Small-scale, low-cost, environment friendly irrigation schemes: sites selection and preparation of full work tender dossier
EuropeAid/137393/DH/SER/MK

MINISTRY OF AGRICULTURE, FORESTRY AND WATER ECONOMY

Component 2:
Support for stakeholders involved in planning and implementation of the irrigation sector policy

TRAINING MANUAL
For Institutional Stakeholders

SUBJECT:

- **A framework for Water Sector Policy Review**
- **and strategy formulation towards**
- **Integrated Water Resources Management**

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1 EXECUTIVE SUMMARY

According to the Terms of Reference (ToR), the objective of Component 2: "Support for stakeholders involved in planning and implementation of the irrigation sector policy" is to provide capacity building of stakeholders in irrigation management, targeting the Water Management Directorate (WMD) at the Ministry of Agriculture, Forestry and Water Economy (MAFWE), and the Joint Stock Company for Water Management (JSCWM) and farmer's groups at the selected sites.

The support to the institutional stakeholders (WMD at MAFWE and JSCWM) should

1) provide clarifications and transfer necessary knowledge about practical application of the selected standardised methodology used to prepare the outputs under Component 1
2) support to successfully carry out the ongoing policy to transfer the responsibility for water management to water users

This support will be provided through the following trainings subjects:

1) **Methodology used for Pre-feasibility studies**
2) **Strategy to transfer/share water management to irrigation water users (Irrigation Management Transfer - IMT) (Workshop)**
3) **System Irrigation Management**
4) **On farm irrigation water management**
5) **Software applications for irrigation: CROPWAT, CLIMWAT, SURFACE, etc.**
6) **Methodology to be used for feasibility studies**
7) **Tender Dossier Preparation (following latest EU PRAG rules)**
8) **Community Participatory methods**
9) **Framework for Water Sector Policy Review and strategy formulation**
10) **Agriculture economics (farm management, marketing)**
11) **Others to be determined**

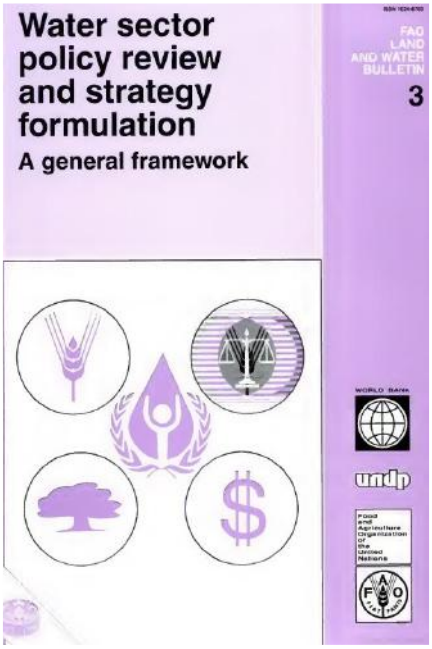
2 INTRODUCTION

Rising population and the rapid rate of urbanization continue to increase demand for the basic services of potable water and sanitation and the need for secure food supplies. Irrigation is the dominant water user in many developing countries and faces increasing competition from other sectors, raising severe localized problems of re-allocation in some cases.

Many countries have reached a stale where the quantity or quality of fresh water resources is imposing limits on present use of the resource and on economic development. Others are rapidly approaching a similar critical situation. All these countries face the common problem that existing policies and strategies, and the institutions to implement them, are inadequate to meet water use needs and sustainable development.

In response to the problem, and to meet the challenge of the future, UN organizations (United Nations Development Programme (UNDP), The World Bank (WB) and The Food and Agriculture Organization of the United Nations (FAO)) and national governments have joined forces to promote reviews of water policies.

- Policy paper Water Resources Management, WB,1993,
- A Guide to the Formulation of Water Resources Strategy, WB, 1994,
- Reforming Water Resources Policy: A Guide to Methods, Processes and Practices, FAO, 995.



In September 1994, UNDP, FAO and WB merged their respective publications, and FAO organized an expert consultation in January 1995 to review the joint document.

The framework presented in this training material is based in the Water Sector Policy Review and Strategy Formulation. A general framework. (FAO,1995), bulletin that incorporated the recommendations of the expert consultation and makes the case for a systematic water policy review in two stages:

• Review and adaption of water policy, and
• Formulation of strategies.

The focus of that guide is the approach and the process for formulating strategies and implementing water sector policies.

The Expert Consultation concluded, with some exceptions, that methodology for water policy development do not generally exist at the country level, but that there is a need for individual countries to formulate, debate and adopt appropriate, national, provincial and basin-wide policies for rational water resources management.

The general framework present show to elaborate the strategic planning process outlined.

Policy review is intended to re-assess

- objectives,
- existing policy and status of the water sector,
- provide new goals and policies on which a detailed strategy can be based.

The process of strategy formulation is concerned with how to put policy into practice at successively national, regional (basin) and local levels.

Strategic planning is a continuous process and involves feedback and cross-overbetween monitoring and assessment (according to established criteria) of the results of implementation of strategy and the resulting programmes and projects.

Reality is far more complex and is complicated by simultaneous strategic and shorter-term horizons and the strong likelihood of changing circumstances, plus changing interactions with other aspects of public policy and economic development.

Thus the process of policy review and strategy formulation is also modified by political processes and human behaviour and has strong longterm evolutionary characteristics.

The importance of capacity building is stressed when addressing the differences between the ideal and reality, and in particular the somewhat artificial phasing of activities of any framework. Capacity building involves:

- Creating an enabling environment with appropriate policy and legal frameworks.
- Institutional development, including community participation.
- Human resources development and strengthening of managerial systems.

The background, problems and principles of water resources management are discussed and provide a breakdown of sectorial activities, the social and economic characteristics of water and explain the reasons for extensive public intervention in the development, allocation, regulation and management of water resources.

Climate change, constraints on water resources, the looming food security crisis, and accelerating urbanization compel us to come up with original solutions to challenges faced by people across the globe: there is a need to look at how water resources and irrigation can be optimized to meet the requirements of coming generations.

Upward demographic pressures are expected to continue to about 2050 when the world population is expected to level out at about 9 billion, from 7.2 billion currently. Moreover, as people become wealthier their dietary habits change to include more meat, fruit, and vegetables and less basic food items. This causes a continue increase in the demand for the basic services of potable water and sanitation and the need for secure food supplies. Irrigation is the dominant water user in many developing countries and faces increasing competition from other sectors, raising severe localized problems of re-allocation in some cases.

Component parts of the policy review include

- determining the importance of water in specific national and regional contexts,
- conducting a comprehensive water resources assessment and
- generating a matrix of problems and critical issues, set against old and emerging objectives for water policy.

- Broad options, based on defined principles, are evaluated and set the scene for detailed strategy formulation,

The detailed strategy formulation establishes critical elements such as

- oversight bodies and expert teams
- identification of all the interested parties (stakeholders)
- definition of an action programme and implementation schedule.

The principle elements and key issues in strategy formulation are

- Extensive use of public consultation and participation (although realistic assessments of the time, effort, cost and logistical feasibility of appropriate stakeholder participation is needed)
- A holistic and integrated approach to assessment, development and management of freshwater resources. Categories of actions determined in the policy analysis matrix are elaborated with consideration of data requirements and information management and the role of modelling in assessing options. Institutional and legal reforms are a major part of strategy formulation, encompassing specification, allocation and recognition of water rights, changes in organizational and ownership arrangements, and decentralization and devolution of responsibility in public sector management.
- Institutions and human resources;
- Stakeholder participation;
- Information systems and management;
- Institutional and legal reforms (specification, allocation and recognition of water rights, changes in organizational and ownership arrangements, decentralization and devolution of responsibility in public sector management, privatization and corporatization, reforms in planning and management)
- The role of economics tools and incentives, promotion of price and market mechanisms;
- Environmental and health considerations;
- Technological innovation and
- International issues.

3 BACKGROUND AND PRINCIPLES

CONTENTS OF THE CHAPTER

The scale of problems in the water sector worldwide, especially agriculture (higher demand)
General checklist to identify common critical issues facing governments in this sector.
The concept of water as a limited resource, with characteristics of an economic good.

Basic principles:	Strategic choices:
• economically efficient use of water • efficacy, • distributional impact, • environmental impact, • fiscal implications, • acceptability, • sustainability and • feasibility.	• inter-sectorial priorities, • food self-sufficiency, • International diplomatic issues. Styles of management: • centralized or de-centralized • public or private • supply-oriented • demand oriented.

3.1 GROWING WATER PROBLEMS

3.1.1 VULNERABILITY (SUPPLY AND DEMAND IMBALANCE)

Competition is already constraining development among agriculture, industry and cities for limited water supplies efforts in many countries. As populations expand and economies grow, the competition for limited supplies will intensify and so will conflicts among water users. Whilst the scale of emerging mismatch in demand and supply is unprecedented, societies and cultures have historically often been vulnerable to water with respect to quantity, quality and timing of availability, and in some instances to capture by enemies.

Competition among agriculture, industry and cities for limited water supplies and conflicts over water are not new. While climate is the principal factor in water quantity and its inter-temporal distribution, population and economic development are the main influences on quality and demand.

The supply and demand for water can be calibrated both between countries and over time, and conclusions drawn about the vulnerability of the region concerned.

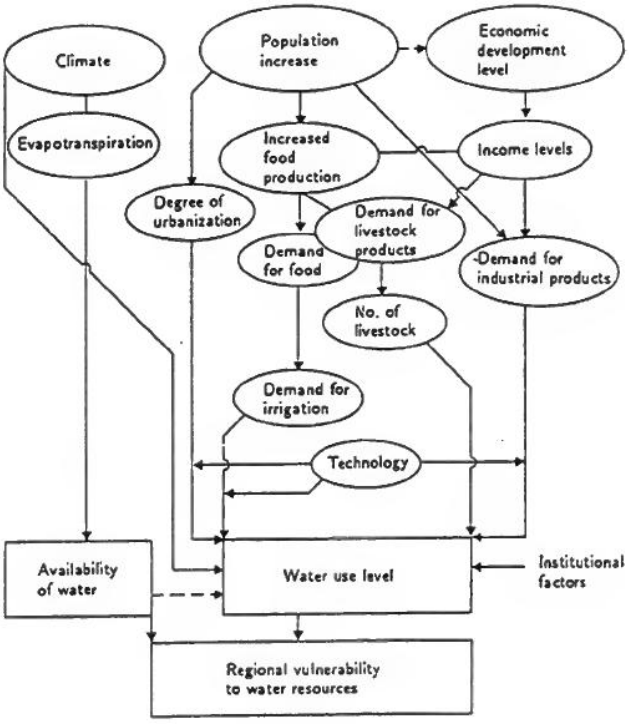


Figure 3-1 Interrelations among forces determining a region vulnerability to water resources.

Table 3-1 Water resources per selected countries in 2000 (FAO,2003)

Country	Total Area	Population	Avg. precipi-tation	Internal resources surface	Internal resources groundwater	Internal resources overlap	Internal resources overlap	External resources natural	External resources actual	Total resources natural	Total resources actual	Dependancy Ratio	IRWR per capita	TRWR per capita
	km2	1000 inhab	km3/year	km3/year	km3/year	km3/year	km3/year	km3/year	km3/year	km3/year	km3/year	%	m3/year inhab.	m3/year inhab.
Brasil	8.547.400	170.406	15.236	5.418	1.874	1.874	5.418	2.815	2.815	8.233	8.233	32	31.795	48.314
Albania	28.750	3.134	42,7	23,1	6,2	2,4	26,9	14,8	14,8	41,7	41,7	35,5	8583	13306
Bulgaria	110.910	7.949	67,4	20,1	6,4	5,5	21	0,3	0,3	21,3	21,3	1,4	2642	2880
Greece	131.960	10.610	86,1	55,5	10,3	7,8	58	16,3	16,3	74,3	74,3	21,9	5467	6998
N.Macedonia	**25.710**	**2.034**	**15,9**	**5,4**	-	-	**5,4**	**1**	**1**	**6,4**	**6,4**	**15,6**	**2655**	**3147**
Yugoslavia	102.170	10.552	81,2	42,4	3,0	1,4	44,0	164,5	164,5	208,5	208,5	78,9	4170	19759
Kuwait	17.820	1.914	2,2	0	0	0	0	0,02	0,02	0,02	0,02	100	0	10

In many countries, while scarcity is less of a problem at a national level, serious water shortages are causing difficulties in specific regions and catchment areas. (northern China, western and southern India, and parts of Italy, Mexico, the United Kingdom and USA).

Imbalance can be also be produced by:

- Misuse of water is widespread.
- Surface water quality is deteriorating in key basins due to pollution by urban and industrial wastes.
- Shallow groundwater is polluted from surface sources
- Coastal aquifers may be irreversibly damaged by the intrusion of salt water.
- Overexploited sedimentary aquifers are subject to compression and consequently to subsidence.
- Cities are unable to provide adequate drinking-water and sanitation facilities.
- Waterlogging and salinization are diminishing the productivity of irrigated lands.
- Decreasing water flows are reducing hydroelectric power generation, pollution assimilation, and fish and wildlife habitats.

3.1.2 WATER USE AND MANAGEMENT

Water is essential to life and economic activity and its use and management cover almost all spheres of human endeavor.

Management of Domestic water supplies: Provision of drinking water and sanitation continues to be a major humanitarian concern:

- 1.0 thousand million people remain without access to safe drinking water
- 1.7 thousand million do not have adequate sanitation.
- The public health impacts of inadequate water supply and sanitation also have serious economic consequences for developing countries
- The increasing financial burden on users to pay for water, sanitation and health has turned water into a central political issue: more than 3 thousand million people worldwide have daily incomes of less than $US 2, which places a severe limitation on their capacity to pay the full economic costs of services.

Management of competence between inland fisheries, agriculture and urban development:

- Inland fisheries and extensive aquaculture are non-consumptive uses of water with high value, especially to the rural poor.

- Inland fisheries have suffered considerable environmental degradation as a result of agricultural intensification and water diversions for irrigation, urban use and flood control.
- Water policy reviews and strategies should consider the sustainable exploitation of living aquatic resources and strengthen institutional cooperation between water development institutions and fishery administrations

Upland water management:

- Mountain areas produce 80% of global water resources,
- Mountain areas have less than 10% of the global population.
- Degradation of upland catchments and diminution of their water resources has been attributed by some to the lack of compensation paid by downstream users to upstream inhabitants as guardians of the resource.
- It is important to identify appropriate institutional arrangements to ensure that funds are used for efficient catchment management

AGRICULTURE - A KEY TO THE PROBLEM:

- The largest demand for the world's water comes from agriculture and more than two-thirds (up to 90% by some estimates) of the world water is used for irrigation.
- Agriculture is a relatively low-value, low-efficiency and highly subsidized water user.
- In the past, domestic spending for irrigation dominated agricultural budgets:
  - 80% of Mexico's public expenditures in agriculture
  - >50% in China, Pakistan and Indonesia,
  - >30 % in India
  - > 30% of World Bank agricultural lending during the 1980s.
- Once established, irrigation projects become some of the most heavily subsidized economic activities in the world, both directly and indirectly (taking account of low energy costs for pumping).In the mid-1980s, 90% of the total (O&M) costs in six Asian countries.
- Irrigation fees are on average, less than 8% of the value of benefits derived from irrigation.
- Irrigation performance indicators are falling short of expectations for yield increases, area irrigated and technical efficiency in water use. (60% of the irrigation water is wasted.
- This excess water seeps back causes waterlogging and salinity, and water-related diseases, resulting in human suffering and increased health costs.
- Irrigated agriculture is expected to produce much more in the future while using less water than it uses today.
  - 2.4 thousand million people depend on irrigated agriculture for jobs, food and income
  - Over the next 30 years, an estimated 80% of the additional food supplies required to feed the world will depend on irrigation
- Cities and industries can afford to pay more for water and earn a higher economic rate of return from a unit of water than does agriculture.
- Agriculture is being obliged to give up water for higher-value uses in cities and industries.
- Irrigators in some areas are now asked to pay for the water they receive, including the full cost of water delivery.

This water dilemma - to produce more in a sustainable way with less water – points to the need for demand management mechanisms to re-allocate existing supplies, encourage more efficient use and promote more equitable access.

Policy-makers need to establish a structure of incentives, regulations, permits, restrictions and penalties that will help guide, influence and coordinate how people use water while encouraging innovations in water-saving technologies.

The era of meeting growing demand by developing new supplies is ending. Water management is shifting away from capturing more water towards the design of user-focused approaches that influence their behavior to obtain water resources savings..

- National water politics are shifting from projects to policies
- Water can become a test bed for economic reform, liberalization and accountability.
- Given water's scarcity and its value to cities and industry, the water subsector will be less dominated by irrigation.
- Recognizing irrigation as a service with customers and users, and not as a production industry.
- At the level of the irrigation scheme, the process of water policy formulation, assessment and appraisal needs better articulation. Participation and consultation are increasingly important, to include water user interests.
- There is clear need to consult policy groups before policy selection, and subsequently for them to provide feedback and adjustment in the light of experience.
- Resolving problems of self interest in policy groups and the identification of options consistent with the national policy framework, as opposed to measures to protect and satisfy special irrigation interests.
- The need to establish organizational arrangements within the public sector that do not fuse policy and regulatory roles with implementation, such as those resulting when a super-ministry is formed from water, energy and agriculture and irrigation departments.
- There is a need to identify a broader range of water policy options, so as to have less 'policy-by-crisis' management and more resilience in the face of outside pressures.

3.1.3 CHECKLIST OF CRITICAL ISSUES

In deciding what emphasis to give the water policy review, authorities may find it helpful to use a general checklist such as that in Box I, although there may well be other issues to consider in any given context.

Governments should assign relative importance (and related weights) to different critical issues according the authorities own judgments. In general, adverse 'scores' in any of the categories in the Box could be the trigger for a review. Poor signals in most of the categories would indicate a serious state of affairs, underlining a need for urgent action.
Box 1 is intended to be illustrative rather than prescriptive, and, for the second of the ten critical issues, provides examples of the sort of detail issues and questions that might be relevant, and similar detail considerations apply to the other critical issues.

BOX 1: CHECKLIST: CRITICAL ISSUES IN THE WATER SECTOR

1 . Supply-demand balance
2. Standard of provision:
   - Are farmers constrained by the quantity, quality or reliability of water?
   - What proportion of the population is not served, or inadequately served, with drinking water?
   - What proportion of the population lacks safe sanitation and wastewater disposal facilities?
   - What are the average levels of water consumption per capita compare with similar countries?
   - What is the frequency and incidence of water shortages, breakdowns in treatment facilities, suspension of normal services, or rationing episodes? Is this more common in certain areas (e.g., poorer neighborhoods, dry regions, rural areas) than others?
   - What proportion of the population regularly obtains its water from private vendors?
   - Is the quality of water provided for domestic purposes adequate?
   - Is there evidence of the incidence of water-related illness?
   - Do households take their own precautions to ensure the safety of their drinking water?
   - Do farmers and industrial firms receive public supplies, they have there own stand-by or supplementary sources?
3. Economic importance of water sector
4. Water quality indicators, including salinity, waterlogging and pollution
5. Future supply options
6. Efficiency of use
7. Financial performance of sector
8. International sensitivity and commitments
9. Symptoms of conflict
10. Structural and institutional change

Any of the problems in Box 1 might be sufficient to trigger a major review of water policy.

3.1.4 PRINCIPLES FOR WATER PLANNING AND ALLOCATION

WATER AS A LIMITED RESOURCE

Despite its widespread scarcity, the majority of societies do not treat water as an economic good or service.

If water were treated like other goods it would be priced to at least cover its cost of supply, including storage, treatment and distribution, so as to ensure its continuing availability.

The price should also be sufficient to reflect the strength of demand, to encourage its consumption to gravitate towards those placing the highest value on it, provided essential supplies were assured to all.

These conditions are clearly not those in which water is supplied and used in most cases. The water sector is typified by:

- supply-oriented provision,
- reluctance to make active use of pricing,
- allocation by non-economic means, and

- the persistence of low-value usage in important sectors.
- Private enterprise in the supply of urban and rural drinking water is an exception rather than the rule.
- the instinctive response to water stress is to consider supply augmentation
- Prices are rarely used to allocate water supplies or to actively manage demand, often because subsidized services and supply have been offered
- Farmers producing essential foods in most developing countries would go out of production if asked to pay the full price, and countries thus deprived of essential foods have no means to pay for the food imports that would then be needed.
- Hence few have any practicable alternative to subsidizing irrigation.
- Water pricing is usually seen purely as an aspect of cost recovery, and in many cases (e.g., agriculture) it does not even achieve that.

The resulting paradox is that an increasingly scarce resource is subsidized, discouraging conservation or waste reduction.

Restraints on public expenditure and public sentiment adverse to subsidies, e.g., in irrigation, is already exerting considerable influence in promoting recovery of operational and sometimes capital costs.

Consideration of water as an economic good may have benefits in sensitizing managers and users to the cost of providing a service, but treating it as an economic good, or even a commodity, is a policy decision that requires careful consideration of legal, institutional and regulatory implications.

The benefits from using water typically vary widely from one sector to another, as well as within sectors. Variations of up to a factor of 10 or more are common in comparing the value of water for different uses within the industrial and agricultural sectors

- the highest-value water uses are found in specialty crop production, industrial process use, in-house domestic consumption and some recreational uses.
- The lowest-value consumption tends to be found in low-value farm crops, industrial cooling, and waste assimilation

This indicates the scope for increasing the total economic benefit from water consumption by re-allocating limited supplies. However, the costs involved, such as for imports of staple foods, may be beyond the financing capacity of governments. Thus fiscal capacity may be a more decisive factor than economic efficiency.

Another sign of the under-development of markets is the minor role played by private enterprise in bulk supply and distribution. It is no accident that privatization has made least headway in the water sector, and, except in the UK, it has largely taken the form of concessions and management agreements, rather than full-blooded ownership.

Arguments for valuation of water as an economic good do not necessarily imply the introduction of markets, as the varied experience in the western states of the USA testifies:

- the mixed administrative allocation of water in New Mexico (based on assessment of economic value) is considered to be more effective and economically efficient than the market system in Colorado, with enormously expensive litigation.

Strong vested interests dependent on cheap water conspire to preserve the status quo and can exercise great political influence:

- Irrigated agriculture,
- industries reliant on large volumes of water

- cheap hydropower.

Factors that hamper the development of a more integrated water market:

- Physical factors: there may be no practical method of transferring water which is surplus to one sector - or used wastefully - to another which could make more economic use of it.
- Legal obstacles, arising from the prevailing set of property rights:
  - Specific users may have legally defined rights or priorities over the use of water,
  - ambiguity over the ownership of water prevents its transfer from one customary user to another.
  - The rights of third parties (including the public interest) in water transfer cases
  - environmental concerns into the transaction.
- Transitional costs of shifting water onto a more market-oriented basis
  - Metering has to be weighed against expected water savings.
  - Industries may need to spend sizeable amounts on recycling equipment, or even introducing an entirely new, water-efficient process.
  - In households, campaigns to promote water-efficient devices are costly and time-consuming.
  - the transfer of water from one sector to another may be disruptive socially (such as leading to a decline in communities that depend on irrigated farming).
- Lack of faith in the efficacy of economic instruments. It is widely believed that the price elasticity of demand is simply too low for water pricing to do an effective job in restraining demand and re-allocating supplies. Although in the urban and industrial sectors, consumers do respond to water prices where they are set realistically
- Where pricing is used actively in agriculture - e.g., for groundwater sales. and in water transfers - there is evidence that farmers respond as economists would predict.

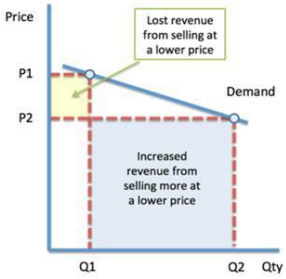
Findings (Sun et al, 2017):

- The main reason for the inelastic demand is the low price of water most agricultural users are paying. When prices are set at the lower end, demand for most goods would be in the inelastic range.
- Prices of water used to irrigate various crops are also found to be below the economic returns of water. If water is priced below the returns it can generate in agricultural production, then farmers will not respond to a rise in the water price until it climbs to the level of water value.
- The value of marginal product (VMP) of irrigation water in crop production, which is known as economic returns to water is the appropriate measure to be used in the analysis of water pricing policy, since it reflects how much value a unit of water adds to crop revenue.
- VMPs of water are higher than the prices of water. If the value of marginal product is above water price,farmers will use the maximal possible amount of water that is available to them.
- If the government wants to stimulate farmers to save water further in this situation, it should increase the water price significantly, so it at least reaches the value of a marginal product.
- The estimated VMPs provide policy makers with some guidelines on the minimum level of water prices required to achieve any water savings among those households.

BOX 2: REVIEW OF ECONOMIC CONCEPTS

Price elasticity of demand measures the responsiveness of demand after a change in a product's price. (How much does quantity demanded change when price changes? By a lot or by a little?).

$$Price\ Elasticity\ of\ Demand\ (PED) = \frac{\%\ \text{Change in Quantity Demanded}}{\%\ \text{Change in Price}}$$

Perfectly inelastic demand	Perfectly elastic demand	Inelastic Demand	Elastic Demand
			
PED = 0. Consumers are willing and able to pay any price for the product. Vertical demand curve. Not real, except for essentials like water or food during crisis.	**PED = ∞ (infinite).** Consumers will buy all available at some price, but none at any other price. It requires perfect competition where no supplier has pricing power. Horizontal demand curve	**0 < PED < 1.** The quantity demanded changes less than the change in the price. A rise in price will cause small reduction in quantity. In general, Irrigation water has inelastic demand because of its low price. For Irrigation water, -USA 1963/2004 - PED = -0,5 (Scheierling et al,2006)*. The % of reduced water consumption is half of the % of price rise.	**PED > 1** The quantity demanded changes by a larger percentage than the change in price. A rise in price will cause a higher percentage of reduction in the amount used. Water prices may need to be increased significantly to induce sizable water savings (Sun et al, 2017)

*Price elasticities of demand for water (PEDw) are crop specific: wheat: -0.12 < $PEDw_{wheat}$ < -0.03, for maize - 0.67 < $PEDw_{maize}$ < - 0.04 (Sun et al, 2017).

DUBLIN-RIO PRINCIPLES

The Dublin Statement on Water and Sustainable Development was agreed at the International Conference on Water and the Environment, January 1992. The Dublin Statement were agreed upon by nearly 500 government-designated experts from 100 countries and was submitted to the UNCED in Rio de Janeiro in June 1992, also known as The Earth Summit. Hence the name, Dublin-Rio principles.

1. Water must be managed in a holistic way, taking interactions among users and environmental impacts into account.
2. Water must be valued as an economic good and managed as a resource necessary to meet basic human rights.
3. Institutional arrangements must be reformed so that stakeholders are fully involved in all aspects of policy formulation and implementation. This means that management must be devolved to the lowest appropriate level, with enhanced roles for NGOs, community groups, and the private sector.
4. Women must play a central part in the provision, management and safeguarding of water.

However, a number of other factors come into play in planning and managing water systems:

- effectiveness,
- efficiency,
- equity and distributional effects,
- public health,
- environmental impact,
- fiscal impact,
- political and public acceptability,
- sustainability, and
- administrative feasibility.

EFFECTIVENESS

The proposed policies should be successful in producing the desired result; (have success).

As water is a sensitive topic in most societies, reforming public behavior towards water is difficult task, with substantial political and administrative costs. Efficacy is thus related to the criterion of acceptability, discussed below.

In the case of increases in the price of water, the clearest measure of response is the elasticity of demand in respect of change in its price. There is growing evidence that certain categories of demand are elastic enough, in this sense, for price changes to induce demand responses.
Even where demand is price-inelastic (where the amount consumed changes less than proportionately to the price increase), prices can still be successful in reducing consumption, compared to other options for balancing supply and demand.

In many instances, a combination of measures might be most effective. Higher charges for water use might be accompanied by a campaign of public information and education; subsidies for the installation of water-efficient facilities; and free advice on reducing consumption and waste. The effective control of water pollution could entail the combination of regulations (’command and control' devices) - properly enforced – with 'polluter pays' taxes and charges.

EFFICIENCY

The efficiency criterion requires that the economic benefits of policies exceed their costs. For instance, in the case of the development of new water supplies, the value of the water produced should exceed the costs of production, to which should be added environmental costs.

For conservation measures, the reduction in consumption is worthwhile so long as the unit value of the water saved exceeds the cost of providing it. Beyond that point, conservation has too high a cost in terms of benefits foregone.

Efficiency also applies to policies involving the re-allocation of water between different users, e.g., within the agricultural sector, or from agriculture to municipal or environmental use. Re-allocation to higher-value uses produces net social benefits corresponding to the difference between the value of water in its old and new uses.

EQUITY AND DISTRIBUTIONAL EFFECTS

Policies should be seen to be 'fair' in their respective impact on the various socio-economic groups.

- Deserving groups, (mothers of young children, poor households or small-scale farmers should benefit from policy reforms, and should certainly not find themselves worse off.
- More affluent consumers should not receive disproportionate benefits from any policy measures, and that extreme inequalities in water consumption should be reduced.

PUBLIC HEALTH

Over one thousand million people lack access to safe water, and 1,7 thousand million do not have proper sanitation Inadequate sanitation and clean water provision remain the most serious of all environmental problems, in terms of the scale of human suffering. These estimates indicate the importance of public health benefits in planning water systems to provide adequate universal coverage of water supply, sanitation and safe disposal.

In applying the public health criterion to water supply, there should be adequate recognition of the benefits to national nutritional levels from having adequate food security based on local irrigated farming.

However, there are also public health risks implicit in certain water supply schemes, including the creation of malaria vector breeding habitats, the spread of bilharzia in irrigation schemes, or increased pollution from greater water use.

ENVIRONMENTAL IMPACT

The environmental impacts of schemes to supply, use and dispose of water are potentially very large. Dams and reservoirs, aqueducts, river diversions, major irrigation schemes, industrial and municipal offtake, groundwater pumping, etc., can have a massive hydrological impact, affecting other users, future generations, amenity and wildlife, as can the disposal of wastewater and the contamination of freshwater bodies through agricultural runoff, industrial effluent or unprocessed sewage. In practice, only certain effects can be quantified, and even those only partially and imperfectly.

The environmental effects of policies may also be captured in numbers, and they should be rigorously tracked using recognized checklists.

Environmental criteria apply with particular rigor to large new schemes for water supply development. In contrast, demand-management measures, such as conservation, are much more environmentally benign, avoiding the major impact of supply projects and reducing costs resulting from pollution.

FISCAL IMPACT

Many countries with serious water problems also have weak public finances. The fiscal impact of water policies is an important criterion, both for general macro-economic management and for the proper funding of water and sanitation provision.

A sustainable policy would be one having a positive impact on the finances of central or local government, e.g., from a tax, price increase, charge, a reduction in subsidies, or the avoidance of major capital spending. It should likewise benefit the financial position of the water utility, irrigation agency, etc.

The strict application of economic water pricing, based on the 'marginal cost' principle, could even generate 'excessive' revenue for the water utility compared to the alternative of average cost pricing.

These revenues could breach allowable rates of return established by regulatory bodies, and could arouse antagonism amongst the general public.

In such cases, total revenue could be adjusted by lowering consumer charges unrelated to consumption, e.g., the fixed part of a two-part tariff, or by reducing the price of the first 'blocks' in an 'increasing block' tariff structure.

POLITICAL AND PUBLIC ACCEPTABILITY

It is desirable that policy changes should be acceptable to the parties affected and should not encounter serious resistance in the political process. However, this is a counsel of perfection and there would normally be gainers and losers from any policy change. Nevertheless, the ground needs to be carefully prepared. There should normally be some proportionality between the effort that goes into introducing a policy measure (the sacrifice of political goodwill, expenditure of political credit, the resources involved in steering legislation through, overcoming public resistance and lobbying, etc.) and the pay-off from that policy.

A policy that achieves little, but at great political cost and arousing much public antagonism, is clearly undesirable.

A policy is more likely to be acceptable if it is seen to be tackling a severe problem, if its costs and benefits are apparently equitably distributed, if there is a strong lead from prominent political and community figures, if it is accompanied by adequate publicity, and if the population is well informed and public-spirited.

It will be tempting for politicians to avoid a policy that relies on major behavioural changes (e.g., introduction of pricing or conservation measures), compared to one consisting of a technological 'fix' (e.g., the development of new supplies). However, the former may be preferable, and in some circumstances may be the only option.

SUSTAINABILITY

Certain policies have a once-and-for-all impact, while others have a continuing or even a growing effect. Short-term measures introduced in response to an emergency, such as a drought, may have a strong immediate impact, but one which tails off sharply when the worst of the emergency is over.

Policies which make a long-term impression on water use, such as technological adaptations and changes in user habits, are more sustainable.

Best of all are measures whose impact increases over time, either because their elements reinforce each other, or because they provide incentives for continuing and cumulative effects.

ADMINISTRATIVE FEASIBILITY

The operation of a policy must be within the administrative capability of the department or agency involved. For instance, metering supplies requires a certain level of household visits, and billing staff. A initiative for conservation needs to be backed up by qualified staff to advise households, industries or farmers on technology and improved water management and use.

For the same reason, if they require intensive monitoring and maintenance, supply augmentation schemes are not the easy option they may appear to be.

New policies will be worthless unless their implementation is monitored and enforced. For instance, the system of water transfer practised in some US states requires official approval for each transaction. The control of water pollution implies regular monitoring and inspection, and a willingness to penalize the offenders. Water pricing requires regular collection of revenue and a willingness to prosecute non-payers.

POLICY REFORM IN AGRICULTURE

Sustainable agricultural development depends on sustainable water use. Governments today recognize that the search for sustainable economic growth requires, in part, both economy-wide and sector-specific policy reforms. Economy-wide policies attempt to create a favourable macro-economic environment while water sector policies, for example, seek to encourage resource efficiency among water users.

The current emphasis on macro-economic policy reforms and economic liberalization has several important implications for irrigation. Recognition of the value of water (and the high cost of turning a water source into a service delivered to a farm) makes the water sector a prime target for further policy reforms. Nonetheless, irrigation remains a resource-hungry sector in this transitional period. Even successful irrigation consumes large quantities of capital and foreign exchange and ties up scarce skilled personnel.

Like many public sector personnel, irrigation managers must walk a fine line between a tighter control of finance, the need for more positive active leadership and better planning of resource allocations, on the one side, and the contradictory need for more ideas from below (farmer customers) on the other. Financial pressures are likely to be the dominant influence. Irrigation as a public sector agency still relies on budget allocations to obtain financing. Many argue that this gives little incentive to save money and may, in fact, have the reverse effect. As private sector disciplines are applied in irrigation, and more user participation occurs, policy-makers are finding that:

- agencies become more supportive of farmers' own efforts and less inclined to make all key decisions before informing farmers accordingly;
- management seeks more consensus on priorities, more information about the basis of decisions and a common view of external factors affecting management;
- irrigation schemes seek and receive more autonomy;
- the financial responsibilities and accountability of managers increases; and managers shift focus from their ministries and governments, depending on the amount of finance generated by service fees.

STRATEGIC CHOICES AND TRADE-OFFS

Many countries are having to confront the prospect of emerging water scarcity in the long term, and for some that threat is already upon them. Difficult choices have to be made in many areas, and some of the more important areas are considered below.

Priorities between sectors

Against the background of increasing population, growing food requirements, industrialization and urbanization, the competing claims of agriculture, industry and household water consumption need

to be mediated. Other important claimants are hydropower, navigation, flood control, fisheries, recreation and the environment.

Self-sufficiency in food, or water?
A water-scarce country pursuing food self-sufficiency may be forced to import water at some point. If water becomes the scarce factor, it may be more sensible to 'import' it embodied in food, especially if food is available on favourable trade terms. California obtains 73% of its daily water input by importing food, though it also 'exports' water by selling cotton, fruit and vegetables.

Domestic versus international concerns
The domestic water policies of a number of countries are directing them on a collision course with their neighbors. This applies both to the use of a common river or lake and to the pollution of a shared water body. Upstream users are in a naturally stronger position, and could even use their water policies to force concessions in other spheres. However, if they press their advantage too far, they face potential international financial and diplomatic sanctions, and ultimately armed force.

Management mode
There are many ways of managing national water resources;

- centralized management and control.: River basin authorities (e.g., France),
- de-centralized: regional, urban or functional agencies and utilities doing deals with each other (e.g., California).

- by public departments or utilities
- privatizing operations. There is the further choice between allowing private companies full ownership of assets (as in the UK) and admitting them as concessionaires, with assets remaining in public ownership (as in France).

- authoritarian (e.g., irrigation technocracies in some South Asian countries)
- participatory (e.g., self-management by community organizations).

Political traditions and power structures, and the balance between the center and the regions, will influence which model is preferred.

Policy mix

- Doing nothing, or postponing any changes, is always an option, and may be perfectly rational in some cases, but the costs of inaction should not be ignored.
- supply-oriented policies
- demand management.
- “command and control” measures (regulations, quotas or instructions)
- economic instruments relying on incentives (prices, taxes, fees or markets).
- balance between the last two types of measure, both of which are necessary.
- continuing subsidies in the water sector, even if they change in form and value.

4 POLICY REVIEW AND STRATEGY FORMULATION

CONTENTS OF THE CHAPTER

This chapter offers an organizing principle for carrying out the review, in seven steps. These are listed in Box 3, and elaborated in the remainder of this chapter

BOX 3: The structure or water policy reforms

Policy Review

1 . Determine the importance of water in national social and economic life.
2. Prepare a matrix of problems and critical issues.
3. Quantify and rank pressures on the water resource.
4. Identify options for mitigation.

Strategy Formulation

5. Formulate a water strategy.
6. Define an action programme and implementation schedule.

The FAO guide summarized in this material defines a water resources management strategy as a set of medium- to long-term action programmes to support the achievement of development goals and to implement water-related policies.

This definition of strategy does not necessarily include project identification, ranking or financing; in this sense it is between policies and projects.

4.1 POLICY REVIEW

4.1.1 DETERMINING THE IMPORTANCE OF WATER

In order to demonstrate the importance of water issues to policy-makers, the general public and key interested parties, certain broad indicators should be made of the relative importance of the water sector. These indicators would also serve to establish the case for resources needed for the sector, in competition with the claims of other sectors and other projects. Useful general indicators include:

- the size and value of water-intensive sectors in the national economy: agriculture, heavy industry, processing, water-based tourism and recreation, navigation, and other sectors sensitive to environmental quality, such as health care;
- the significance of irrigated agriculture to national food security. GNP and exports;
- the cost to the budget and public investment programme of providing and subsidizing water services.
- The proportion of foreign aid earmarked for the water sector;
- the relative importance of water-related diseases in national health status, and estimates of their economic and financial costs;
- the balance of payments implication of the water sector, e.g., debt servicing of water projects, cost of importing food due to internal water deficit, etc.; and
- the estimated national economic costs of water pollution.

These indicators should both present the current situation, and take a forward look to somerelevant future date, say 10-15 years ahead. This is especially important for countries;

- with rapid population growth or urbanization, or both;
- where the balance between sectors is likely to change;
- where changes in housing patterns and consumer taste are foreseen;
- where there is a large backlog of service provision to be made up; and
- where large investments in new supply, quality improvements, or rehabilitating systems are envisaged.

4.1.2 MATRIX OF PROBLEMS AND CRITICAL ISSUES

Drawing on the checklist of critical issues introduced in Chapter 3, a matrix can be devised, containing evidence of the problem, its source and relative importance in each context.

Relative importance can be signified on a scale of 1 to 5, where 1 is relatively minor and quite easily managed, and 5 is very serious and can only be tackled with great difficulty or cost, or both.
Box 4 illustrates the type of information required and how it could be organized. The problems chosen here are not intended to be a complete or even representative list, since each country will have its own particular set of problems.

Table 4-1 Matrix of Problems and Critical Issues.

Problem Type	Evidence	Source	Ranking
Supple Demand Imbalance	By sector/ By region Future trends	Growth of population, per head demand, climate change, overuse	International or historical evidence. Future date in which it will become critical. Comparative ranking and time schedule can be inserted in the cells
Level and Quality of service provided	Proportion of population (now and future) without, or with inadequate provision (drinking sanitation, irrigation, wastewater disposal, consumption per head, reliability	Shortage of investment funds, high standards for connections rapid grow of informal settlements, poor maintenance	
Inadequate water quality	Water quality indicator, incidence of water related diseases, rising treatment costs, legal actions, increased salinity, soil salinization	Growth of polluting industries, urbanization, lax legislation and enforcement of penalties, rising international or national standards, inadequate drainage or waterlogging	
Costs of future provision	Unit costs of projected schemes for supple, rehabilitation, treatment, sewerage, compare to current and past levels. Future costs relative to pubic investment, cost of environmental mitigation.	Exhaustion of easy options in the face of growing demand, insufficient examination of alternatives, insufficient demand management, poor cost recovery, etc.	

Problem Type	Evidence	Source	Ranking
Inefficient use	Agriculture: performance measures (system efficiency, agronomic norms, economic value of water) Sanitation: limited spread of water efficient consumer devices, water pricing, metering, etc.	Absence of incentives to conserve water, poor system maintenance, low public awareness of water situation, inefficient industrial plants, limited access to new technologies, etc.	International or historical evidence. Future date in which it will become critical. Comparative ranking and time schedule can be inserted in the cells
Growing conflicts among users	Coexistence of surpluses and deficits among regions / sectors. Growing shortages in sectors, competition for limited supplies, growing environmental stress, litigation over water, development of water markets, rising price of marginal water supplies, international disputes	Rowing imbalance of water supply and demand, absence of means to settle disputes amicably or efficiently (law, markets, prices) failures of planning and forecasting.	

Table 4-2 Example of a Matrix of Problems and Critical Issues.

Problem	Evidence	Source	Ranking
Institutional modification	Insufficient control of service providers	Different oversight bodies for different sectors	5
Waste Water Collection	Areas without network	Insufficient funds	4
Waste Water Treatment	Cities without treatment	Insufficient funds	4
Institutional Development	Institutions in transitional stage	Changing legislation. Competition and overlapping between institutions	4
Inefficient use	Low irrigation efficiencies	Surface irrigation methods	4
Irrigation development	Unused / left over areas	Land tenure problems.	2
Water Tariff Methodology	Low price. subsidies	Inadequate regulations	4

4.1.3 QUANTIFYING PRESSURE ON WATER RESOURCES

Evidence assembled in the matrix would be extracted to produce orders of magnitude of the severity of the water problems, now and at crucial dates in a relevant planning period (between 10 and 25 years in the future). These data would indicate to planners and decision makers the seriousness of the water situation, from various points of view, now, and how it is expected to evolve in future.

This information can be organized under three headings: physical and hydrological, economic and financial, and environmental, and some of the key indicators are given in the table.

Table 4-3 Key indicators for the water sector

Physical and hydrological	Economic and financial	Environmental
• Balance between per capita availability and use of water • Level (depth) of groundwater in key aquifers	• Size of water-intensive or Water quality indicators in water-reliant sectors within the economy. • Reliance of agriculture and production on irrigation • Price of water in free-market conditions (e.g., from urban vendors or in auctions). • Proportion of the national budget absorbed by water (e.g.. operational deficits, subsidies). • Proportion of public investment programme, foreign aid or both, accounted for by water investments.	• Water quality indicators in critical locations • Environmental costs of water food provision and use (e.g.. of dams, water pollution) • Incidence of water-related diseases, and estimates of

4.1.4 IDENTIFYING OPTIONS

Having identified the main problems and formed a judgement on their relative seriousness, the next step is to review options available for addressing the most important of them. The policy analysis matrix given in Box 5 (chapter 5) may be useful for categorizing actions. This matrix envisages actions at four main levels:

• Planning and analysis - entailing the creation of data systems and analytical frameworks, which may include strategy documents, water resource assessments, data banks, monitoring systems, modelling and research

• Legal and institutional reforms - including the formation of management structures and regulations. These actions may include the reform of water and land legislation, agreeing water quality standards and passing supporting legislation, the creation of new authorities or systems of coordination, corporatizing or privatizing water utilities, empowering water user groups, setting up a regulatory framework for the private sector, etc.

• Economic policies with the aim of providing a suitable 'enabling environment' for water use. General economic policies should be examined to adjust their effects on water (e.g., farm support, food self-sufficiency, industrial promotion, and new settlement). Specific incentives should be created to persuade users to treat water as the scarce resource it is, e.g., economic pricing, the creation of opportunities for markets and trading, and introduction of pollution charges.

• Projects and programmes - such as public investments, information and education campaigns, and programmes to encourage water efficiency.

The choice from this 'menu' of actions should be evaluated against a set of criteria similar to that proposed in Chapter 3, namely:
• efficacy,
• efficiency.
• distributional impact,
• environmental impact,

• fiscal effects.
• political and public acceptability,
• sustainability, and
• administrative feasibility.

4.2 FORMULATING WATER STRATEGY

OBJECTIVES OF WATER RESOURCES STRATEGY

The aim in formulating a national water resources management strategy is

- to provide measures to manage the resource in accordance with adopted goals and policies.
- test whether these goals and policies are realistic.

A strategy should be developed with the idea of the best or most efficient use of existing or emerging resources to achieve goals. A national strategy:

- need not identify specific investment projects, although it may outline or provide broad directions for an investment programme.
- should emphasize such aspects of water development as the necessary institutional and human resources framework,
- should address the medium- to long-term issue of building or enhancing a country's water management capacity.
- should incorporate the views of water resources stakeholders by including them in the formulation process.
- should be developed principally by national experts.
- should be a domestic product that encourages the commitment and 'ownership' necessary for sustained economic development as well as for the implementation of the water strategy and the success of individual projects and investments.

Difference between Master Plan and Water Resources Management Strategy

A master plan

- is investment- or project-oriented; the product of a master plan is often a specific set of investments to be made or projects to be undertaken.
- have a role to play in water resources management if they are viewed as an investment plan that follows the accepted strategy,
- should be placed firmly within the context of development goals and key water-related policies.
- Some master plans do not have adequately considered the institutional and human resources frameworks that are important in water management.
- often neglects the long-term issue of building a country's water management capacity.
- have been developed with considerable expatriate involvement, and capacity-building of institutions and individuals has often been inadequate.

Each country has a unique set of legal, institutional, economic, social, physical and environmental conditions that influence its water management policies and strategies. While experience worldwide

is useful when generating options for action, the solutions to any country's problems must be tailored to its specific needs.

Strategy formulation in context

Strategic planning is essentially a continuous process:

- development objectives and policies are reviewed and after consideration of the relevant issues, options for implementing policy become evident.
- Selection of a particular strategy then leads to the implementation of funded programmes and projects, whose performance must be assessed.
- The feedback from performance assessment may then modify strategy accordingly.
- Part of formulating a strategy should be to specify the entity that will be responsible for monitoring or following-up the implementation of strategy. This entity might be
    - a professional think-tank,
    - outside experts or
    - a standing committee.

It is important that this entity has both the authority and capability to oversee implementation of strategy and that the commitment to review progress is not just a paper exercise.

The need for capacity-building

Capacity-building is a major aspect of formulating a water resources management strategy. The major constraint to water resources development and protection will be the limited capacity of the institutions in many countries to absorb financial resources and convert them into worthwhile and sustainable actions and projects.. The Delft Declaration identifies the three basic elements of capacity-building as:

- creating an enabling environment with appropriate policy and legal frameworks;
- institutional development, including community participation: and
- human resources development and strengthening of managerial systems.

Many failures in water resources management have resulted from lack of trained staff and weak institutions.

- Real long-term success in water resources management depends on the ability of nationals to identify problems and formulate and implement policies and strategies.
- Countries constantly need to adapt their policies and associated strategies to new circumstances and challenges.

Stakeholder participation

Stakeholder participation should involve those who are concerned with or have an interest in water resources and who will be affected by outcomes of policy and its implementation. Decisions regarding water resources can affect nearly every sector of the economy and the public as a whole, and stakeholder participation should be established in a form that will elicit responses at appropriate levels from those concerned.

Experience with stakeholder participation in developing countries is largely limited to community-level projects with external aid financing, such as village-level water and sanitation committees, and water user associations (WUAs) in irrigated agriculture.

It is very easy to underestimate the time, effort and finance required for successful animation of such initiatives, and requirements of national-level programmes are likely to be even more demanding. The

strategy formulation exercise could fail to win public support and necessary political and financial backing if it is perceived as merely an exclusive and technocratic task without the involvement of key constituencies - including professional associations, private sector agencies, and NGOs. The press and media are important channels for raising public awareness of issues and options in water resources management. One of the risks is over-politicization of issues (technical or non-technical). Some technical issues might be better left to the expert team or its advisers, particularly in the early stages of strategy formulation.

PROCESS OF STRATEGY FORMULATION

An outline showing the stages and the main critical elements in the process is given in the figure and discussed in the following sections.

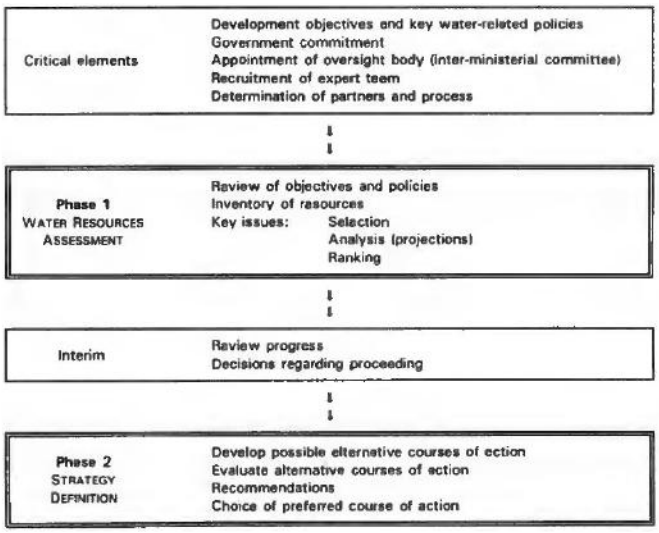


Figure 4-1 Key points in water strategy formulation

The iterative nature of strategy formulation means that policies both guide the process and can be revised by it. During either Phase 1 or Phase 2, or even after a strategy has been adopted, policies may need to be adapted or clarified. The options presented to decision-makers may include revising impractical or unrealistic policies.

4.2.1 CRITICAL ELEMENTS

Several elements are critical for successful strategy formulation.

- At the highest levels, the Government must commit itself to the process of formulating a water strategy and to water resources management using an integrated approach. This commitment can take various forms - for example, the head of state or senior Government leaders endorse the approach in a declaration or written statement.
- The government should appoint an oversight body - an inter-ministerial steering committee or other high-level authority - to whom the team of experts responsible for strategy formulation should respond,
- The government should recruit a team of national experts to be responsible for the process and content of strategy formulation.
- The expert team determines the partners and the process for strategy formulation and with its oversight body agrees on appropriate terms of reference.

Government commitment should also entail

- the commitment of resources to undertake what could be a long process
- Some external technical assistance and other support may be available, a substantial portion of these resources should be furnished by the country itself.
- that the process will be collaborative, consultative and transparent:
    - Collaborative means generating a sense of partnership among key stakeholders within the country and the invited external support agencies
    - Consultative means fostering debate and discussions among stakeholders on the issues and options that arise in formulating strategies.
    - Transparent means both that the process itself should be articulated and that communication through periodic public reports on progress should be encouraged.

The Oversight Body and the Expert Team

The oversight Body:

- An Inter-ministerial committee is a desirable oversight body
- Too often, the work of developing water resources plans has been left to one ministry without the genuine participation of other areas of government.
- What matters is not so much the structure, as that strategy formulation has a genuinely inter-sectorial, multidisciplinary approach that can be implemented successfully.
- Responsibility for final selection among the options presented and for oversight of strategy formulation should be made explicit at the beginning of the process.
- The budget for strategy formulation should be designated in general terms before to choosing a team of experts. Government can make estimates, but the final budget will probably not be ready and committed until the team has agreed with its oversight body on the work to be done.

The expert team:

- The size will vary according to the terms of reference, which will depend on the size of the area to be studied, the complexity of the water resources issues to be addressed, and the quality and level of the existing knowledge.
- Members of the expert team should be chosen primarily for their expertise, professional competence and ability to appreciate cross-sectorial water issues. The members should be drawn from a variety of institutions that may include government, public and private agencies, academic institutions, professional associations and NGOs, including user groups. It may include members of the public, foreign technical experts and other interested parties.

Depending on the political structure of the country, the inter-ministerial committee may wish to keep the parliament or legislative body well-informed of the progress with strategy formulation, particularly if funding or governmental issues are at stake.

Determining the partners and the process:

<u>Preparing Terms of Reference:</u>

Terms of reference for the national expert team should be prepared before beginning the water resources assessment that constitutes Phase 1.

- The supervisory body or inter-ministerial committee will probably have a general idea of the work to be done, even before the expert team is selected;

- The final terms, however, should be prepared in consultation with the team members after they have had the opportunity to suggest the scope and process of the work and to determine the resources they will require.

Partners:

- The expert team should determine the partners and resources it will need and the process it will follow.
- Partners who will be involved directly in the process include government departments, consulting firms, university faculties and professional associations.
- The expert team will avoid charges of bias in the process of choosing partners. On the other hand, the choice of water resources expertise may be limited. Some guidance on these items will doubtless come from the expert team's oversight body. Tasks in this area include:
    - identifying partners,
    - identifying and meeting stakeholders,
    - defining stakeholder roles.
    - determining the work management structure, and
    - agreeing on and communicating work and consultation procedures and a work programme.

Determining the work management structure involves defining the tasks, structure and schedules to be followed in the process. There are many guidelines upon which the team can draw to define their tasks (Tiffen, 1991; (WMO, 1992); (ESCAP, 1989); (Unesco, 1987). The expert team may wish to form ad hoc or standing groups to cover various specific issues, and should be able to draw on necessary expertise or resources within the government or elsewhere. Key areas to be considered in the formulation of are:

- institutional and human resources arrangements;
- stakeholder participation;
- information systems;
- economic aspects;
- environment and health; and
- International arrangements.

4.2.2 PHASE I WATER RESOURCES ASSESSMENT

The water resources assessment (Phase 1) is an examination of the physical aspects and wide variety of factors that influence the development and utilization of water resources. It is the same assessment done in policy review, but it will involve greater levels of detail about

- the stated policies
- existing and on-going developments,
- preparation of an inventory of water resources and water use.
- administrative, institutional and legal factors outlined above.
- Incorporation of the stakeholder viewpoints that should form a major part of the feedback on the effectiveness of policy and of the stated objectives in national water management.
- Understanding of the natural environmental systems yielding water. Ideally, this understanding improves continuously over time as monitoring and analysis continues, driving policy changes and models of water utilization.
- monitoring and analysis procedures. The decline in monitoring and analysis in many cases, due to budget and capacity constraints, leads to water resources issues disappear from the political agenda and policy innovation stagnates, as the planning process breaks down.

- intenational considerations: resource assessments should be made on the basis of a whole river basin or drainage area, it may be appropriate for several countries to undertake a joint water resources assessment.

Review of policy goals: This was discussed earlier.

Preparing an inventory;

Most water resources developments are long term, extending over 20 to 40 years or more, and transitions occur slowly. A detailed appreciation of the existing water resources management system, including the manner in which organizations function and the standards of service provided to the users, will help the expert team to understand the main issues and the paths and time any changes will take. This involves collecting information and experience in five key areas:

- water-related data;
    - data on the actual physical resource (its location, quantity and quality)
    - the availability and quality of data on water supply and demand from hydrological, meteorological and water quality data, for each major river basin. Far from merely generating a physical description of the resources or a checklist of
    - examine how data are collected, stored, disseminated, analysed and used. Among institutional arrangements, the expert team will probably wish
    - Lists of the major water-related issues are prepared
    - Highlight major issues to be addressed and any gaps in existing information
- institutions and human resources;
    - review existing laws and regulations
    - review and the organizational arrangements for implementing them: identify those institutions (or the lack of them) responsible for resources planning, pollution enforcement or O&M of irrigation systems
    - determine if the organizations that exist can implement policies, whether they are public or private, or how they function
- the economics of water;
    - how water and its delivery is priced,
    - the quality of demand forecasts
    - the analytical techniques used in pricing and economic analysis.
- the environment and health aspects;
    - Inventory of the state of major drainage areas and sensitive ecosystems,
    - incidence of waterborne diseases
- international water affairs.
    - catalogue and evaluate international treaties and arrangements.

Selecting, analyzing and ranking issues

Phase 1 concludes with selection and analysis of the major issues to be addressed in the water sector.

- analysis should refine them at the
    - local (basin) level
    - national or international levels: in the case of international waters, it would be useful to identify priorities to be handled at the country level, and those that would require dialogue with other countries.

- Selection of key issues is crucial if strategy formulation is to remain a manageable activity. Major issues may need to be addressed in different *time frames*:

- Short term: issues to be addressed quickly, before they become catastrophes: construction of dams or flood protection, dam safety, over-pumping of groundwater, resettlement practices or dangerous pollutant levels in drinking water.
- Medium and long term: quantitative and qualitative projections for
  - the demand and supply of water; (and its dynamic nature)
  - other services in the water sector.
  - Hydrological and meteorological factors,
  - population and economic growth,
  - urban development,
  - diversified agriculture,
  - Water pricing policies,
  - environmental allocation,
  - changes in technologies and
  - improved demand management

Indicative projections are normally sufficient to identify trends in water use and supply, and may highlight issues or help to rank them in order of importance. It is important that the expert team set limits on the amount or complexity of the projections. Qualitative or descriptive forecasts should be made to cover basic views of what the future will be like, or how it will be affected by impending socio-political developments. Sensitivity analysis can be a useful tool in attaching quantitative values to qualitative changes affecting water resources management.

- Issues that will jeopardize sustainable development and may cause substantial damage to the environment. These include
  - groundwater contamination by pollutants or saline intrusion;
  - soil salinization; erosion; and
  - spread of waterborne diseases.

- ranking key issues in order of importance: will help the expert team focus on developing a variety of options that may cover several issues at once.

For example, if pumping more groundwater is the best solution, the expert team should consider who should develop the resource, who should regulate, and whether adequate environmental safeguards are in place. In short, the institutional and human resources options are necessary adjuncts to any technical or physical options.

4.2.3 AN INTERIM STAGE

Review

It is useful to review the process at this point. If there are gaps in data or serious conflicts among stakeholders, remedial action may be necessary before moving on to selection of strategic options.

Conducting Review Workshops

At the end of Phase 1 , a series of workshops could be organized to evaluate the outcome of the assessment, to review progress and to plan the next steps. Participants could include the country's decision-makers, key stakeholders, members of the expert team, and representatives of external support agencies. In cases where the country is ready to proceed with the second phase, specific terms of reference could be agreed at the workshop.

4.2.4 PHASE 2 STRATEGY FORMULATION

The expert team develops and evaluates alternative courses of action and presents recommendations to decision-makers. The actions chosen constitute the water resources management strategy.

Developing options

In developing and analysing options and in making recommendations, the expert team must strike a balance between the ideal and practical forms of water resources management for a country. Without becoming overly concerned with political ramifications, the expert team should nonetheless be acutely aware of the feasibility of recommendations.

The expert team should have in Phase 1 identified the major water resources issues or problems and ranked on the basis of physical, institutional and human resources options.

Evaluating options

Feasible options should be compared

- technical, (broad technical arrangements needed to meet physical development of water resources, cost, the quality of .service that could be provided)
- sociological institutional and human resources arrangements, (acceptability to water resources stakeholders, potential for involving water users, NGOs, professional and trade associations, private-sector service providers and local governments, minimizing the need for complex inter-agency coordination, requirements for, and alternative means for attaining, capacity-building in institutions and enhancing skills for water-sector management)
- environmental (various means of matching supply and demand, and of satisfying environmental concerns)
- environmental and health protection measures, in particular regulations concerning the monitoring and management of surface waters and groundwater, pollution control in all water subsectors, and incentives for wastewater re-use.
- cultural, ideological and legal issues. (use of enforceable regulations or revision of inadequate ones);
- necessary inputs to achieving a strategy, their availability and the likely outcomes and consequences of a particular strategy.
- economic: (analysis of the costs and benefits of each alternative, and reduction of the load on the public sector, broad economic efficiency of each option and an indication of its multisectorial effects)
- demand management possibilities, including the use of
    - (a) pricing and non-pricing instruments,
    - (b) appropriate technologies for water delivery, conservation, re-use, and pollution control, and
    - (c) innovative educational means of motivating present and future users of water to monitor consumption and conserve water
- the extent to which options respond to original policy objectives
- careful consideration and mention of the risks involved. (Eg. formalizing water use rights and legalizing water trading may raise the potential for monopolization of water supplies and may exacerbate inequitable access in rural areas. Some measures might be suggested to lessen such risks, whereas others may be an 'accepted' consequence of necessary change).
- present the draft strategy to stakeholders, gaugethe response and incorporate suitable modifications and alternatives
- discard unrealistic or unmanageable policies.

Recommendations

On the basis of evaluations and with due consideration of political and economic realities, the expert team will provide a list of recommendations. The inter-ministerial committee (or another authority empowered to do so) will eventually choose among the options presented.

These choices will constitute the strategy, which should include the nomination of the body which will oversee its implementation.

Selection of options

It will probably take some time for a government to make choices and allocate resources to implement the strategy. Debate in the legislature or discussion among executive departments will no doubt prove a lengthy but necessary process.

Water resources strategy assistance

Individual country governments or their agencies may wish to seek external support in developing a strategy for water resources management. Technical expertise may be required at a variety of levels and across sectors, but it is desirable that any outside support be primarily focused on assisting the host country to develop or reinforce its internal planning and management capability.

4.3 DEFINING AN ACTION PROGRAMME AND IMPLEMENTATION SCHEDULE

This final step should be taken once it is clear what the strategy is. However, it is difficult to measure the impact of broad-based policies, especially if the strategy and resulting programmes and projects are not implemented as proposed due to changing needs and priorities.

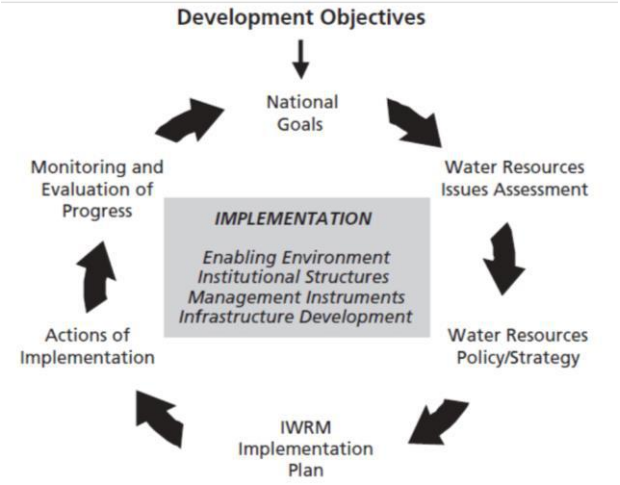


Figure 4-2 Stages in IWRM planning and implementation

Continuous monitoring is clearly an essential part of the ongoing, dynamic process of strategic planning.

Environmental impact assessment (EIA) is an increasingly important area of monitoring, which may result in substantial modifications to policy and strategy if unforeseen outcomes emerge.

Effective routine monitoring and information management allows more of a preventive as opposed to a reactive process, allowing earlier and less costly correction of problems.

A preventive and more flexible approach will also facilitate acceptance and approval of the proposed action programme.

No matter how well conceived the action programme may be, negative impacts might arise through interaction between water policy and other national policies; similarly it is conceivable that policies in the various sectors may be in conflict with each other politically, financially and instrumentally. An example of the interaction between a policy monitoring plan and an EIA is shown below, in the figure.

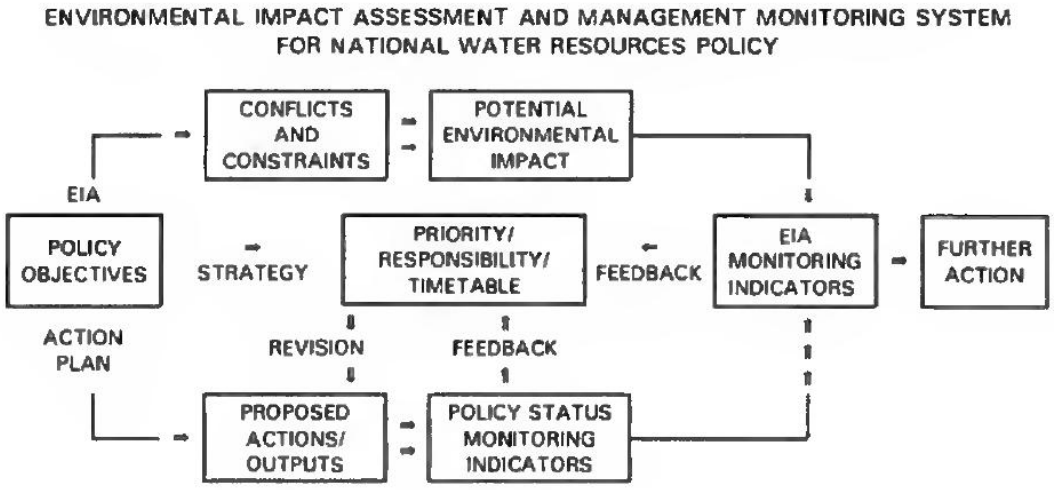


Figure 4-3 Diagrammatic interaction between a policy monitoring plan and EIA

4.4 INTEGRATED WATER RESOURCES MANAGEMENT

(Hassing et al, 2009)

The emergence of the concept is one of the results of a search for a new water management paradigm.

IWRM is an empirical concept which was built up from the on-the-ground experience of practitioners. Although many parts of the concept have been around for several decades – in fact since the first global water conference in Mar del Plata in 1977 – it was not until after Agenda 21 and the World Summit on Sustainable Development (WSSD) in 1992 in Rio that the concept was made the object of extensive discussions as to what it means in practice. The concept has been adopted widely by water managers, decision-makers and politicians around the world.

The Global Water Partnership's definition of IWRM is widely accepted. It states:

'IWRM is a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.'

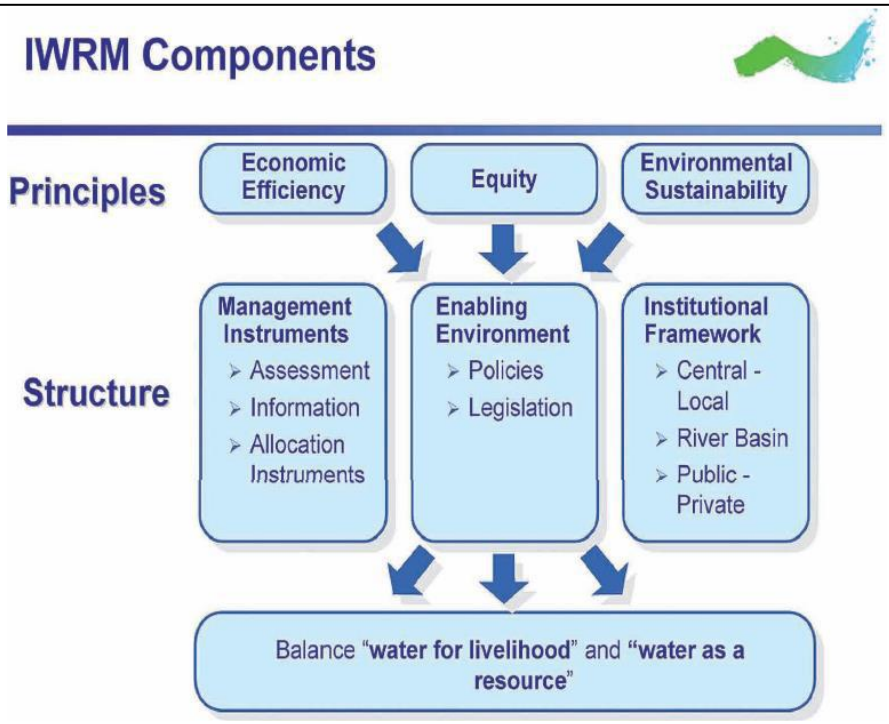


Figure 4-4 The three pillars of IWRM: an enabling environment, an institutional framework

Implementing an IWRM process is a question of getting the 'three pillars' right (see Figure 4.4):
1. moving towards an enabling environment of appropriate policies, strategies and legislation for sustainable water resources development and management
2. putting in place the institutional framework through which the policies, strategies and legislation can be implemented
3. setting up the management instruments required by these institutions to do their job

IWRM is thus not a scientific theory that needs to be proved or disproved by scholars. Rather it is a set of common-sense suggestions as to what makes up important management aspects. IWRM has proved to be a flexible approach to water management that can adapt to diverse local and national contexts.

It requires policy-makers to make judgments about which set of suggestions, reform measures, management tools, and institutional arrangements are most appropriate in a particular cultural, social, political, economic or environmental context.

One of the great strengths of IWRM is that it has given the water community a common language that's applicable over a wide range of levels from the local to the national and regional. This allows knowledge and lessons-learned to be exchanged across borders, across regions and at a local level, and makes it possible for decision-makers and managers to agree on and monitor policies and targets for the improvement of water resources management.

5 FORMULATION OF A STRATEGY

The framework presented in (FAO,1995), contains more details about the elements to be considered in the formulation of a water sector strategy. They are described in more detail in the guidelines (FAO,1995), and here they are jut listed:

5.1 THE ELEMENTS

1. A HOLISTIC APPROACH: Integrated water resources management.
2. CATEGORIES OF ACTIONS:
3. PLANNING AND ANALYSIS
    a. Methodologies and tools for water policy analysis
    b. Data requirements
    c. Obtaining the information
4. MODELLING
5. LEGAL AND INSTITUTIONAL REFORMS
    a. Legal reform
    b. Reorganizing the water sector
    c. Participation: NGOs and WUAs
6. ECONOMIC MEASURES
    a. Macro-micro links
    b. Creating incentives
7. TECHNOLOGY
8. PROJECTS AND SPENDING PROGRAMMES
    a. Projects and policies
    b. Environmental assessment

5.2 INSTITUTIONAL AND HUMAN RESOURCES ISSUES

1. ASSESSMENT AND INSTITUTIONAL ANALYSIS
2. WATER RIGHTS AND LEGISLATION
3. REGULATIONS, ADMINISTRATION AND ENFORCEMENT
4. ORGANIZATIONAL ARRANGEMENTS
    a. Community organizations
    b. Professional associations
5. HUMAN RESOURCES DEVELOPMENT

5.3 STAKEHOLDER PARTICIPATION

1. DEFINITION AND BENEFITS OF STAKEHOLDER PARTICIPATION
2. LEVELS AND TECHNIQUES OF PARTICIPATION
3. STAKEHOLDER PARTICIPATION DURING STRATEGY FORMULATION

5.4 INFORMATION SYSTEMS

1. JUSTIFICATION AND RATIONALE
2. ELEMENTS OF A WATER RESOURCES MANAGEMENT INFORMATION SYSTEM
    a. Data types
    b. Obtaining information
3. IMPROVING WATER RESOURCES INFORMATION SYSTEMS

4. THE EFFECT OF TECHNOLOGY ON INSTITUTIONS

5.5 THE ROLE OF ECONOMICS

1. INTRODUCTION
2. APPLYING ECONOMIC CONCEPTS IN STRATEGY FORMULATION
    a. Characteristics of water
    b. Economic efficiency and the value of water
    c. Opportunity cost and pricing
    d. Other economic incentives
    e. Economic analysis of alternative courses of action and investments
    f. The economic value of water
    g. Cost estimation
3. COST RECOVERY
4. ECONOMIC ASSESSMENT OF PROJECTS AND PROGRAMMES

5.6 ENVIRONMENTAL AND HEALTH CONSIDERATIONS

1. INTRODUCTION
2. PUBLIC HEALTH AND WATER RESOURCES
3. HEALTH AND ENVIRONMENTAL ISSUES IN ASSESSMENT OF WATER RESOURCES
    a. Surface water
    b. Sensitive ecosystems
    c. Effects on public health
    d. Groundwater
    e. Priority environmental issues
4. WATER RESOURCES ASSESSMENT- ENVIRONMENTAL INSTITUTIONS
    a. Legislation
    b. Priority institutional issues
    c. Environmental impact assessment
    d. Coordination

5.7 INTERNATIONAL ISSUES

1. INTRODUCTION
2. INTERNATIONAL ASPECTS OF WATER RESOURCES STRATEGY
3. INTERNATIONAL WATER LAW
4. OBJECTIVES OF COLLABORATION
5. ACCESSING THE DATA BASE
6. WATER SHARING AND ALLOCATION
7. INTERNATIONAL RIVER BASIN ORGANIZATIONS

Training Material prepared by
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