Water, Households & Rural Livelihoods

Research promoting access of the poor to sustainable water supplies for domestic and productive uses in areas of water scarcity

Water Supply and Sanitation & Integrated Water Resources Management: why seek better integration?

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1 INTRODUCTION

This working paper was prepared as a contribution to a joint Indian, South African and UK research project on Water, Households and Rural Livelihoods (WHIRL). The objectives of the paper are to identify approaches to improve access of the poor to secure, safe and sustainable water supplies in areas of water scarcity, and to identify some of the key challenges to the more effective management of water resources in these areas. It is targeted at organisations responsible for the delivery of water supply and sanitation (WSS) services and management of land and water resources in developing countries. It aims to promote discussion and dialogue between the research partners and these organisations.

The paper is produced at a time of major changes to approaches to the management of water resources in general and the delivery of WSS services in particular, throughout the developing world. The limitations of traditional approaches based on supply provision have been recognised in many places, and the principles of integrated water resources management developed (IWRM). These trends are reflected in both international debates (such as those at World Water Forum in The Hague in 2000), individual national policy developments (such as the 1999 National Drinking Water Guidelines in India) and donor assessments (including the 2001 DFID Strategy Paper on Water in Crisis). It is easier to identify the failings of past approaches, however, than to specify new directions forward. Indeed, there are concerns (vocalised at both The Hague and a multi-donor workshop at Wageningen in October 2000) that the IWRM approach was too complex to be readily understood or implemented, and as such was potentially disabling in terms of providing a basis for effective change. There is also a feeling that the approach is not suited for addressing real, urgent needs and priorities, of which WSS is almost invariably one. Finally, the need to relate this or any resource-based approach to a human development paradigm is of paramount importance and a major challenge. The emergence of livelihoods-based approaches is a good example. Both IWRM and livelihoods are exciting but challenging approaches that need to go beyond abstract principle and develop as concrete realities. This paper is intended as a contribution to discussion on how to meet this need.

The paper initially examines the role of water supply and sanitation in livelihoods, and the importance of addressing WSS in poverty-focused programmes. It then examines the potential for integrated resource management approaches such as Integrated Water Resources Management, Integrated Catchment Management (ICM) and Participatory Watershed Development (PWD) to improve the real availability to poor people of the vital goods and services that water resources provide.

2 LIVELIHOODS AND THE ROLE OF DOMESTIC WATER SUPPLIES

Poverty-focused development projects or programmes cannot continue to ignore WSS in areas with inadequate water supplies and sanitation provision. Time and again, participatory assessments of needs amongst poor people have identified WSS as a key priority, regardless of the prevailing environmental conditions. It is typically ***the*** key priority in situations where resources are scarce, supplies irregular and/or water quality is poor. The poor themselves are usually acutely aware of the impact of poor WSS on their health and general well-being, whilst women in particular suffer the burden of fetching water and managing with inadequate

supplies. Poor people also often pay higher prices for water in locations with poor services e.g. to water vendors.

Domestic water supplies and environmental sanitation contribute to livelihoods in a wide range of ways. They have important roles in promoting food security, health and household maintenance, and water-based livelihoods and livelihood diversification, and the management of WSS systems has important effects on ecosystems that support livelihoods (see Table 1).

Table 1. Role of domestic water supplies and environmental sanitation to livelihoods

Contributions to livelihoods	Example
Food security	Use of domestic water and wastewater in rural homestead and urban agriculture e.g. gardens, stall-fed livestock.
Health and household maintenance	Use of water for drinking, cooking, bathing, washing etc. effects health, productivity and workload (especially women)
Water based livelihoods and livelihood diversification	Use of water for agriculture (see above) and non-agriculture commercial activities e.g. construction, small-scale (often informal or unplanned) industries e.g. by potters, weavers, tanners.
Ecosystems maintenance	Sanitation facilities reduce the impact of waste disposal on water-bodies (e.g. through eutrophication) that support livelihoods e.g. fisherfolk

Note: Categorisation based upon Soussan (1998)

As well as consumptive uses such as drinking, washing and cooking, the livelihood contribution of productive activities dependent upon domestic water supplies in dry areas is now increasingly being recognised (see Box 1). The amount of water available to support these activities is a key constraint to improving income levels. The quantity of domestic water used is also now understood to be as or more important than improving water quality in order to reduce the transmission of disease (WELL, 1998).

But maintaining supplies at current levels, let alone providing additional per capita supplies in both rural and urban areas to improve health and support the productive activities of the poor, is a major challenge for the WSS sector. The sector has traditionally focused on meeting design norms, often equated to basic needs (typically 25-40 litres per person per day). But the actual use to which domestic water supplies are put often bare little comparison to design assumptions (which are based on normative assumptions about domestic consumption only and do not recognise the wide range of other functions that domestic water supplies provide). The livelihood contributions associated with these actual or potential uses need to be much better understood, and directly addressed in the development of WSS systems.

Similarly, past efforts have concentrated almost exclusively on physical supply or, in more recent years, supply with an added component of health and hygiene education. Little attention has been paid to several other vital issues:

- The **operation and maintenance** of supply systems, with many government-provided

schemes in particular failing after a short time because of poor operation and a lack of effective maintenance.

- The **sustainability** of water supplies, and how this relates to the wider pattern of water resource uses. In particular, there is increasing evidence of conflict between domestic supplies and irrigation where groundwater is the main source of supply. This is even true in places such as Bangladesh, and is reaching crisis proportions in arid parts of India and elsewhere.
- Social capital and differentiation within communities, cultural norms and taboos and other aspects of the **social relations** of WSS and how these relate to access to water supply and sanitation facilities in many rural communities.
- The **institutional context** of both supply provision and operation and maintenance in rural areas. This is true within communities (especially in relation to the O&M of communal supply systems), in relation to the links between local communities and external institutions (government departments, NGOs, etc) and in terms of the relations between different external institutions (inter-agency links in government, government-NGO relations, etc).
- The **economics** of WSS. The Dublin Principles established the concept of water as an economic good, but it is also seen as a basic human need (and even a right in some quarters). Examples of sustainable cost recovery in government or donor schemes are few and far between (though effective private sector provision is found in many places) and the basic economics of WSS, in terms of their full economic value, are very poorly understood (see Box 1).

Box 1. Economic benefits from domestic water supplies

New income-generating activities are often open to people with a small marginal increase in water availability, and can contribute to enabling people to move out of poverty. The importance of domestic water supplies for a range of productive activities such as vegetable gardens, watering livestock and other small-scale economic activities is now increasingly being recognised:

- In South Africa, AWARD found that income from economic activities dependent upon domestic water supplies, especially construction, was 78% greater in well-supplied villages with total actual water consumption averaging 62 l/c/d, than in poorly-supplied villages (actual water consumption 44 l/c/d)
- In Zimbabwe, collector wells constructed to exploit the basement aquifers and providing sufficient water for both domestic purposes and community gardens, have been shown to rapidly generate a stream of financial and economic benefits. These are re-invested promoting diversification into other income-generating activities ranging from small livestock or fruit tree schemes through to pottery, knitting and buying and selling clothes, as well as purchase of inputs for dryland cropping (Waughray *et al*., 1998)

Of course these benefits need to be compared with the costs of supply, especially of treated water, and the marginal returns to water when used for other purposes e.g. irrigation upstream.

3 WHY DO WATER SUPPLY SYSTEMS FAIL?

Despite massive investment, and impressive improvements in ‘coverage’, large numbers of people still don’t have access to adequate water supplies. Sanitation provision is even worse.

Many systems that exist are also not functioning adequately or at all due to broken pumps and other factors. As a result people are often stuck with systems that provide intermittent supplies (e.g. a couple of hours per day), shortages during dry seasons and drought, and rely upon costly supplies from water vendors during periods of scarcity.

There are many causes of persisting water supply system failures. Some of the most important are identified in Table 2.

Table 2. Some of the principal causes of water supply system failures

Causes of water shortages	**Examples**
Physical constraints not properly addressed during planning	• poor aquifer with limited storage • arsenic/ fluoride risks • potential competition with other uses, especially irrigation, not addressed
Engineering shortcomings	• reticulation systems that are too expensive to operate and maintain
Institutional/ management failure	• illegal connections to water supply systems and consequent problems in tail-end villages • overexploitation of groundwater under conditions of open access • poor cost recovery leading to lack of investment/maintenance • lack of maintenance e.g. handpumps • poor institutional organisation for the O&M of communal facilities
Corruption	• incentives for some to maintain and profit from water shortages e.g. vendors, tanker operators, kick-backs associated with large engineering contracts
Rising demands	• increasing population • incentives to use water inefficiently especially for irrigation • changing patterns of water use with changes to lifestyles
Social Factors	• Social barriers to access to water supply facilities (e.g. caste, restrictions on women)

Many of these factors are not inevitable, but rather reflect fundamental failings in the details of the design, planning, implementation and subsequent management of facilities. This is true even within the confines of the water supply sector, but these failings are compounded when the process (as is normal), fails to take account of other water management sectors such as irrigation or industrial provision. The picture becomes even more complex but complete if water supply is linked to other aspects of resource management and livelihoods maintenance. As such, there are a number of improvements that could be done within the existing system, but the impact of these would be limited in situations of acute competition and scarcity. More could be done if effective mechanisms for integrating other aspects of water management existed: in other words IWRM. But it is clear that where the pressures are at

their most acute then water supply and water resources management needs to be contextualised in relation to other aspects of the livelihoods of the poor who are the target of WSS enhancement efforts. There are consequently a wide range of factors that explain the failings of many supply schemes. One of these is increasing demands, and competition between sectors for limited water resources. The importance of this is just beginning to be appreciated and it is now understood that addressing water supply provision in isolation from other water uses is unlikely to succeed. This means that the relationship between WSS and other aspects of water resource use is fundamental to the analysis presented in this paper.

4 RELATIONSHIPS BETWEEN WATER RESOURCES AND WSS

The multiple nature of water resources and their uses is reflected in a move away from traditional sector approaches to what has become known as integrated water resources management (IWRM). The interrelationships between these uses and the legal, policy and institutional context within which they take place are represented in Figure 1. This schematic provides a structure in which the use of water for domestic and other purposes can be better understood. If the objective is to enhance the assets available to the poor, then from a water resources perspective we need to better understand the relationship between water resources and their benefits in a catchment, identifying the potential points for intervention. For, example identifying what effects policy changes would have on access to resources, resulting changes in resource utilisation providing increased benefits in the terms of the livelihoods of the poor. This type of 'model' can help in identifying the different types of multi-disciplinary information and possible causal linkages to be investigated and acted on.

The catchment perspective is a vital starting point for analysis, for the relationship between WSS and other aspects of water resources management can only be understood within the dynamic of hydrological processes within catchments. This means, vitally, that water resource issues inevitably transcend the immediate local community (village or equivalent): the scale at which participatory WSS planning typically takes place. Any anthropogenic changes to hydrological processes in any one place has potential impacts to all downstream (and in some instances upstream) users. This catchment perspective is generally recognised as the basis for IWRM (though IWRM and catchment planning are not synonymous), and in particular provides a structure within which the relationship of WSS to the wider hydrological system can be understood.

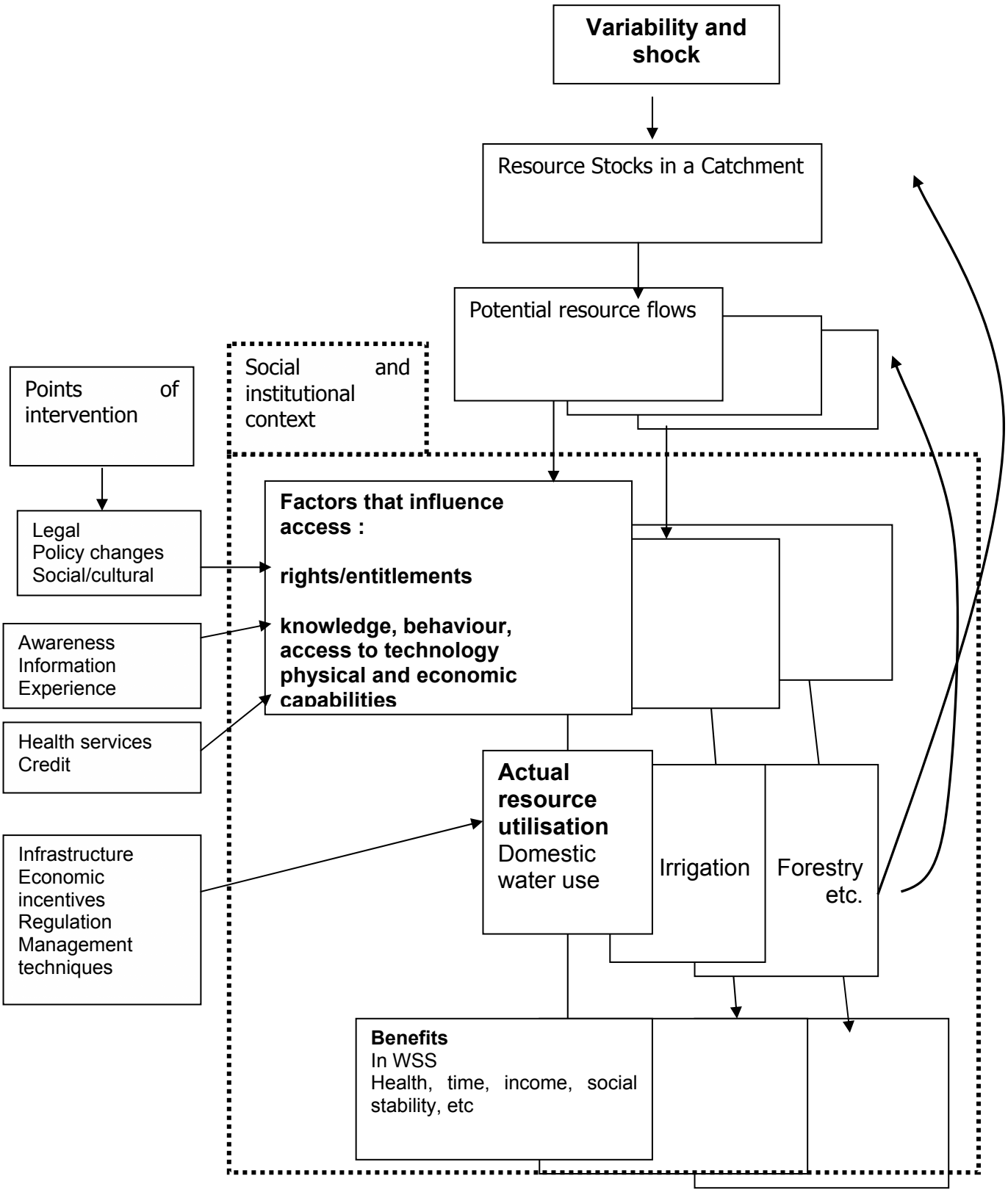
Domestic water demands are commonly assumed to be trivial with respect to the consumption by other sectors in developing countries. At a macro scale, irrigation typically accounts for 80-90% of water use and other uses (industry, power, ecosystems maintenance) are also generally seen as accounting for far larger quantities of water than domestic use. But in areas of relative water scarcity – particularly the more arid regions of the world – even relatively small per capita domestic water demands may account for a large proportion of the available resource in catchments. This is especially the case, when a 'buffer' to provide a reliable year round (or longer) supply in drought prone environments is allowed for. For example, Batchelor *et al.* (2000) show that while domestic water requirements in two rural watersheds in Karnataka, India are a small component of the overall water balance (less than 1% rainfall), they represent a relatively large percentage of groundwater recharge (around 10% at present, rising to 20% over next 30 years). During years of low rainfall and drought, the demand for domestic water represents an even greater share of the available resource. Here, groundwater is the resource upon which most villages depend for domestic water supplies.

4.1 Competition between WSS and other uses

In many areas with strong competition for limited resources – including catchments with large urban population centres, rural areas with high population densities, and areas with high demands for irrigation and other non-domestic water uses - urban and rural water supplies can no longer be improved solely through reliance on the development of new sources and infrastructure. The WSS sector, although typically given priority allocations by policy in most developing countries, is increasingly having to 'fight' for its water resources. This is in part because the sectoral divisions in water resources management mean that non-WSS sectors (irrigation, industry, transport, tourism, others) can safely ignore WSS issues. Given that they are better resourced, and that the constituencies that they represent are often more politically powerful and vocal, there is little evidence that policy declarations over the prioritisation of WSS are followed in practice. A consequence of this is that competition for water from other sectors is significantly reducing the availability or quality of water resources for WSS, and raising the costs of future provision of water services (see Box 2). Pressures on resources in rural areas include the increasing 'footprint' of expanding cities that depend upon water resources from an ever-increasing hinterland and the rapid growth of irrigation (especially dry season irrigation) in many parts of the developing world.

In the future, if present management trends continue, resources to meet rising demands will often have to come from reduced use in other sectors, such as irrigation. In many places, the need for savings may be minimised by demand management measures in the WSS sector, and offset by improvements in efficiency in other sectors (such as more efficient irrigation techniques). This will not happen automatically, however, and in many cases there is a clear need to have active policies (e.g. energy and water pricing) and programmes to improve irrigation efficiency, influence crop combinations, ensure effective and fair allocation mechanisms and so on. In many ways, this is what IWRM is about in these places. However, these types of actions are unlikely to be sufficient in the most pressured situations, and difficult choices will need to be made in the allocations between sectors if domestic water needs at an affordable cost are to be met and income-generation activities at the household level are to continue to prosper. Policy gives domestic water sector priority, but in practice often fails to deliver. Affordable WSS options are increasingly important given that poor consumers are expected to contribute through cost recovery initiatives. There is evidence that even the poorest people are willing to do this if the service delivery is adequate, reliable and of a good quality. The poor are, understandably, reluctant to contribute where these minimum criteria are not met: something that characterises too many government-sponsored (and donors financed) schemes in the past.

Figure 1 Relationships between water resources and their benefits in a catchment



Box 2 Impacts of declining groundwater levels in India

In many Indian villages, drinking water supplies drawn from traditional wells and boreholes have been severely affected over recent decades (especially during the 1990s) by widespread over-abstraction of aquifers for irrigation. Irrigated areas and the amount of groundwater abstracted have increased dramatically, associated with policies to increase food production, subsidies and increased access to loans for farmers to sink wells and purchase pumps, and incentives such as free or cheap electricity. Under effectively open-access regimes, such policies have led to widespread declines in groundwater levels. In response, a shift from traditional large-diameter dug wells for drinking water supply to deeper tubewells has still failed to provide sustainable sources. Many village water supplies now fail routinely during the dry season, and they are increasingly vulnerable to periods of drought. Tankering of supplies is a costly emergency solution, is unpopular with communities and is often wasteful of the scarce water that is available (Soussan et al. 2000).

Increasingly unable to develop local groundwater resources for drinking water supplies, district government and state development agencies have often sought large-scale engineering solutions to harness surface water resources. Many schemes have been driven by engineers, and corrupt decision-making has also played a major role in the choice of technology. Large dams, water treatment works and extensive pipeline networks have been given priority – often each serving hundreds of villages. However many disadvantages associated of this approach have emerged, and often schemes cannot be sustained. Regional piped water supply schemes have suffered from poor and unreliable infrastructure, and as responsibilities are decentralised, even the high operation and maintenance costs cannot be afforded. Local solutions are now increasingly being sought to manage water resources better, and secure sustainable resources for consumptive and productive use at lower costs.

As well as being in practice a finite resource, there is an increasing risk of pollution and decline in the quality of water resources (e.g. the Kathmandu Valley) from industrial sources and poor sanitation. In other settings, water quality risks can come from "natural" sources such as fluoride, arsenic or salinisation (though human management can make these far worse). This also represents a "scarcity" – the scarcity of adequate quality. As such, we can best understand the competition between WSS and other water uses in terms of the scarcity of the services that water resources offer. This approach to competition and scarcity is part of the general move away from seeing water and its management in physical terms and instead assessing it in terms or resource values within an IWRM context. This also provides a better basis for integrating sanitation, so often the Cinderella, into the analysis as it can be assessed as one of the multiple resource values that water resources provide. The multiple nature of water resource values and the multiplicity of water users are fundamental features of any assessment of water resources.

5 THE NEED FOR INTEGRATED SOLUTIONS

The inadequacies of past sectoral analyses have become increasingly apparent, but the development of a strong, coherent and easily-understood alternative analytical framework that reflects the multiple complexities of water resources and uses has lagged behind the

understanding of the problems of past approaches. The issue, discussed above, of IWRM being seen as having to do everything at once in an integrated but over-complex and unimplementable manner is of critical importance here. The principle of integration is generally accepted, as is the idea of catchments as the basis for this integration. What is less apparent is how these principles can be put into practice.

There are several types of integrated approach that may offer useful experience and solutions. These include: integrated water resources management, integrated catchment management and participatory watershed development. Each of the approaches has various advantages and disadvantages relating to effective water resources management and impact on water supply and sanitation. This paper focuses on IWRM.

6 INTEGRATED WATER RESOURCES MANAGEMENT

Against the prevailing background of a sectoral approach that tends to separate WSS development from other important water consuming sectors e.g. irrigation, industry, forestry, dryland agriculture etc., the WSS sector is having to seek integrated solutions to secure limited water resources for domestic needs at affordable cost. In India for example, this has been recognised in changes in state and national-level policy (e.g. RGNDWM, 2000). Integrated water resources management (IWRM) approaches are attractive because they provide a framework to manage competition for limited resources and the potential conflicts and inefficiencies that may arise, providing mechanisms to resolve the trade-offs between different users.

IWRM promotes integration across sectors, applications, groups in society and time and is based upon the Dublin principles agreed in 1992. These recognise the finite and vulnerable nature or water resources, a need for more participatory approaches to development and management, and the economic value of water (see Box 3). Although honourable principles, there are practical limitations and constraints. IWRM has be relevant to the real world, and initiatives should not seek to replace government (i.e. democratic) structures and will be likely to fail if they attempt to do so.

In many ways, IWRM is now the conventional wisdom. This suggests that it should be easy to define the direction of future approaches and programmes for water. But it is not that simple. Three problems are emerging that have the potential to deflect attention from the whole approach:

1. IWRM is increasingly seen as being **too complicated**, as a demand that a whole list of individually challenging challenges are all met before anything can be done.
2. There are **different visions** on exactly what IWRM means. Although there are many shades of grey, two basic approaches can be set out:
   - IWRM as an **expert control system**, in which all (or at least all "important") aspects of water resources supply and use are integrated into a centralised planning system (often under the control of one 'super-agency').
   - IWRM as a **way of thinking**, where no attempt is made to control all aspects of water management through one system, but rather the challenge is seen as helping many different water managers to understand and take account of the wider implications of their actions.
3. IWRM is seen as too **long-term** and not capable of addressing real and immediate needs, whilst governments and water managers are faced with a whole host of these immediate

and tangible problems for which practical solutions need to be found, and found quickly.

These are real issues that cannot be ignored. There is no point in putting up theoretically excellent solutions if they are not going to be implemented. This presents a challenge that this note is intended to start to address: Can we identify ways forward that are simple and practical, that meet immediate needs and priorities and that also contribute to a longer-term, more comprehensive approach to the sector as a whole?

In other words, we need a **twin track approach** that links together a programme of individual activities to create a greater whole. This approach should be based on some simple ground rules:

IWRM is a way of thinking, an orientation, which gives a context in which individual activities can be understood and planned to create both immediate benefits and longer-term change.

A key is that this orientation, this way of thinking is a **shared one**, with all key actors understanding and 'owning' the approach and able to communicate with each other. IWRM is more about the integration of ideas, beliefs and commitments than it is about the integration of data or technical approaches. The latter are a means to an end; the former ***are*** the end. This integration of thinking will not happen spontaneously. It will need to be carefully supported and forums for creating dialogue and consensus are an essential activity that external support, such as that of the Netherlands, can greatly facilitate.

This should be reflected **institutionally**: IWRM is not about integrating institutions responsible for water into some sort of vast controlling bureaucracy. Rather, it is about the **harmonisation** of the approaches and understanding of the multitude of different resource managers. This is a matter of persuasion and information, so that different actors see that it is to their long-term benefit, as well as the wider social good, to modify their management of water resources.

We must not expect any and all individual projects or other activities to do everything at once. The best projects are simple ones. The tendency to design projects that are meant to be about the construction of sophisticated infrastructure *and* participatory mobilisation of many thousand of dispersed actors *and* institutional reform *and* revenue collection *and*... is inherently self-defeating (the more so given the very short time periods available and the extent to which each change depends on the others). Such multiple goals and processes are the remit of sector-wide programmes, not individual projects.

There is consequently a need to develop a **strategic (or sectoral) approach**, based on an overall strategy in which different components can be simple and practical, but also contribute to the overall process of change. The starting point for this is usually national policy in any one country, and these are increasingly common and increasingly sophisticated. On their own, however, policies are not enough however good they are. They need to be translated into effective action, and it is this step after policy that is often the missing link. Where this is the case, it should be focal point of Netherlands (and other donor) support.

In this, there is a need to carefully define who does what: to ensure that there is effective decision-making at the appropriate level and that they have the authority, information and resources to take decisions at each level (in other words, subsidiarity). A key to this is often

to move from centralised government agencies that retain jurisdictional control that they are unable to exercise but at the same time that restrict the choices open to others.

Many water resources problems reflect limited knowledge, and especially a lack of understanding of the needs and the impact of actions of one group of resource managers (e.g. irrigators) on other interests (e.g. drinking water supplies). *But* creating this sort of understanding cannot be dependent on conclusive scientific proof based on comprehensive data analysis, as this is just too often not a practical proposition. Awareness-raising should be based on a minimum of the right information, combined with active dialogues between the different interests to establish the best possible consensus.

Where dialogue cannot create a consensus to modify potential damage, then some sort of **conflict mitigation** can be needed. This must be based on transparent and legitimate mechanisms and is linked to the wider governance environment.

7 IWRM: HOW IN PRACTICE TO ADOPT THESE PRINCIPLES?

Policy, legislative and institutional reform: there are a number of examples from around the world where governments are attempting to adopt IWRM through, in the first instance, reforms to the laws and policies that define the basic character of water resources management and to government (and at times other) institutions that are the means through which these policies and laws are put into practice. For instance, South Africa has recently adopted a new National Water Act based upon IWRM principles and is in the process of establishing new institutions at the catchment level to manage water resources.

Similarly, Bangladesh has embarked on a major process of reform that is intended to change the main thrust of water resources management from an engineering approach focused almost exclusively on flood control based in one central government agency (the Bangladesh Water Development Board, BWDB). This is reflected in the 1999 National Water Policy, the main approach enshrined in the on-going National Water Management Plan, the types of project (especially donor-supported projects) that are now starting and a major programme of institutional reform to downsize and reorientate the BWDB and to create new capacities for water management in institutions at both central and local levels. Although there are some limitations to the scope of change so far achieved, issues such as environmental impact assessment and participation are now fully integrated into the procedures for water management in Bangladesh.

India has also seen the recent introduction of a number of changes to water resources policies and management approaches through central government initiatives. These include seeking to link rural water supply with watershed development programmes.

An integral part of these changing approaches is the idea that WSS should be more fully integrated into core water resources management processes (it has often been separated out to a health-based institutional home). There are consequently real opportunities in many countries to relate new initiatives to on-going changes in thinking, laws and policies. To realise these opportunities, however, will require a careful process that demonstrated that principles of integration can be turned into practice.

Trends that should encourage the adoption of IWRM principles in WSS delivery at different scales, and integration of WSS within even broader watershed development and integrated

catchment management (ICM) initiatives that seek to promote sustainable livelihoods, and emphasise the integrated management of land and water resources (ICM) include:

1. identification of WSS as an ideal entry point for ICM/Watershed development projects where inadequate water supplies and limited sanitation are amongst the key problems faced by poorer communities,
2. the opportunities provided by watershed development and livelihoods projects through community and institutional development activities that may be exploited to address WSS needs and maximise development impacts, and
3. recognition of the importance of land-water linkages, for example the role of soil and water conservation measures in groundwater recharge, surface-groundwater interactions, and the importance of rural-urban linkages.

Water supply and sanitation have traditionally not been addressed in watershed development programmes in India, as guidelines did not promote such activities. These projects typically bundle together a wide range of development activities such as soil and water conservation, soil fertility improvement, silviculture, micro-credit etc working on a micro-watershed basis. The more successful programmes have tended to be implemented by NGOs with considerable investments in community development structures e.g. self-help groups. There are serious attempts, however, to develop such approaches in state institutions, often through partnerships with NGOs as the key on-the-ground implementation agencies.

Where there is demand for improved WSS, such projects - provided they have sufficient flexibility - have been able to develop WSS (e.g. new boreholes, pumps etc) or act as a facilitator in mobilising communities to access resources from other agencies e.g. local government or line ministries with responsibility for WSS. There is considerable potential for participatory watershed development projects to adopt IWRM principles and implement innovative solutions to promote sustainable water management.

Where integrated catchment management (ICM) initiatives are seeking to improve management of water resources for all users, this may be considered to be unfair or irrelevant when large sections of the population have inadequate access to WSS for their basic requirements. A good example is the Save the Sand project in Northern Province, South Africa where development of community water supplies has been integrated with programmes focusing on environmental improvement. Water supply and sanitation may often be an appropriate entry point for area-based management initiatives, such as ICM and watershed development projects, as it can respond to a major need, and provide immediate benefits thus promoting mobilisation of communities for other development activities. In this case, integration of WSS may potentially be a means to end, to address other pressing development or environmental issues, as well as socially and politically expedient.

8 ALLOCATING WATER FOR WSS

In most countries, water resources policy gives formal priority to the water supply sector over other water users (e.g. industrial, irrigation, navigation). However, in practice, these priorities rarely guide actions and mechanisms to ensure domestic water needs are met are often weak or do not exist. The reasons for this are manifold, but perhaps the most important are institutional structures that fragment water management and, in many cases, marginalise WSS along with the economic and political power of other uses (especially agriculture and, in some cases, industry) that means they are able to lobby political systems and fragmented

institutions to effectively ensure that their needs are met first. There are a number of other factors that may also help to explain the failure to put policy into practice. These include corruption, lack of awareness, myths/misconceptions, rapid change, and poor data. In India for example, traditional institutions for management of tank-irrigation systems which also provide domestic water resources in many instances have weakened, and groundwater has effectively become an open-access resource with little implementation of groundwater legislation to control over-abstraction.

There are four main approaches to water allocation (Dinar *et al.*, undated):

1. Marginal cost pricing
2. Public (adminstrative) water allocation
3. Water markets
4. User based allocations

How can these mechanisms be employed to secure water resources for domestic water supply? Each approach has its advantages and disadvantages, and in practice, they are often mixed. In some developing countries, sufficient financial resources and institutional capacity may enable public water allocation systems to be established or improved, based upon administrative regulation and enforcement (e.g. South Africa). In such cases, it is essential that the state demonstrates that it can build and, more crucially, operate and maintain effective infrastructure systems if they are to form the basis for long-term WSS provision. There are many, all too many, examples where this has patently not been the case.

Elsewhere, economic mechanisms based on the development of water markets and/or marginal cost pricing may work, but there would need to be a clear demonstration that the conditions for effective markets exist and that the consumers are willing and able to pay for water at either market rate or on a marginal cost basis. For this, the evidence is mixed. Poor people, and especially the urban poor, can and often do pay for water (typically at much higher rates than their more affluent neighbours), but the success rate of programmes attempting to introduce water pricing is extremely low.

There are many cases where user based allocation systems may be more appropriate. In particular, the case for WSS where local communities have a major say, at a minimum, in their development and a high level of control over their operation is extremely strong. In such cases of community-based WSS provision, responsibility for water allocations will be with the local communities. In such cases, though, it is essential that the local-level institutions operate in a way that represents the interests of all sections of the community. In particular, the needs and interests of socially or economically marginalised groups (and such divisions can be highly structured and entrenched, as in the caste system in India) need to be protected and some form of arbitration system is essential.

9 DEFINING THE KEY CHALLENGES

Moving from development to management of water resources

Attempts to improve WSS provision have traditionally focused on increasing supply based around infrastructure development, but the limitations of such approaches are now widely recognised. Infrastructure is important, indeed essential, but so are effective management systems, accountability to consumers and fair and transparent allocation mechanisms.

Indeed, if all of these are in place, then there is likely to be scope for introducing some of the economic allocation mechanisms discussed above, not least because this will lead to a higher sense of ownership and appreciation of the WSS system and because it offers the prospect for a system that is able to replicate itself in the long term.

It should be recognised that developing such user-based systems will be more difficult and costly, and more time-consuming, to do in the first instance, and that many planners and policy makers have reservations about the real capabilities of local communities to manage WSS systems. Despite these reservations, however, there is an increasing move towards such systems, including through changes to national-level policies in places such as India.

The authors believe that there are major gaps in the methodologies and training available to enable the WSS sub-sectors to embrace appropriate elements of IWRM, and to enable watershed development and ICM projects to tackle WSS appropriately. There is a clear need to raise awareness and counter myths and misconceptions about what will or will not work. Some of the conceptual and practical tools to facilitate integration of WSS and IWRM that are emerging are also not widely accessible and need to be synthesised and more widely disseminated. There is also a clear need to document cases where innovative approaches have worked so that these can provide models of good practice that can further the case for such approaches and provide exemplars for adaptation and adoption elsewhere.

Such approaches need to be based on a strong knowledge base. This should include a better understanding of how to:

- Estimate the status, trends, options for achieving various aims/objectives. Who, where, how? (example of water resource audits from India, see Batchelor *et al.* 2000).
- Determine the value of water uses – economic, social, environmental, political.
- Establish or improve water management mechanisms to address quantity and quality issues associated with competition for a finite resource.

Some of the specific research issues that need to be addressed include:

- *At what scales and management units can IWRM principles best be applied to support WSS?* The catchment provides a sensible hydrological unit to manage surface water resources, but there are mainly drawbacks (Winpenny, 1997). Large river basins may have little relevance to local aquifers, and administrative units may potentially provide for more effective decision-making; not least because many barriers to developing IWRM are institutional rather than hydrological. There is great scope for the use of innovative approaches such as GIS tools to facilitate analysis at different scales, but the capabilities to understand such techniques and to ensure an effective flow of data for them will often need to be developed.

- *How best to promote appropriate participation in WSS and water management at appropriate scales?* A number of recent studies have shown how communities can effectively develop, operate and maintain water supply schemes. But participation in water resources management is complex. There cannot be full participation in water resources management at all levels, and some planning must be based upon top-down decision making albeit based upon better understanding and with improved accountability to users. Key issues include representation, especially gender issues, how to increase awareness and motivation, how to resolve conflicts between different water resource

users and how to promote participation in both the establishment and function of new bodies at the local/district scale. Need to achieve convergence between bottom-up participation and tough decision making at higher levels.

- *How can institutional, political and governance constraints in promoting integrated approaches be overcome?* Institutional capacity at the local/district is under severe strain in many countries. The decentralisation policies found in many places are increasing this, as new responsibilities are assigned with no real transfer of resources or effective power to meet them. Capacity and skills need to be improved. A favourable policy and regulatory framework is also required, promoting integration along the lines of IWRM principles. Politicians have a vital role to play and need to be made more aware of these challenges. The influence of corruption in WSS development and water resources management must also be explicitly recognised and addressed.

- *How can planning be harmonised and streamlined?* Need to harmonise WSS, water resources and catchment planning, and with other development plans. There is a need for M&E that continuously informs the planning process, with this process itself made more transparent and effective.

- *How can the increasing costs of water supply and sanitation developed be minimised through IWRM approaches and sustainability improved?* Is the WSS picking up a disproportionate amount of costs at present? Will catchment management reduce costs? Will supplies be more sustainable? These and other questions on the economic side of water management need to be resolved if effective and sustainable systems are to be developed.

- *How can allocation, entitlements and access issues be addressed by the WSS sector?* The potential for a 'reserve', impacts on costs, small scale economic development, competition and conflict, impacts, intra and inter catchment, need to be better understood. Also need to understand access to irrigation sources for domestic uses, especially during times of water shortage, and how this coping strategy can be supported and strengthened. Effects of negative policies and disincentives. Legal and customary frameworks for rights and entitlements.

- *How can demand management be employed to improve the sustainability of WSS systems?* Are savings in irrigation water likely to benefit WSS and under water circumstances. More efficient irrigation may reduce domestic water supplies dependent upon drainage or seepage from irrigation canals. What can be done to improve the efficiency of operation of WSS: for example, studies in drought-prone area of Gujarat showed system losses of over 70% to be typical (Soussan *et al*., 1999).

- *How to generate, maintain and use knowledge?* The role of information flows, communication, and participation of stakeholders, in determining resource values, understanding scarcity, and how one assesses e.g. generates knowledge. The processes of misinformation and propagation of myths.

- *How can unintended effects of water resources exploitation, watershed development and ICM be predicted and managed?* How can groundwater-surface water interactions be better understood and managed, including the impact of groundwater abstraction on downstream surface water resources and tanks/ reservoirs. Is there a role for participatory

monitoring? How can impacts on ecosystems and aquatic resources (fish, others) of expanding water use be minimised.

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