INTEGRATING 'LIVELIHOODS' INTO INTEGRATED WATER RESOURCES MANAGEMENT: TAKING THE INTEGRATION PARADIGM TO ITS LOGICAL NEXT STEP FOR DEVELOPING COUNTRIES

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ABSTRACT

This paper examines the weaknesses in the current understanding of Integrated Water Resources Management (IWRM) from a livelihoods perspective. Empowering poor people, reducing poverty, improving livelihoods, and promoting economic growth ought to be the basic objectives of IWRM. But as currently understood and used, IWRM often tends to focus on second generation issues, discouraging attention to making water available to poor people for productive and domestic uses. This paper argues that IWRM needs to be placed in the broader context of modern Integrated Natural Resource Management (INRM) and the livelihoods approach, which take a holistic and people-centered approach. The paper concludes with an alternative definition of IWRM as involving the promotion of human welfare, especially the reduction of poverty, encouragement of better livelihoods and balanced economic growth through effective democratic development and management of water and other natural resources in an integrated multi-level framework that is as equitable, sustainable and transparent as possible, and conserves vital ecosystems. Transparent user-friendly information and models for assisting decision-making are an essential feature of livelihood-oriented IWRM.

INTRODUCTION

This paper starts from the premise that poverty reduction, empowering poor people to improve their livelihoods, and achieving long term equitable economic growth are the most important objectives of efforts to improve natural resources management in developing countries. Poverty has many dimensions, but lack of access to a reliable water supply for household as well as for productive purposes is one central feature of poverty in developing countries and must be reduced drastically if the Millennium Development Goals are to be met. More than a billion people in the world's poor rural areas lack access to safe drinking water and sanitation; and a similar number lack access to affordable irrigation (Polak et al. 2002). Making water available for agricultural production (including livestock, fish, as well as crops) where rainfall is unreliable or insufficient can make a huge difference to peoples' lives, as the vast majority of rural poor (and even peri-urban poor) depends on agriculture. There is considerable evidence that making even relatively small amounts of water available for personal and productive uses to poor people can transform their lives (e.g., Polak et al. 2002; Lipton and Litchfield 2003).

"Integrated Water Resources Management" (IWRM) is now the dominant paradigm for water management in both rich and poor countries. IWRM is defined as a process that promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (GWP 2000). The World Bank, regional development banks, most bilateral donors, and many national governments have adopted IWRM policies, following similar definitions.

While taking a more integrated approach to developing and managing water resources is unquestionably important, we believe that the current IWRM discourse is too narrow in two senses.

First, it does not put improving livelihoods of people at the center. Second, it does not take a truly holistic 'natural resources' view (for example land is sometimes included rhetorically as in the GWP definition, but forest resources, and biodiversity are rarely included). These two weaknesses lead to an unintentionally narrow perspective, making IWRM counter-productive as an analytical framework from the perspective of poor people. There is considerable evidence available to support this assertion (e.g., Moench et al. 2003).

This paper proposes a paradigm shift that puts improved livelihoods of poor people at the center of IWRM and IWRM in the broader context of "Integrated Natural Resources Management" (INRM). Recent formulations of INRM take a systems perspective and develop indispensable inter-disciplinary models based on the integration of information on physical as well as social variables.

WATER AND POVERTY NEXUS

We are confronted every day through the news media with the devastating impacts on poor people of either too much or too little or too polluted water. Whether it is droughts in eastern and southern Africa, or floods in Asia, the stark images on our TV screens shock us. This year around 14 million people are said to risk starvation in Ethiopia alone because drought has devastated peoples' crops. But these dramatic events, as terrible and devastating as they are, tell only a part of the story of how water is related to poverty. Every day millions of women and children must carry buckets many kilometers to fetch household water. Further, millions of families in rural Africa, Asia and Latin America are unable to produce enough on their small farms or household gardens (if indeed they have access to land) to meet their basic needs, let alone lift themselves out of poverty. Many factors underlay this low productivity, but inadequate and unreliable supply of water is the most important single factor in many cases, and certainly a significant factor in nearly all cases. In sub-Saharan Africa there is considerable evidence of declining soil fertility, leading to a vicious cycle of declining yields and further impoverishment. This too has many complex causes, but lack of reliable and adequate water that would make investments in fertilizer productive is a major issue.

A recent Global Water Partnership (GWP) paper addresses the issue of poverty reduction and IWRM (GWP 2003). The paper was commissioned precisely because the GWP recognized that recent formulations and applications of IWRM are not sufficiently focused on poverty. As the paper notes, there is a vast analytical literature on poverty—its definition, dimensions, causes and cures—but there is still "no coherent analysis of the relationship between poverty and water access and use" (GWP 2003:7). The international community has begun to recognize the relationship, for example in the Millennium Development Goals for 2015 to halve the number of people without access to safe drinking water and sanitation, and in the WSSD Plan of Implementation (cited in GWP 2003). But these remain focused largely on drinking water and sanitation, i.e., they do not take a sufficiently broad perspective, for example by addressing water for productive uses. Few governments have highlighted access to water in their Poverty Reduction Strategy Papers. As the GWP paper notes, "to give water its due emphasis in poverty analysis, nothing less than a paradigm shift in poverty perspectives is called for" (GWP 2003:9). Achieving this paradigm shift calls for broadening our concept of IWRM—placing it into a broader INRM perspective and integrating livelihoods analysis as a central feature.

IWRM IN INRM PERSPECTIVE

Integrated scientific approaches are currently being emphasized because we think that rural development can be accelerated if we understand farmers' decision-making from different perspectives. This is actually quite optimistic, since for centuries much progress in farming methods has been made without such full scientific understanding and integrated approaches. A significant result of the increased intensity of use of natural resources is that using more of a resource for one purpose means there is less available for another. Such connectedness requires a systems approach.

For decades, holistic and multidisciplinary approaches to natural resource management have been accepted in principle in scientific research, such as Farming Systems Research, Eco-regional Research (Teng et al.1995), Integrated Water Management, Integrated Natural Resources Management (INRM), Integrated Soil Fertility Management (ISFM), and Integrated Pest Management (IPM). Over time, these approaches evolved from being 'descriptive' (stating how the main state variables changed in time and in response to key environmental drivers) to being more 'explanatory' (showing the underlying relations between variables and the environment of the system, and hence explaining why processes proceed as they do). Exploratory modeling ('what if?') then becomes feasible at least in confined geographical areas. During the same period, participatory approaches have gained significant momentum and it is now recognized that farmers' socioeconomic context is at least as diverse as their biophysical environment. This does not ease the development of models, which combine socioeconomic and biophysical data and makes clear that any related upscaling is only possible with significant loss of information. However, the integration of different scales remains important at least from the biophysical perspective (e.g., for the analysis of off-site effects, groundwater depletion, etc), while interventions have to be client, location and scale specific.

INRM recently found scientific recognition in a concise and much more operational description of issues and elements (Sayer and Campbell 2001). They argue,

> "to meet the challenges of poverty and environmental sustainability, a different kind of research will be needed. This research will need to embrace the complexity of these systems by redirecting the objectives of research toward enhancing adaptive capacity, by incorporating more participatory approaches, by embracing key principles such as multi-scale analysis and intervention, and by the use of a variety of tools (e.g., systems analysis, information management tools, and impact assessment tools). Integration will be the key concept in the new approach: integration across scales, components, stakeholders, and disciplines."

The authors bring clarity to the approaches needed to understand and manage natural resources. Basically, INRM is not a focus in any particular direction towards any particular goal, because neither can that goal be simple and clear, nor will the conditions be constant under which it should be reached. Continuous adjustments are called for. This necessitates a different approach to the research and management program (less static), the scientists and managers involved (more holistic, interactive, participatory), the institutions that manage and implement research or natural resources management (more flexibility and collaboration). In short, the authors advocate 'learning together for change'. This is captured in Figure 1. They also emphasize that many of the successful cases of INRM have had development of 'social capital among stakeholders' as the entry point. This is clearly a process for which the majority of scientists or water managers are not trained at all.

Principles in operationalizing INRM recognized by Sayer and Campbell (2001) and Campbell (2003) are:

1. *Multiple scales of analysis, both temporal and spatial*. Not a single set of analysis, but cycles of research and learning. It is crucial to find the slow-changing variables (e.g., soil fertility, groundwater).
2. *Decision-making processes – "management."* The 'M' of INRM. In much of INRM the household is characterized as the decision-making unit and understanding household priorities with respect to use of assets is most important.
3. *Plausible promises*. INRM should be a problem-solving approach with results that are tangible. Successful cases are always built around very specific interventions. Use of 'best bet options' and 'best practices' is gaining appreciation (Maglinao 2001), though actual best practices are so context-specific that we question the rather universal use of this concept.

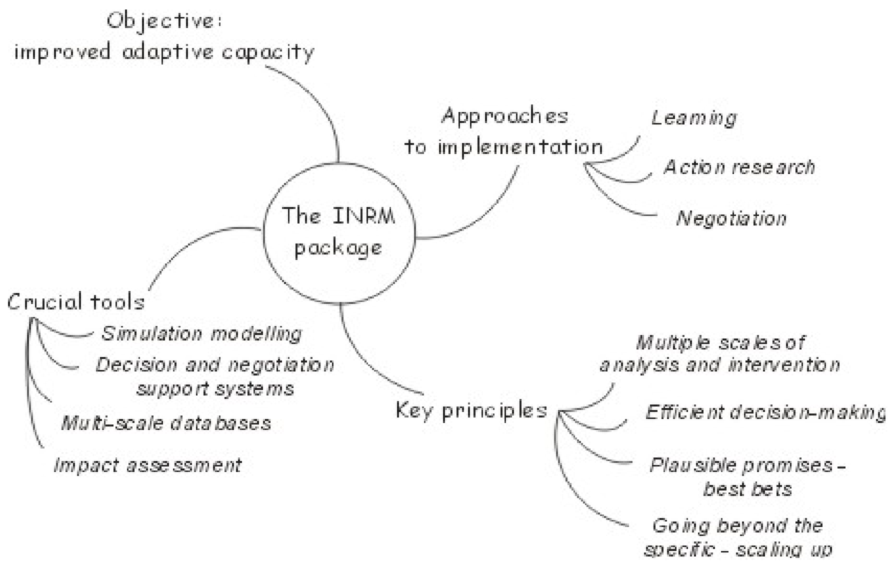

Figure 1: Key concepts in Integrated Natural Resources Management (Sayer & Campbell, 2001)

4. *Scaling*. Even though success in specific cases is important, INRM should allow transfer of knowledge to other situations: to scale up (larger) and scale out (more of the same); and to learn from errors. This is especially constrained by socioeconomic system complexity. However, it has been argued that system complexity is not boundless and can often be reduced to key drivers, responses and intervention points (Campbell, 2003). This is certainly a challenge for our research but also a warning against flawed scaling-up and scaling-out.

Tools for operationalizing INRM include, among others, the following (see Campbell 2003):

1. *Systems modeling*. It enables users to understand and predict the behavior of complex systems that are characterized by non-linearities, time delays and feedbacks; it also allows stakeholders from 'different sides of the fence' to start building common concepts and language.
2. *Participatory action research with stakeholders*. Crucial adaptations of general methods cannot be achieved without it.
3. *Decision and negotiation support tools.* These are practical forms of system models.
4. *Multi-scale databases*. Theory can only be applied with success if site and situation specific data are available; this is crucial for up- and out-scaling.
5. *Impact assessment*. This is a key feature since it helps in adaptation, performance enhancement, negotiation, and allocation decisions.
6. *Geographical information systems (GIS)*.

In an environment where natural resources and the way people use them are relatively stable, the INRM approach gives a good handle on how to improve management. However, as more and more elements of the people-natural resources systems become connected through new infrastructure, increased intensity of interventions causing downstream effects on water quality and quantity that did not exist before, and increased knowledge such as observations from space about illegal land use, it is not easy to translate INRM and other systems approaches into practical management tools.

Putting the persons managing agricultural and natural resources, including water, at the center of attention and underlining the means they need to have at their disposal for improved management, emphasizes 'livelihoods' of individuals and communities (e.g., Campbell et al. 2001). The 'livelihoods approach' can be seen as a way of viewing scientific problems through the eyes of the target group. This approach is particularly important in research for and with smallholder farmers. In this approach, one thinks about the five types of assets that individuals and communities need in order to be productive in agriculture: natural resources (land, water, biodiversity), physical assets (infrastructure, machinery), financial assets (income, money transfer, loan), human assets (knowledge, skills, gender) and social assets (organization in the community, rules and laws) (Campbell 2003).

Penning de Vries et al. (2002) link these concepts to the five dimensions of sustainable agriculture: increased productivity, reduced risk, increased resource protection, economic viability and social acceptability. They discuss these interactions with the help of a hypothetical example that compares two technologies (Figure 2). The “standard” technology (inner line) represents cultivation of a traditional crop variety, the “new practice” refers to growing a new variety with higher and more stable yields, but which also puts more strain on farmers’ working hours and increases water pollution.

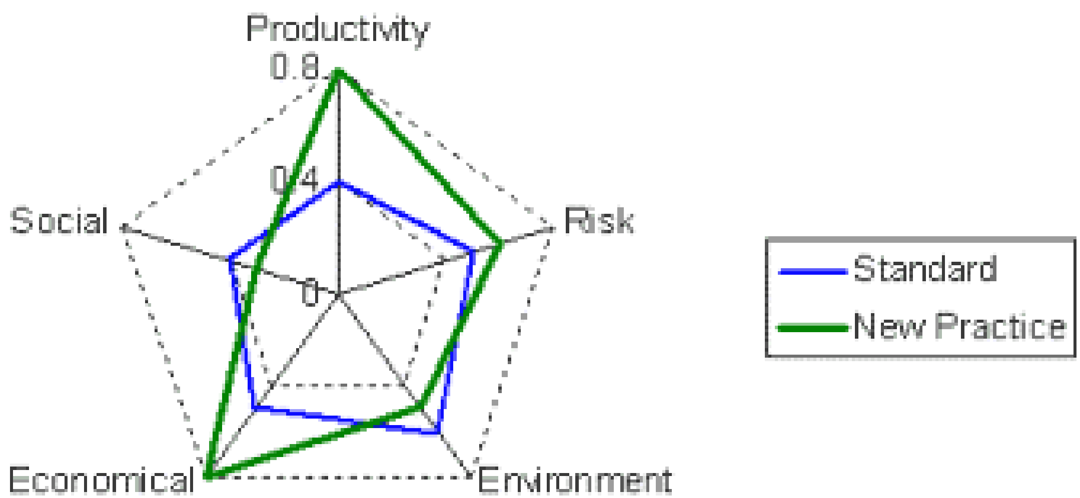

Figure 2: The impacts of introducing new technology on the sustainability dimensions

Even though INRM and livelihood approaches contain elements that are not easy to measure scientifically, let alone compare and rank, these research approaches do not shun the use of solid science. On the contrary, they allow discussions of (a) scientific aspects of integration at different scales in INRM-activities, (b) decision-making process of managers, and (c) negotiations among stakeholders as an essential mechanism to conflict resolution. The role of reductionism in these approaches is secondary (not in quality, but in sequence of call), but there is always a strong role for integrative science. This includes: how to abstract from the complex systems models characterizing only the main issues (as not all processes are equally important), their main inter-relationships including those with environmental conditions (there are always a limited number of interactions more important than all others); and how to determine the dynamics of these systems, their equilibrium and resilience with respect to external influences and minimum levels of assets (below which the agro-ecosystems processes no longer interact and system behavior breaks down). And also: how to do proper INRM and INRM-research with very limited ‘hard data’, and how to incorporate farmers’ knowledge into these frameworks.

It seems a logical development to pursue a livelihood-centered INRM approach as our next way of getting a grip on improving the management by farmers of natural resources and of the other assets they have at their disposal, and to re-focus IWRM more firmly on livelihoods. It basically means more emphasis in IWRM on management and relaxing management constraints and on the ‘capital’ that farm households have at their disposal to overcome these.

IWRM FOR LIVELIHOODS

Many countries, often with support from development banks and bilateral donors, are in the process of adopting IWRM policies and reforming their laws and institutions accordingly. In principle this is a very positive development, as narrowly sectoral approaches to water development have led to serious problems in many river basins. However, examination of the actual implementation of the new IWRM policies shows that it is unusual to find water for peoples' use as a central objective. Considerable attention is paid to demand management, cost recovery, reallocation of water to "higher value" uses, and to environmental conservation. As this process proceeds, agriculture is often identified as "the problem"—i.e., as the villain whose 'wasteful' use of water is the root of all water evils. Conflicting views between environmentalists and specialists in agricultural water emerged as a major theme of the Second World Water Forum in The Netherlands in March 2000 (Cosgrove and Rijsberman 2000).

Further, the application of IWRM should take into account the stage of development of river basins, and which "hydronomic zone" of a basin is being considered (Molden et al. 2001). In basins whose water supply is over-allocated ("closed basins") a policy of demand management and encouraging re-allocation to higher value uses is sensible. But when the same policies are applied to under-developed basins in the name of "IWRM" then more harm than good may be done. In Sub-Saharan Africa less than three percent of the available water resources has been developed; further water resource development for agriculture and other purposes is urgently needed to promote economic development and poverty reduction. But in too many cases IWRM reforms seem to be acting as an impediment to development, directing attention to second generation problems prematurely.

For example, in the Ruaha basin in Tanzania, the authorities assume that recent incidents of drying up of wetlands and reduced levels in hydroelectric reservoirs are entirely due to 'wastage' of water by irrigation and therefore seek to restrict the flows to agriculture during the dry season. Research currently being carried out by Sokoine Agriculture University with IWMI and the University of East Anglia is throwing considerable doubt on this premise (Lankford and van Koppen 2002). Further, irrigated rice production in the basin contributes enormously to the livelihoods and incomes of farmers in the basin, and comprises a significant proportion of the total rice consumed in Tanzania. Oversimplified perspectives on agricultural water use in the context of river basin water management can lead to serious harm to the productivity and well being of people.

There is no disagreement on the IWRM philosophy. But the broad concept needs further elaboration and many practical questions remain. As Moench et al. (2003:5) note, major questions exist over who does the integrating; whose interest should be reflected in the integrating process; how to govern such an integrating process to ensure all stakeholders' interests are equitably reflected; how should disputes be resolved; and which issues should be addressed through integrated approaches, since some could be dealt with separately. No effective institutional IWRM solutions exist in developing countries—but there is wide agreement that "governance"—another broad and nebulous concept—is the key to long-term success (e.g., GWP 2003; Moench et al. 2003). The contribution made by Moench et al. (2003) is to provide detailed case studies from South Asia examining social responses to water issues and the implications for conventional IWRM thinking. Five "core insights" emerged from their work:

1. In economies where a large proportion of the population is directly dependent on agriculture for their livelihoods, access to reliable sources of water is a fundamental factor influencing the level of poverty;
2. Taking a broad integrated approach to solve many of the water-related problems faced by poor people is unnecessary and in the current context of rapid social change and weak institutional structures is not likely to be successful;
3. Hydrologic units such as river basins or aquifers are not always the most appropriate unit for analysis or management—many problems are more localized and can be addressed at a more

local level: the key is to define boundaries at scales that enable effective action in relation to target groups and clients. It has nowadays become fashionable to relate IWRM to the basin level. This might be progress in comparison with earlier days but we should not forget that farmers' perspectives are often at another scale.

4. Much greater effort is needed to devise management approaches that can adapt to hydrologic variability (i.e., spatial and temporal variability in water availability), limited data and knowledge, rapid social, technological, economic, and demographic change, and the dynamics of politics; and
5. The fundamental importance of strengthening governance structures—a process that they found happening in some areas where they worked.

An IWRM framework at the level of the river basin or aquifer can provide an overall framework in terms of understanding broad opportunities and limitations for water development. These can be modeled and scenarios prepared to provide options for stakeholders' consideration. But livelihoods-based IWRM should focus on a) how local-level communities of interest can best use their available water supply to meet needs they themselves identify and prioritize; and b) where necessary and feasible how to bring additional water supplies to such communities to enable them to improve their livelihoods. A strict livelihood approach acknowledges farmers' priorities and time frames but alone it cannot give similar attention to off-site or downstream effects, which might not affect the livelihoods in the actual study area. This not only challenges the backbone of IWRM but also our paradigm of sustainable land and water management. In fact, this challenge simply reflects common reality where individuals give their own concerns the highest priority. Saying this, it becomes obvious that a livelihood-centered INRM (or IWRM) approach has to be built on a broad pillar of stakeholder capacity building to support farmers' and other poor water users' aims to achieve sustainable livelihoods, while accepting social responsibility towards minimizing negative downstream or off-sites effects. This process will need institutional support at different scales.

Livelihood-Centered IWRM at Local Level

This subsection focuses on rural sub-Saharan Africa, although the same points are relevant for South Asia and other poor regions. In sub-Saharan Africa, over 40% of the population lives on less than $1 a day, and food production has failed to keep pace with population growth over the past decade or more. The productivity and income security of the approximately 200 million persons in sub-Saharan Africa who depend largely on agriculture (cropping, livestock, fisheries) can be increased significantly through improved water and land management. At IWMI (2003) our basic hypothesis is as follows:

> *Access to reliable and sufficient water is an essential, though not sufficient, condition for sustainable improvements in agriculture, and can be created and sustained in many regions of sub-Saharan Africa. This water can be used productively by smallholder farmers by making smart use of the many technologies and practices that are already crafted but not truly field-tested, provided that market development, information supply to farmers and adequate legislation go hand in hand with it. Such access to water, and to markets in turn, will encourage sustainable management of the natural resource base, including soils and land.*

For much of rural Africa and indeed much of Asia and parts of Latin America, rainfall is either too low or too erratic to support sustainable productive agriculture. But low-cost technologies such as rainwater harvesting, soil and water conservation, and low-cost water lifting and application technologies (e.g., treadle pumps, small power pumps, bucket and drip systems) can make a difference for millions of farmers. These do not use large amounts of water by themselves, though at a certain scale in watersheds, there can be positive or negative downstream impacts (e.g., see Moench et al. 2003). In these poor rural areas, IWRM should be focused on how to enable local farmers to gain access to and use water for their personal and productive needs. Work in South

Africa, Tanzania, the Horn of Africa and elsewhere has demonstrated clearly that even basic low-cost strategies to capture rainfall, concentrate and store it, and to reuse gray water on a relative small household plot can reap tremendous benefits in terms of improved diets, nutrition and cash incomes (de Lange & Penning de Vries 2003, Ngigi, 2003). IWRM should not only include attention to natural resources and water management institutions; it should also include attention to land access and land management, market access, making information available for smallholders, and provision of supporting infrastructure like roads and telephone networks.

Livelihoods-based IWRM has yet another dimension. Both governments and NGOs tend to approach communities with a single-dimension water supply development proposal: a water supply system for domestic purposes; or an irrigation scheme. But communities have multiple needs: water for personal uses, agriculture, livestock, fishing, laundry, small businesses like brick making. In irrigation schemes there is evidence that the value of the myriad unplanned uses of water may be very significant and may even change perceptions of the return on investment (Renwick 2001). Ironically, use of water from domestic water supply systems for productive purposes is often regarded as illegal, a clear example of a non-systems approach.

Recently interest has grown in examining the potential for multiple use or ‘hybrid’ water systems (Polak et al. 2002; IRC et al. 2003). Rural domestic water supply schemes tend to be expensive and to require external funding since they do not generate an income stream. Their sustainability is often problematic for poor communities without sufficient income to pay even minimal maintenance costs. But hybrid systems, enabling irrigation and therefore intensive cultivation of small plots, can radically change the economics of water supply systems. They become potentially commercial enterprises (Polak et al. 2002), build capital, and are a source of food for improved nutrition and of cash income through the sale of produce; from an IWRM perspective they are classically “integrated.” Rather than approach communities with pre-conceived notions of what is on offer, communities should be assisted to evaluate the water and land resources at their disposal and the various options for making use of these resources for their own benefit. User-friendly models can be used to help stakeholders analyze tradeoffs among the various options to arrive at an affordable hybrid water system. IWMI, International Development Enterprises (IDE) and other partners are currently seeking support to test the concept of hybrid water supply systems under different conditions.

Livelihood-Centered IWRM: Governance

Governance is a part of management at the community as well as basin levels. Governance remains the core issue in IWRM, with many rich as well as developing countries struggling to find institutional mechanisms for its effective implementation. The problem of governance is as salient at local as at river basin and national levels. “Participation” even at local levels is no guarantee of equity and sustainability, especially in communities characterized by serious inequities (Meinzen-Dick and Zwarteveen 1998). At the level of river basins, there are often very powerful vested interests opposed to giving a real voice to poor smallholder farmers; in such a context, how to design institutions that do provide an effective voice to poor stakeholders is an unresolved issue not helped by idealistic rhetoric (Wester, Merrey and de Lange 2003). Further, successful institutional models from rich industrialized countries cannot be transferred to poor developing countries—the problems addressed and the local conditions found in developing countries lead to “limits to leapfrogging” (Shah et al. 2001). In South Africa, a management authority is being developed for the Olifants catchment, with explicit attention to the participation of the smallholders (Schreiner and Van Koppen, 2002), many of whom were excluded from involvement in resource management before.

The governance issue deserves a separate paper. We make only two points here that are directly relevant to our argument for “livelihoods-IWRM.” The first point, also emerging from the studies by Moench et al. (2003), is that we should focus our attention on working with local communities, and seek ways to empower them to solve their own water problems locally. Such ‘empowerment’ includes encouraging stronger institutions based on local cultural principles leavened as necessary by concerns for equity and fair play, integrating scientific knowledge with local wisdom to identify the feasible options available to the community, and helping them to identify any external assistance they may need, for example sources of credit or technical assistance.

The second point is that durable and effective river basin level institutions can only be built on a strong foundation of local institutions. But we cannot wait for the decades required to build strong local institutions before embarking on basin level institutional development. Therefore, we suggest establishing interim forums in which the diverse stakeholders’ interests would be represented, and to use these forums for educating people on IWRM principles as applied to their circumstances. User-friendly models that enable stakeholders to analyze scenarios and contribute to rational decision-making can be used to good effect. Desirable features of such models include: a) the integration of social, economic and technical data, so that the social implications of technical decisions can be illuminated, and b) the ability of presenting several relevant options from which the user can choose the one(s) that fits his/her situation best. Moench et al. (2003) advocate the role of “social auditors” to promote gathering and using good social local data.

An important function of such forums and tools is to make information widely available in a transparent and useable format, as a means to discourage cosy backroom deals for water development**.** In this scenario, if a community wishes to develop its water resource, it would be feasible for all stakeholders to examine the likely impact downstream. If a major commercial interest like a mine wishes to obtain a significant water right it would be possible to examine the tradeoffs, and perhaps negotiate agreements that will be more beneficial to the basin stakeholders. These are somewhat idealistic scenarios, not easily implemented, but they are feasible and should be encouraged widely

Such user-friendly models both require and facilitate developing capacity for data gathering and analysis. Models are only as good as the data used. But there are examples of developing simple but useful models that use as inputs local knowledge, for example about rainfall, flooding, and drought patterns (Sakthivadivel et al. 1997). We therefore urge far more effort to develop, validate and apply user-friendly models based on multiple sources of data, with transparency being the key word with regard to the data used and the underlying assumptions of the models.

CONCLUSION: TOWARD LIVELIHOOD-CENTERED IWRM

As noted above, the GWP defines IWRM as a process that promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. We propose an alternative formulation, as follows:

> “IWRM involves the promotion of human welfare, especially the reduction of poverty and encouragement of better livelihoods and balanced economic growth, through effective, democratic development and management of water and other natural resources at community and national levels, in a framework that is equitable, sustainable, transparent, and as far as possible conserves vital ecosystems.”

This formulation puts people and their well-being at the center of IWRM while retaining the essential features of coordination, integration, equity, and sustainability. It also explicitly recognizes that IWRM must be done at multiple levels—local, watershed, basin, etc. The term ‘transparent’ is intended to capture the point that information must be shared in a useable form with stakeholders, to empower them to contribute to decision-making effectively while accepting social responsibility. Stakeholders can be an important source of information, and thus are creators as well as consumers.

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