



PROTECTION OF THE ENVIRONMENT & NATURAL RESOURCES FOR SUSTAINABLE LIVELIHOOD IN INDIA

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ABSTRACT

Ensuring environmental sustainability—the seventh Millennium Development Goal (*Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water*)—requires achieving sustainable development patterns and preserving the productive capacity of natural ecosystems for future generations. Natural resource mismanagement and degradation threaten vital water services—undermining economic growth, human well-being and environmental resilience. With the increasing population, demand for basic needs has been steeply rising during the past five decades in most of the developing countries. Presently, about 25% of the villages do not have assured source of drinking water for about 4-5 months during the year and about 70-75% of the water does not meet the standard prescribed by W.H.O. Poor quality drinking water is adversely affecting the health and diarrhea is an important cause of infant mortality.

This study has considered the potential of developing market-based approaches for watershed protection services at three different levels - micro, meso and macro respectively.

This paper covers practical applications of Sustainable Livelihood (SL) approaches within natural resources management. The papers provide substantial case study material of varied practical experiences, combined with reflection on the emerging findings concerning uses of SL. Some focus on specific types of application of Sustainable Livelihoods (SL) approaches and some on their application to specific sectors (e.g. water).

This paper has three elements. The first identifies the pre-eminence of a health-based view within the water and sanitation sector. This view emphasises the health impacts of improving access to supplies of clean drinking water and better sanitation.

The paper also analyses water in the context of poor households. In doing so it uses the Sustainable Livelihoods (SL) framework as an analytical tool. Combining this theoretical analysis and the experience of water projects by the author, the elements of a SL approach are identified. The end result is anticipated to be greater water security for the poor.

Finally, the paper assesses the operational and theoretical implications of adopting a SL approach, in terms of the following:

- Water should be treated as an asset and a good
- Institutional linkages
- Sequencing and time
- Knowledge environments

On the whole thus, there is a certainly a potential for developing market-based mechanisms and payment systems for watershed protection services in India to complement the existing regulatory and collective action approaches, and to improve the livelihoods of the

poor. However, there is a definite need to undertake more comprehensive research on this subject to address the constraints and knowledge gaps that have been identified during this scoping phase, and these have been listed in the report as future research activities that need to be taking up in the next phase.

I. INTRODUCTION

Ensuring environmental sustainability—the seventh Millennium Development Goal—requires achieving sustainable development patterns and preserving the productive capacity of natural ecosystems for future generations. Both efforts in turn require a variety of policies that reverse environmental damage and improve ecosystem management.

The challenge has two dimensions: addressing natural resource scarcity for the world's poor people and reversing environmental damage resulting from high consumption by rich people. Many environmental problems arise from the production and consumption patterns of non-poor people, particularly in rich countries. Rich countries consume a lot of fossil fuels and deplete many of the world's fisheries, damaging the global environment. They also use a lot of tropical hardwoods and products from endangered species.

To ensure the sustainability of Earth and its resources, including the development prospects of poor countries, these harmful production and consumption patterns must change. Energy systems will have to generate much lower greenhouse gas emissions. Fisheries will have to be managed based on ecological limits rather than heavily subsidized free-for-alls. And international rules of the game will have to mitigate the overconsumption that endangers ecosystems and certain plants and animals. But with smart policies and new technologies, the costs of these changes can be quite low.

Human well-being depends on natural resources and environmental services that help produce food. People rely on soils to grow crops, grasslands to raise livestock and freshwater and oceans to support fisheries. Underlying much of this productivity: genetic resources. Over centuries farmers have generated crucial stocks of knowledge and productivity by breeding livestock and selecting, storing and propagating plant varieties. Diverse genetic resources enable farmers to adapt to environmental change by creating new livestock and plant varieties better suited to new conditions. In periods of scarcity, wild biodiversity is also a source of alternative food products.

Natural resources such as forests and water have historically been taken for granted as limitless 'goods'. However, widespread conversion and degradation of forests and other ecosystems due to overexploitation, is posing a challenge for sustaining the health of ecosystems and the services that flow from them. In the forestry sector, this has led to a shift in focus from 'goods' such as timber to 'services' such as biodiversity conservation, landscape beauty and watershed protection. The time has come to strike a balance between the two. But, while goods are generally freely traded, there are no markets for services. Unless resource managers get real payments for their services, they will not have any incentive to maintain the flow of these services. Can markets be developed for watershed services? Can poor people's livelihoods be improved through such markets? These are some questions that must be debated urgently.

Historically, in India, most traditional resource management systems have been replaced with state controlled *regulatory approaches*. The ownership, management and control of natural resources have been vested almost entirely in the hands of the government. Until recently, the main approach to forest management was that of *departmental policing* of forests, forbidding local communities of access to them in the classical *fences and fortresses* mode. Similarly, in the case of watershed protection and development activities, it was largely government agencies through the line departments of various ministries that undertook watershed treatment work.

The approach was largely again a top down manner of working, with little community participation. The emphasis on technical interventions and on meeting targets of construction and treatment led to poor community mobilization and social organization important for sustaining these interventions. This techno centric, top down

approach towards management achieved little success in halting the rapid degradation of the country's natural resources.

From a regulatory to a participatory approach

In order to remedy the above approach, over the last decade a number of policies and guidelines have facilitated a shift in natural resources management from a *regulatory* to a more community-based *collective action* approach in India. In this new approach, greater control is vested with the local communities over the resources in question, thereby leading to a greater sense of ownership. The forest policy environment today strongly encourages the participation of local communities in forest management, emphasizing collaborative partnerships between the Forest Department and the local people. In the case of watershed development, a set of 'Common Guidelines' were issued in 1994, which called for an integrated and participatory approach to watershed development.

Within the participatory approach, evidence suggests that watershed development and forest protection have been much more successful in places where sufficient biophysical and institutional incentives exist or have been provided to the local people to participate in such activities. Furthermore, the commitment of communities to watershed development projects has also been significantly higher wherever the beneficiaries themselves have contributed to the costs of the project activities. Wherever sufficient awareness has been created, and the right incentives provided, people are willing to contribute to the costs of watershed development activities in their locality.

It is being argued and seen in other parts of the world that markets for environmental services are an efficacious tool for the conservation of natural resources, without compromising on the benefits that have been traditionally derived from them in the nature of goods.

'Markets for environmental services'

With increasing degradation of the natural resource base leading to a global environmental crisis, there is a growing appreciation of the role of forest-systems in providing not just goods but also vital services. These services are diverse, ranging from carbon sequestration to landscape beauty and from biodiversity conservation to watershed protection. To sustain the flow of these services, there has been an increasing movement towards putting a value on them and, concomitantly, making payments for this value.

Markets for various forest services are, therefore, generating real payments for forest owners and managers. These in many cases are poor communities. The payments provide them with increased incentives to maintain their forests, thereby, directly improving their livelihoods.

Some examples of markets for forest services are:

- For forest biodiversity – bioprospecting
- For recreational value – eco-tourism
- For carbon sequestration –tradable carbon offsets

Services provided by forests come under a larger umbrella of 'Environmental Services'. This concept is based on placing imputed values on various environmental services to promote the conservation of natural resources as well as meet livelihood needs in a sustainable way. Thus, payments based on these values, made and received as an incentive for appropriate management of the natural resource base, constitute what is commonly termed as 'markets for environmental services'.

Like other services, such as forest biodiversity or carbon sequestration, the hydrological functions of land use in the form of watershed protection services have also started receiving significant attention. The value of better access to reliable supplies of clean water and reduced vulnerability to environmental risks such as flooding and landslides are increasingly being appreciated. Globally, there has been development of systems for payment for watershed services in several countries

Markets for watershed protection services in India – a complementary approach

Today, watershed protection in India is receiving tremendous support for its multiple benefits not only in improving the livelihoods of the rural poor in much of dry land India, but also for the services that accrue to larger downstream beneficiaries in the form of municipal water supplies, regular water flows, flood mitigation and reduction in sediment flow for hydropower generation.

While market-based approaches have been credited in several countries with promoting efficient resource management, it is not clear how they may be best employed to improve the use of water resources and land management in watersheds in India. A major concern relates to the impacts of markets for watershed services on the livelihoods of the marginalized,

II. POTENTIAL AND CONSTRAINTS: MARKET-BASED MECHANISMS EMBEDDED IN COLLECTIVE ACTION

Markets for watershed protection services do not always imply a monetary or even tangible transaction between service providers and service receivers. An exploration of the potential for market-like arrangements encompasses all incentive-based arrangements, transactions, payments and compensation systems (monetary or non-monetary) for watershed protection services that are ‘market like’ in nature and have the potential to develop into more sophisticated mechanisms in the future.

Given this and learning from experiments from other parts of the world, the potential of *market-based* approaches as alternative, yet complementary, solutions to existing regulatory and collective action approaches for the sustainable management of natural resources has begun to be explored in India.

A preliminary scoping study of two states in India, Himachal Pradesh (HP) and Madhya Pradesh (MP), revealed that there is a latent potential for the development of such approaches. However, underlying this potential are also several constraints, which would need to be overcome.

At the micro level: Intra-village transactions

There are some interesting examples at the micro-scale where *market-like* mechanisms for watershed services have led to improvements in livelihoods and equity. These have been developed within a collective action framework.

Himachal Pradesh (HP)

- HP constitutes a major natural watershed for the entire North India region;
- Around 66% of the state is legally defined as forest land;
- 90% of HP’s rural population is dependent on forests for its livelihood;
- Well-managed watersheds provide crucial services to downstream states in the form of freshwater supply, prevention of landslides and floods, and control of siltation in dams and reservoirs;
- A good policy window:
- A draft state water policy, which recognizes the need to place mechanisms to sustain watershed services;
- Guidelines to develop an Environment Policy for the state, recommending the development of appropriate mechanisms to provide sufficient incentives to local communities to participate in forest protection and afforestation;
- Systems for one-time regulatory payments made for catchment area treatment already in place.

Madhya Pradesh (MP)

- Major rivers of the state originate in upper watershed regions of the state;
- MP has the largest area of forest land in the country;
- Very high livelihood dependence of rural communities on forests;

- A conducive policy environment:
- Has the country's largest watershed development programme – The Rajiv Gandhi Watershed Mission;
- Significant potential for hydropower projects seen by government of MP;
- Increased focus on water issues and growing interest of state government in reforms and private sector participation in water resources management.

On the whole, there is very little awareness of the concept of providing appropriate compensation to the landless and land-poor in return for their participation in watershed protection activities, both at the field and policy levels. Given this, it is hard to dispute the desirability of having such mechanisms on a wider scale. Contrary to the common perception that *markets* and *market-based* approaches are always anti-poor and iniquitous, these village-level mechanisms show how watershed protection activities can be made more equitable to benefit the livelihoods of the poor. Despite the desirability of such mechanisms, there is, however, a need for a certain measure of caution. Given the multiplicity of factors at the village level in India, as well as the specificity of contexts, the practicality of de-linking land and water rights and promoting the trading of these rights needs to be thought through carefully before generalizing any such principle at a wider state or country level.

De-linking of land and water rights has led to development of 'embedded markets' in some cases. But it is not very common. There is tremendous potential in this for addressing the issue of equity.

At the meso level: Inter-village transactions

There are a number of interesting examples of inter-village cooperation with regard to water sharing, watershed protection, grazing rights and more generally, natural resources management, both traditional and otherwise, which are based on incentive mechanisms that closely resemble market-like arrangements.

These are generally perceived to be more equitable and beneficial for livelihoods as compared to alternative 'state-controlled' regulatory systems. Research on existing cases of local exchange-based mechanisms, though conceptually closer to the collective action approach, would yield rich learning for the development of market-based approaches for watershed protection services.

In order to put in place inter-village transactions/payment mechanisms as incentives for watershed protection, a strong awareness needs to be created about upstream-downstream linkages in the minds of the people. This awareness was found in some villages in HP, where people traced the drying up of fresh water springs to the degradation of forest vegetation upstream. On the whole, however, this kind of linkage is still very weak or absent in the minds of the people. Usually, people are not interested in issues beyond their village unless they are directly affected by them and can 'see' the changes/benefits from watershed protection on the ground.

A major constraint in India for putting in place such market-like arrangements is the fragmentation of intra- and inter-village unity along lines of caste, class and political affiliations. This adversely impacts the setting up and smooth functioning of village-level institutions, which would be necessary for any kind of transactions to take place.

It is often difficult to draw the conceptual and definitional boundary, at this level, between what constitutes a collective action mechanism and what a market-based mechanism. Keeping this in mind, a question that arises is how desirable it is to replace collective action arrangements that are traditionally based on goodwill and *quid pro quo* arrangements with market mechanisms. However, as the scarcity of water becomes more acute in the future, there will be a definite need to devise some complementary solutions to the existing approaches to provide incentives for conservation/ watershed protection to ensure the sustained flow of services.

Traditional examples of inter-village cooperation exist, which closely resemble market arrangements. Much can be learned from these for developing more sophisticated mechanisms.

At the macro level

A significant potential for the development of markets for watershed protection services exists at the macro level between downstream beneficiaries and the upstream watershed protection service providers. Some of the downstream beneficiaries of upstream watershed protection are water supply agencies in urban areas, hydroelectricity projects, and mineral water companies. While the hydro-power sector receives watershed services of water flow regulation and reduced sedimentation in dams and reservoirs, urban centers receive assured water supplies and, in some cases, landslide prevention services.

Currently, the water tariffs, as in other parts of the country, are highly subsidized in Bhopal. Removal of subsidies and increasing tariffs is a politically contentious issue in India. There is a need for great positive political will in order to make this happen. Unless accountability in the public utility system is increased, people would be generally unwilling to pay any extra money to the Bhopal Municipal Corporation.

On the whole, the concept that one has to *pay* for upstream watershed protection is still a very new one in the hydropower sector. Had statutory regulations not been in place, it is difficult to say whether the hydropower companies would have made any contribution for upstream watershed protection on their own.

There is significant potential to develop mutually beneficial market-based mechanisms for watershed protection services between poor upstream communities and downstream beneficiaries (such as hydropower and municipal water supply agencies) in the medium to long term.

- Markets for environmental services are not necessarily anti-poor. Market mechanisms have the potential to promote equity and improved livelihoods;
- Regulatory, participatory and market based approaches can be complementary and combinations may be better than one approach alone;
- Development of market mechanisms require greater scientific validation of upstream-downstream linkages and appropriate and transparent institutional mechanisms;
- Environmental services traditionally under state control are considered as 'public goods'. However, market-based approaches can often provide more cost-effective and efficient solutions to meet environmental goals by creating incentives for conservation.

III. A SUSTAINABLE LIVELIHOODS APPROACH TO WATER PROJECTS

For many years the domestic water sector has focused on the achievement of health benefits through supply improvements, based on the premise that more and better water can help to improve the health of individuals. This approach has been consistent with the provision of improved supplies by governments and other agencies as part of a strategy of meeting the basic needs of the poor.

In the last decade however, the wider policy environment has moved towards self-financing and cost recovery on water projects, where greater emphasis is placed on community financing as a means of ensuring cost recovery. The idea of water as an 'economic' good has been the driving force behind this change. Whilst the end result is still anticipated health benefits, the principle that the 'consumer pays' is now more firmly linked to sustainable supply delivery. This shift in emphasis has various implications for poverty reduction, not least of which is whether or not poor consumers can afford to pay.

The central issue this paper addresses, therefore, is the need to understand the impacts of improved supplies on socio-economic 'livelihood' circumstances of households, and to move away from an emphasis on health benefits. Grouping this under the 'sustainable livelihoods' umbrella, the approach can assist in creating clearer links between the expectations of policy makers and donors (in their drive to mobilize communities around a 'demand-based' theme) and the capacities and motivations to undertake this new role on the part of communities and households. A central strand in this relationship is likely to be the link between anticipated impacts at a household level and the motivation of households to participate in community efforts to pay for service.

A health-based view has driven most sector development in the last 30 years, derived mainly from public health approaches to water supply and sanitation and government-led supply provision. During the 1960s and 1970s, this focus on developing supply and improving sanitation became the mainstream development approach within the sector, and was enshrined in the United Nations (UN) water decade which had a central ‘health-based’ and supply-oriented message. In health terms, the overriding benefits were perceived to be the reduced transmission of water-borne diseases e.g. diarrheal diseases, typhoid and guinea worm. The focus widened during the 1980s to integrate water supply, sanitation provision and hygiene education, as the need to take a more comprehensive approach to reducing the presence and transfer of pathogens at a household level was recognized.

Poor health caused by poor water supply quality, insufficient sanitation and unsafe hygiene behavior was regarded as both a symptom and cause of poverty. Images of open sewers and unclean water sources became a favorite medium for conveying the ‘idea’ of poverty in the developing world, regardless of the many other influences and causes. Table 1 gives figures for access to safe water and sanitation at a global level, which came to represent measures of success or failure in creating sustainable supplies

Since the early 1990s there has been further change centering on the persuasive idea that water is an ‘economic’ as well as a ‘social’ good⁴— with significant implications for health-centered approaches. The emphasis shifted from service supply to demand, and had major implications for communities and project financing. The link this new relationship creates with household livelihoods and the wider social and political policy environments is argued to be far stronger than previous supply oriented, health-based approaches.

This is a key departure for the livelihoods view of water supply. While a poor quality supply for a household’s own consumption might warrant a higher poverty weighting, the same supply might be plentiful and not harmful for livestock, serving to increase livestock productivity and reduce the vulnerability of the household. It may also increase the household’s income sufficiently to free other assets to improve supplies in the long term. Thus, whilst the water–poverty relationship is significant, the mechanisms to achieving greater poverty reduction through water supply involve trade-offs, which the livelihoods view helps to identify. The emphasis is not on water quality, so much as the uses to which it is put.

The SL framework adds levels of complexity to analyzing water resource use at the household level, and identifying the trade-offs inherent in household-level decision making, through:

- unpacking the components of demand at the household level
- identifying the range and depth of barriers to access;
- embedding these household factors in community- and national-level processes
- making the micro-level linkages to macro-level policy and institutional environments

In broad terms, the framework begins to create linkages between water sector work and a range of parallel socio-economic and policy issues – including decentralization, community based ownership, political representation and accountability, and managing risk in dynamic natural environments. In the process, it helps to broaden our water supply from health institutions and public health approaches. Whilst this embedding in wider contexts has attendant practical problems, it can simultaneously establish a greater reality in addressing community water supply problems, not least because it is more likely to identify early on potential barriers to sustainable supply development.

At the heart of the framework is an analysis of the capital assets of the household, divided into natural, social, human, physical and financial. A sixth – political capital – has been suggested (see Ashley and Carney, 1999: 35). From the perspective of water resources the latter could be a major asset, in terms of the political bargaining involved between the government, the private sector and communities. It may also help to increase the capacity of the poor to influence the form and weight of trade-offs from the community-level upwards. The poor, after all, are themselves political actors.

The SL framework regards the vulnerability context (including natural and human-led trends and shocks) as the starting point for analysis (Carney, 1998). The starting point for adopting the framework in the water sector, is a sound understanding of the vulnerability contexts within which people gain and secure access to water resources. Access and water security are determinants of local-level processes (including local norms and customs, local property rights regimes and local economic factors); regional and national political and policy issues; and international policy development and global climate issues.

Different environments present different levels of risk in securing access to supplies – particularly where there is natural aridity. A number of factors will affect the risk profile including the context (urban or rural); topographical factors; the transparency of government, availability of local private sector companies, and the channels of communication through which demands can be expressed.

Hence, vulnerability is not confined to physical factors; but includes the risk and vulnerability to livelihoods posed by unstable social, physical and political environments which see voting controlled through patron-client networks, and local processes of decentralisation captured by elites.

The main point of the asset pentagon is to force ‘users to think holistically rather than sectorally about the basis of livelihoods’ (Carney, 1998: 7). Robustness resulting from a strong asset bundle can be manifested in reduced household vulnerability and increased influence on policies and institutions, leading to the conclusion that asset building is a ‘core component of empowerment’ (Carney, 1998: 8). Different asset bundles at the household level are manifested in the different degrees and types of access to water resources in different environments. The composition of the bundle can determine access through the relative availability or absence of:

- Labour power (human and/or animal), which draws on physical capital to collect water;
- Water purchase (or the means to purchase), which can be obtained through mobilizing financial capital;
- Natural capital, which determines water availability, and is a factor in scarcity;
- Social capital, which creates opportunities to raise other forms of capital through the community (as communal resources) and is an additional factor in scarcity, as it can involve the removal of social barriers; and
- Human capital, which provides the knowledge and educational environments by which decisions can be made on gaining access and lessons can be learnt and disseminated.
- Many of the links between different forms of capital assets and water supply are revealed in an example from the livelihoods and water workshop in 1997. This case study demonstrates the complexity of the household asset relationships.
- The livelihoods cycle is taken to represent assets used in productive activities to create income. Income is then spent to meet household consumption needs and maintain household asset levels. Water is thus both part of the expenditure and part of the consumption of a household economy. Improved decision making ability through better systems to deliver water. Remove risk and uncertainty of access (including maintenance and management of natural capital stocks).

Identifies the poorest households and strengthens participation in, and influence on, community/ local and/or private resource management systems; creates safety-net structures within communities to ensure the poor have access to water; improves rights environment, including the establishment of right to access by poor households within communities. Enhanced through training in catchment protection and maintaining natural environment. Secured through access to small-scale credit for provision of connections to service. Enhanced by assisting water access for productive purposes (e.g. for animal consumption in pastoral areas). Knowledge of DRA, community self-assessment of needs, participatory monitoring, gender mainstreaming.

Linking micro and the macro levels in the livelihoods framework demands that policy and institutional analysis must take place at all levels (see Carney, 1998), and include gender analysis. The policies and institutions mediate between the vulnerability context and the livelihood assets of the household. They are critical in defining the types of bargaining and decision making that take place within the trade-offs referred to earlier. As part of the

political environment, they are also important in the vulnerability context and in the development of policy to reduce the impact of shocks on the poor.

Both formal and informal institutions are important, particularly at the community and district level. Formal institutions can determine the capacity of households to increase their asset base and secure new sources of provision. They include private sector providers such as local and international water companies and local authorities responsible for supply development. The nature of community engagement with the two is changing as supply development gives way to demand creation. Political organisations – e.g. those able to lobby on behalf of the poor, campaign for, say, tariff structures to benefit the poor or to establish cross-subsidisation – are additional and important formal institutions which can work with, and around, the changing policy environment. Informal structures include private water vendors, informal community-based organisations undertaking other routine community activities (e.g. the organisation of funerals) and other informal institutional structures (e.g. ethnic, clan, religious groups or loose associations of economic interests).

Policies within the water sector previously have been based on the achievement of coverage levels and access to resources defined in crude per capita terms. The move to eliciting demand as the basis for creating coverage means that the facilitating role of government replaces the target setting emphasis of the past. This does not, however, amount to a pro-poor enabling environment. Rather it creates the conditions which can require greater draw-down on the livelihoods assets of the poor, in particular social, human and physical capital. A SL approach helps to reveal the impact of the drawdown and to avoid the stereotypical view that communities are homogenous ‘institutions’ willing and able to manage resources on the basis of demand. Instead, it focuses on the household-level as the basis for the success (or otherwise) of community capacity to create the necessary capital to work within a demand-based environment. In so doing, a SL approach can help to highlight the specific poverty impacts of policy change within the sector. As an institution, a community is both the sum of its households (with their various SL strategies) and more than the sum – it also includes features of human and social capital which add social and cultural texture ranging from political, clan or tribal affiliation, to possible regionally-specific characteristics. These additional facets of communities serve to underscore the importance of the policy and political level within the box of ‘state–society transactions’ and the impact of these processes on water supply development.

The central challenge to applying the framework to the sector is in understanding how this affects the development of institutional relationships, types of intervention and even the relationship to other ‘sectoral’ issues such as food security.

Building a livelihoods approach which is distinct from just ‘doing’ water projects:

- Focuses on the existing policy environment and changes taking place therein (in this case, principally the move to a demand-based environment);
- Has an end goal that is not the achievement of health benefits, but seeks to increase the overall robustness of the household asset bundle, in order to strengthen livelihood strategies, assist in creating pro-poor outcomes, and to increase positive linkages in state–society transactions;
- Should increase the range of livelihood options available and the capacity of poor households to diversify through seeking assistance from other institutions, including translating knowledge into capacity.

III. IMPLICATIONS FOR POLICY AND PRACTICE

Water as a natural asset forms part of the asset range available to households and its economic value as well as its cost needs to be properly understood in order to understand the linkages with livelihood strategies. This is the case not just because this points towards ways of strengthening asset bundles through improving access to natural capital, but also has methodological implications for demand assessment. The structure of demand for water within a community – particularly demand over and above the survival level – may be informed just as much by its productive uses as by its routine daily consumptive uses. Calculating anticipated demand at the

household and community level may, therefore, require greater depth of analysis of household livelihood uses (and potential uses) than is commonly undertaken by demand-assessment. This also has policy implications for notions of scarcity, particularly in terms of the presence or absence of other assets critical to gaining sustainable access to supplies. Scarcity can be determined by the unavailability of physical and human capital as well as by the absence of the water.

Thus, sequencing asset availability is important in order to support a new policy environment based on demand, from the financing perspective. In the case of community-level financing and management, where the key issue is anticipating, calculating and expressing aggregate community demand, far greater levels of social capital will be required, not least to ensure the capacity of communities to agree on and enforce sanctions against those breaking the rules established for access. The sequencing of asset availability will also affect who can participate and contribute social capital at different times to financing and management of supplies.

If, in the case of the poor, the requisite assets are unavailable or beyond the capacity of the poor to access at particular times, then different demands may be placed on scarce resources. Responses may include greater conservation and/or a switch to higher-value uses, or seeking different sources for different uses, perhaps sacrificing drinking water quality in the process. These responses mirror some of the processes involved in demand management at a macro-level, where water pricing impacts on use in agriculture and industry, forcing users to move water to higher-value activities or to use water more effectively in existing activities. As a result, the need for the three subcomponents (water supply, sanitation and hygiene education) to be introduced in parallel is diminished. Whilst sanitation is clearly important and the promotion of hygiene messages is significant in reducing disease transmission, their automatic attachment to water supply (at least at the outset) is not always necessary – if health improvement is not the immediate goal then their inclusion would seem wasteful. Water supply improvement can stand alone, given the range of other livelihood-enhancing functions it may provide. In addition, a demand-responsive environment.

This holistic management of assets works at the household and community level and requires, *inter alia*, knowledge of:

- The stock of community resources available/accessible;
- The relationship between household resource use and common pool resource availability within the community (i.e. why a household chooses to access a private supply versus a communal supply, and the rules and norms which surround that resource);
- The threshold level for access to resources, below which households will be forced to seek assistance (i.e. the minimum level to ensure livelihood sustainability);
- Existing resource management strategies and rule-defining behaviour (across a range of livelihood strategies).

Managing assets in an integrated fashion is closely linked to the process issues discussed below in relation to sequencing and time – particularly the aspects of seasonality of demand and supply of water resources. It is also closely related to the question of knowledge environments, including capacity to monitor levels of natural asset stocks, and to use knowledge to assess the availability of resources for human and livestock use. One of the most pressing practical concerns is to link the management of water resources to food security needs. Understanding household-level integrated asset management helps to draw out the critical relationships between access to water resources and food security. The institutional implications of this and other aspects of a livelihoods approach are dealt with below.

Institutions – as the vehicles for policy change and implementation – are the filters which determine the success (or failure) of livelihood strategies. The established practice of seeking direct health impacts has naturally involved institutions concerned with health, from the local health extension worker to the World Health Organisation. The focus has been on constructing capable local-level institutions to manage and maintain new structures and to be the local conduits for hygiene messages. This has frequently involved a set of institutional

linkages within the community (between households and management committees) and between communities and outside interests, ranging from private service or goods suppliers to local and regional government.

The implications for policy makers of the livelihoods view is essentially three-fold:

- 1) Institutions involved should reflect the need for micro–macro linkages and should facilitate communication between all levels, and between institution types. (This is particularly important in an environment which requires close collaboration between civil society, government and the private sector). For instance, local structures controlling community financing and management should be able to create channels of communication with higher order institutions.
- 2) New local institutions should also be capable of linking horizontally with existing indigenous institutions which may be the most important stores of social capital and influential in linkages with external institutions. These links and networks will be important in building capacity to address water supply improvements in a demand-based environment.
- 3) Institutional linkages should be framed around water as a consumption good and as an economic asset of production. In practice, this means greater connectivity with local business, microfinance organisations, local government and the private sector. Financial management and the enforcement of charges and other levies requiring sanctions, place demands on human, social and financial capital assets of households.

The emerging picture is of very complex formal–informal institutional linkages at the local level, which will be less easily managed than the triumvirate between government, civil society and the private sector envisaged under the demand-responsive approach. The increasing institutional complexity in both formal and informal spheres is likely to increase the political input into decision making over water resources at all levels, and tensions may arise as civil society engages in the use of political capital to increase access to other capital assets to combine with changing levels of access to water resources.

Underlying this paper has been the question of what we need to know and how we need to use knowledge. The systematising of knowledge and its use has deep implications for future policy and practice in the sector, not least because the acquisition and use of knowledge is frequently an elite based process which, de facto, excludes the poor and yet frames the development of formal or informal policy towards the poor. Knowledge environments, as they have been termed here, refer to the knowledge systems surrounding the various sectoral actors – communities, households and individuals, government institutions, the private sector and civil society (predominantly NGOs) – and do not refer to formal systems of knowledge on their own.

Whilst more needs to be known about the water economy at the household level in order to develop a successful livelihoods-based approach, this has cost implications, requiring as it does the combining of insights across different disciplines. Nevertheless, being more informed need not be much more expensive if existing knowledge systems are tapped into – including those of the communities and households themselves. This process of generating better knowledge needs to be complemented by better informing of communities at a local level. For instance, how households respond to shocks in the availability of water as a natural capital asset in different circumstances affects their capacity to finance and – in all probability – participate in the management of community resources. It may also affect their attitude to private versus public sources in the long term. One of the key knowledge requirements, therefore, with major policy implications, is how to create interventions with the participation of communities and households that can feedback information on asset availability and use.

At a community level, the research approach would involve rapid assessment based on key informants at local and sub-regional level rather than lengthy (and costly) research projects. Principal aims should be to establish:

- The impact of changing water availability in terms of natural asset stocks on the range and use to which other household capital assets are put, including labour and financial capital assets.

- The impact of changes to the vulnerability context (including greater or lesser risk caused by indirect effects of policy changes in other areas such as agriculture and livestock marketing) on the types of household assets required to overcome access barriers.
- The impact of changes in structures and processes within the box of state-society transactions on the types of activities undertaken as part of livelihood diversification and the knock-on effects on the demand for water resources for productive purposes.
- The range and types of strategies for gaining access to water resources adopted by different household types within communities and the extent to which these are livelihood-dependent (for instance based on the availability of animal power).

IV. CONCLUSION & SUGGETIONS

This paper emphasises the health impacts of improving access to supplies of clean drinking water and better sanitation. It then assesses the relevance of this view to wider debates on how to achieve supply sustainability by adopting demand-responsive approaches (DRA) and by shifting the emphasis to the principle of ‘consumer pays’. The paper argues that an overemphasis on health impacts does not fit well with DRA, which is being increasingly advocated by agencies at an international level. Thus, in order to encourage demand for water services in particular, and to ensure that communities can be engaged in self-financing their development, greater attention has to be paid to the role of water within wider household livelihood strategies – and livelihood impacts should become a major focus of interventions.

The paper also analyses water in the context of poor households. In doing so it uses the Sustainable Livelihoods (SL) framework as an analytical tool. Combining this theoretical analysis and the experience of water projects, the elements of a SL approach are identified. Adding greater emphasis to these elements will help in the wider uptake of DRA, providing the means by which to ensure supply sustainability. The end result is anticipated to be greater water security for the poor.

Finally, the paper assesses the suggestion of adopting a SL approach, in terms of the following:

- **Water should be treated as an asset and a good:** Understanding water at a household level means addressing the productive uses of water as an asset as well as its uses as an economic and social consumption good at this level.
- **Institutional linkages:** Institutional development should be more closely linked to developing social capital to benefit the poorest members of communities and to assist in their access to and communication with ‘institutions’ responsible for supply development, be they from civil society, government or the private sector.
- **Sequencing and time:** Understanding the significance of sequencing interventions to achieve desirable livelihood outcomes is important, as is the time taken to access supplies. A closer examination of this factor in all situations (e.g. by season, or according to urban or rural users) can assist in fine-tuning implementation to achieve maximum livelihood sustainability for the poorest in their specific contexts.
- **Knowledge environments:** Understanding the role knowledge plays in poor households’ decision-making over water access is crucial to understanding their wider decision-making. Acquiring and disseminating knowledge as part of project development is essential to building up a long-term picture of how livelihoods are enhanced by using a SL lens within the water sector.

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