, distribution of benefits).

b) Allocation and policing of rights to water resources (including the use of water in nature for all legitimate purposes) and resolution of conflicts.

c) Hydrologic data measurement, processing and publication.

d) Planning of resource use and system development

e) River basin management, including the provision and operation of regulating and control works for rivers and aquifers, for the purposes of flood control, drainage, irrigation and other supplies, power, river navigation, fisheries management, quality control and recreation.

f) Provision and operation of piped services for general public use especially in urban areas:

   (i) supply works including sources, treatment, distribution

   (ii) waste works, including sewerage and urban drainage, sewage disposal.

g) Provision and operation of other services, including local irrigation and drainage networks, industrial water systems, canals etc.

h) Monitoring and protection of water quality in nature.

j) Support services, such as research in water technology, training.

k) Finance: raising of capital and revenue for these purposes, together with public accountability for the level of services and use of resources.

The above can be further sub-divided ; in some degree they overlap. But the essential choices in organisation lie in the re-arrangement of these functions, and in the accompanying subdivision of responsibilities by geographical area, such as river basins, and between central and local organs of government.

8. The first of these tasks (a) is usually the function of legislatures and departments of government, perhaps advised by ad-hoc commissions. Effective management is aided by concentrating responsibility in one or two ministries but this is rarely achieved. Because of the separate historical origins of their various concerns with water, ministries of agriculture, industry, power, housing, transport, finance and defence are quite often deeply involved, often to the detriment of any clear evolution and application of policy. In many countries efforts have been made, with mixed success, to give a single department (perhaps a composite department of environment) a leading role or else to effect co-ordination through inter-ministerial councils or agencies on the fringe of government. The latter might also have responsibility for (c) and/or (d). The more limited the resources of experienced management available

the more important (from the standpoint of those to whom water is a prime concern) it is to avoid dispersing it among departments with narrow constituencies and conflicting aims.

9. Responsibility for (b) is usually divided between the administrative organs of government (perhaps represented by special purpose water rights commissions) and the courts (sometimes a special judicial tribunal). The role of the courts has been greatest where the tradition of pure riparian law was strongest, but as will be seen this is becoming a thing of the past. Exceptionally, as in England and Wales, the authorities responsible for basin management and water services have been given responsibility for the allocation of water rights to themselves and other users, with some provision for 'refereeing' by ministers and with the aid of the courts in enforcement. But in general the arguments for keeping rights allocation separate from management responsibilities seem to have prevailed.

10. Data measurement, processing etc. may be mainly the job of a national agency with no other major responsibilities in water or may be shared with the authorities doing planning and/or management. The latter are bound to have some data collection activities and are usually well placed to service weather and gauging stations economically and to secure data relevant to their needs (for instance, well co-ordinated quantity and quality data), with some central guidance on standards and

techniques and perhaps central archiving and publication. Planning can be no better than its data base.

11. The strongest theme in water management during the last generation has been a call for better co-ordinated planning of systems based on inter-dependent resources, such as those of a single drainage basin, and the examination of wider options in the deployment of financial and other resources. This has arisen because of the increasingly evident conflict of competing demands - for interconnected ground and surface waters; for maintained river levels and flows, consumptive uses and inter-basin transfers; for clean supply rivers and economical waste disposal; for flood control, good drainage and water conservation. Ultimately the flows, natural storage and natural purification capacities of a basin (as modified by man's intervention) constitute a single resource, and it is not easy to see how two or more organisations can separately and effectively plan its use once the buffer of a comfortable surplus has begun to disappear. The need has been accompanied by - and has stimulated - the development of techniques of modelling and system analysis which have made it more feasible to plan the best use of inter-related resources. Basin planning bodies to co-ordinate local or even national executive bodies have been adopted in some countries, sometimes with influence through access to government, sometimes with useful financial powers. Elsewhere planning has been fully integrated with

basin management, making for less detached but probably more effective planning. Such integrated basin agencies may require some machinery of national co-ordination to achieve, say, transfer of 'flows' or sharing of storage.

12. Services to towns and villages (f) have nearly always been of local origin and many remain local in character. Many were, and some remain, private or mixed enterprises. With the growing size of towns mutual interference and impacts on other water interests become inevitable, but there is a natural and wise reluctance to remove the services too far from local control and local financial accountability unless absolutely necessary. In humid countries with large industrial conurbations these services (especially waste disposal) nevertheless account for most of the spending on water and may dominate the problems of basin management. In England and Wales they have been merged with basin management and planning in integrated regional agencies (with the exception of some private water companies). This again is an exceptional development for which there may be little case in countries with a more scattered population and more distinct local characteristics. On the other hand integration of supply and waste services, unknown in Britain before 1973 but not unusual elsewhere, is probably an economical form of management in most places.

13. The services mentioned at (g) are usually the province of private enterprise or associations of users, with or without government assistance

although large scale works may be undertaken by government agencies. There is a very wide array of management arrangements, strongly influenced by local traditions, and little can be said by way of generalisation. But in many countries they play a vital role in water management and some of them (strongly established irrigations associations; well developed private systems of industrial water supply) are important influences on the system of allocating water rights.

14. Protection of the environment and of resources for future use is of growing importance, especially but not solely in the congested industrial societies where the environment is most at risk. The vigour of public reaction to environmental abuse(which led to the setting up of a special purpose agency for instance in the United States) has produced pressures for a frontal attack on the discharge of pollution. But sensible priorities in environmental protection can only be developed in the context of comprehensive planning and the discriminating application of controls on resource use, such as abstraction and discharge permits, charges etc. where they will do most good. There are therefore strong links with the jobs of basin planning and allocation of water rights. Monitoring is an aspect of data acquisition (c) and can probably be done most economically by the basin management agency (as in England and Wales). But there are clearly some arguments for a more obviously disinterested public agency, especially where the management agency contributes much of the pollution load.

15. Point (k) is obviously of great importance and greatly influences the whole style of management. The regional development approach, at one extreme, has been based on the massive injection of capital, from central government or elsewhere, and especially in the case of sponsored irrigation, flood control and navigation projects, the beneficiaries have often been expected to contribute only a fraction of the total costs. Development agencies have often been free to subsidise one service (say, irrigation) from another (power). At the other extreme recent changes and pressures for change in management in industrial countries have often been directed towards identifying the beneficiaries of water use more precisely and distributing the cost burden accordingly ("The polluter pays" etc.); and towards self-supporting local water services. The allocation of water rights through modern systems of permits, and more particularly charges, contributes to the same end (a partially self-regulating water economy) and loses some of its rationale in the face of a political decision to give a region a 'lift' through development. These issues are often tied up with the political status of the various units and levels of authority. Which are to have a local political base (as for instance, a composite regional authority, which may be composed of representatives of central, provincial or local governments and various sectional interests) and which are to function as administrative arms of a central political authority?

ALLOCATION OF WATER RIGHTS:

16. This has often been taken to mean the award or recognition of an individual right to take water from a stream, or from underground, for some purpose. A brief reference to the traditions in this field was made in paragraph 3. In many countries these have been modified or superseded by statutory permit systems, and this trend seems likely to continue. But the subject can also be said to embrace the allocation or denial of other rights, notably the right to right to discharge (polluted) water which is often subject to permit also, and to the imposition of charges in connection with either abstraction or discharge. Closely linked with these is the allocation of water between actual or potential abstractors and the residual streamflow by the determination of 'minimum acceptable flow' or prescribed flow below an abstraction point, to govern abstraction, and the award of priorities to different classes of use such as domestic, irrigation etc. Statues or orders and the accompanying authorisation procedures which place particular sources at the disposal of a water supply authority or within the jurisdiction of a regional management authority might also serve as allocative instruments. There is also the particular issue of international or interstate sharing of waters. The instruments used and problems involved in any of these might presumably be open to discussion under this heading. There are also the related issues of planning to secure an optimum pattern of allocation of sources to specific groups of users, or of storage volumes shared between supply

authorities or between river management functions, and the reallocation of resources and costs as circumstances change Within a country these might sometimes have to be resolved through a national master plan with over-riding provisions for re-allocation.

17. England and Wales can again serve as a clear-cut example of the virtual abrogation of traditional riparian water rights and their replacement by a system of licenses, now operated by the regional water authority. This system was introduced in 1963, but some control over groundwater had existed earlier. An element of riparianism survives in that an applicant for a surface water licence must occupy land adjoining a watercourse. Charges are also imposed, according to the amount of water licensed for abstraction, the circumstances of its diversion, use and return, its quality and other factors - that is to say, the total impact of the licence on the resources available to the community, and the revenue is used through a 'water resources' account to operate the system and develop further resources. There is also provision for revoking licences on payment of compensation. In a sense, therefore, there is potential for a 'market' in water resource rights. Discharges have also been made subject to consent and to any conditions the water authority sees fit to impose. So far no charges have been introduced for the right to discharge, but in other countries - France, Federal Germany, the Netherlands, among others - such charges apply in varying degrees. In countries and regions with an 'appropriation' tradition, such as

western U.S.A., proposals for permit systems have had more regard for the maintenance of established priorities in water use, and provisions for the revocation of permits, and for charges, have met with more resistance.

18. The use of designated minimum flow has also been pursued as a broad allocative device, often with very limited success. Minimum quality targets for specific river locations may be similarly used. A vital consideration in river management is the inter-relation of quality and quantity. Allocative arrangements may fail in their purpose if this is overlooked (for instance, because of high salination of residual flows, as in the Colorado). Flow augmentation and treatment for the restoration of water quality must often be considered as alternative steps to the same end, and this has been one of the arguments for integration of the successive stages of water cycle management.

19. Another factor which may dominate the problems of allocation is the variability of natural flows, since it is in circumstances of extreme low flow that the allocation becomes critical. Absolute priorities of use are sometimes inadequate and ineffective and apportionment rules may be required - for instance between abstraction and residual flow or between storage for irrigation and flood detention - which take account of the state of flow and other relevant circumstances. For this statistical knowledge of flows is needed.

20. Arrangements for the sharing of flows and storage, costs and benefits between countries, regions and organisations may all be complicated in their different ways by these considerations. The resulting arrangements are inevitably a compromise between simplicity, equity, security in foreseeable conditions and flexibility to meet changed circumstances. The tests of any such arrangements, as of any system for the allocation of private user rights, must include equity and political acceptability in the local context: effectiveness in serving their purpose and providing incentives to efficient resource use; the ease and costs of administration and enforcement; and adaptability to change.

SUMMARY.

21 It might be useful to round off this sketchy introduction with an aide-memoire of some of the salient points and (overlapping) issues which should not be overlooked and which may be among those deserving of discussion:-

Management structure:

Primary political purpose: by what tests will performance be judged?

Effectiveness in deploying available sources of manpower etc.

Continuity with established institutions and public attitudes.

Problems of co-ordination within government.

The scope for regionalisation of planning, management, resource allocation.

Integration or separation of the hierarchy of services?:-

regional and local

clean and dirty water

executive management with planning

" " data acquisition

" " rights allocation

" " environmental protection

The location of financial accountability and the political status of organisations.

The roles of public, private and mixed organisations, associations etc.

Allocation instruments:

Continuity with law and tradition: absolute national priorities.

Security of established rights versus flexibility for future economic advantage.

The role of regulation versus economic incentives (charges etc.).

Costs of administration and problems of enforcement.

Vesting or rights in public water athorities: authorisation procedures, sharing and reallocation of flows, storage.

The inter-relation of quantity and quality.

Flow variability: the question of relative reliability for different purposes in circumstances of diminishing flow.

The data base needed for sophisticated allocation.

International/interregional sharing.

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