1 WATER, POVERTY AND PRODUCTIVE USES OF WATER AT THE HOUSEHOLD LEVEL

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1.1 Introduction

Around the world, hundreds of millions of men, women and children live in extreme poverty. Their poverty is multi-faceted: besides lacking money, they have limited access to education, suffer from poor health, have little political weight, and are vulnerable to all manner of external shocks like droughts and economic crises. In addition they have access to very limited resources, natural, physical or financial: in particular they typically suffer from limited access to water – both of safe quality and adequate quantity. A great many of these poor men and women, in urban, rural and peri-urban settings base their livelihoods on 'informal activities' – small-scale cropping, livestock keeping, agro-processing and other micro-enterprises. In many of these activities an adequate water supply is a crucial enabling resource: as a resource used in or necessary for the activity itself; as a provider of time (by reducing time spent collecting water); or as a key element in improved health that enables people to do work. Taken together then, water supplies provided to households, and particularly the poorest (and women, who are found disproportionately amongst the poorest), have a huge potential to impact on poverty. This symposium is about such water supplies, about how to provide them and how to ensure that their potential to impact on poverty can be fully realised.

People have for millennia used water in many different roles within their livelihoods: drinking, washing, cooking, irrigating, manufacturing, worshipping. Sometimes they allocate specific sources to specific purposes, more often they use the same source or sources for multiple uses. In the last couple of hundred years, the modern water sector has been created, with its range of sub-sectors each with its own approaches, doctrines, and more or less rigid sectoral boundaries. The success of the sectoral approach has been to provide billions of people with safe water supplies: for domestic use, for agriculture, for industry. The failure, as detailed by John Soussan in his paper (Soussan, 2003), is that 20 to 30% of the world's population, the poorest and disproportionately women, have not shared in these benefits. In addition the environment has suffered as piecemeal, un-coordinated development has led to inefficient and unsustainable water resource use.

Until now, the various water sub-sectors have not paid sufficient attention to the fact that their paradigms, norms, and models do not cater to the needs of a large number of their 'clients', and thus fail to achieve the impact on poverty that they could. This is as much institutional blindness as blindness of individuals: line departments have been created to be *line* departments with well defined remits and no mandate to look beyond the boundaries set by these remits; water supply programmes rarely elicit the view of the users as to whether or not the domestic water supply system is providing adequate water from the *users'* point of view. In recent work in India 51% of water points in Kalyandurg were, according to users, failing in one or more key functions (e.g. water of acceptable quality, adequate quantity even during peak summer, acceptable levels of crowding/queuing, no social discrimination, no technical breakdowns etc). Yet according to government statistics the mandal had 100% sustainable coverage (Rama Mohan Rao, *et al.*, 2003). The result of this fragmented approach is water-sector interventions that fail either to be sustainable or to address the real needs of their target audiences, a failing that is most pronounced for the poorest, and particularly, as always, for women and children.

More recently, in the last decade or so, and in reaction to these failures, new approaches are being tried, based on a more holistic approach to working with water and a more context sensitive

approach to providing water services. These approaches come under a number of headings including sustainable development, participatory approaches to development, and integrated water resource management. The cases and experiences reported in the symposium papers provide a number of examples of these new, holistic and people-centred approaches as experienced in the water sector. They demonstrate again and again that the starting point for development and change must come from an understanding of people (men and women, rich and poor, at all levels of society) and what they do (or would like to do) with water. They demonstrate the huge potential that can be realised when multiple uses of water like small-scale food production and other productive enterprises are specifically catered to. However, they also indicate that, to achieve this potential, innovative ideas are not enough. The necessary institutional structures, policy environments, and legislation to support bottom-up development must be exist. Only then can people and organisations take responsibility for issues that are outside, or fall between, the interests and capabilities of individuals and groups, and become empowered to support people's needs.

1.1.1 What the symposium is about – productive water supplies and their use at the household level

What is meant by 'productive use of water at the household level'? The reason for using this rather cumbersome title is the need to describe a set of activities that typically fall between a number of sectors. Household water supplies are most often thought of as coming under the remit of the domestic water supply and sanitation (WATSAN) sub-sector. Yet despite a dictionary definition that says simply 'of or belonging to the home, household, or family affairs'[1], the WATSAN sub-sector typically focuses on water supplies used for drinking, washing, cooking, and sanitation – and nothing else. Water for agricultural production is more often thought of as being provided by the irrigation sector, but this seldom focuses at a household scale. We talk about productive use within this context, then, to refer to water used for small scale, often informal activities such as those described in the papers presented to the symposium. And we use the term '*household level*' to indicate both the relatively small scale activities (and quantities of water) involved, as well as the primary social unit at which the use of this water takes place. Productive water at the household level is the use of a household water supply for activities whose primary purpose is improved nutrition and/or income generation, and refers to quantities over and above those needed for purely domestic consumption. We discuss later in this paper what quantities should be related to household level use, but essentially they are of the order of magnitude 150l per person per day. Not far from what is typically supplied by northern and urban water supply utilities.

The symposium brings together experiences in household level productive use of water from practitioners and researchers from around the world and across water's sub-sectors. The common link between them all is that water plays a range of critical roles in the lives of poor people, and particularly women. Some of them report on new technologies that enable poor people to benefit from sub-surface water, others identify and quantify existing use of water for 'non-planned' activities – productive use of domestic water, domestic use of agricultural water, productive use of waste-water. All draw the central lesson that an approach that takes into account and supports these multiple and often un-planned uses is a stronger and more sustainable one.

The focus of the papers is on small-scale activities that exist at the intersection of commonly recognised water sub-sectors (domestic, agricultural, industrial). Because these activities are *small-scale* and often *informal* they risk dropping through the gaps between sub-sectors - forever destined to be 'somebody else's problem' (although frequently picked up by NGOs whose approach is less sector specific). Yet these informal, diverse, and fragmented activities are absolutely critical to the health and wellbeing of the people who engage in them.

[1] The Pocket Oxford Dictionary (1992)

The papers in these proceedings carry two key recommendations, aimed respectively at the WATSAN (domestic water) sub-sector, and at the wider population involved in providing water for developmental purposes.

a) Recognising the importance of productive water
Productive use is defined primarily with regard to the domestic water supply sector. The bulk of experiences reported in this book relate to what would generally be regarded as supplies falling under the remit of the domestic water supply sector. For the vast majority of people, it is domestic water supply (water as a utility) that is their first and often only source. In particular for the poorest, a domestic water supply is frequently the only potential source of water for any activity. For this sector the key message is to shift from *domestic water supply* to provision of a *household supply* for a range of purposes, and to ensure that productive uses of water are recognised as part and parcel of the domestic 'entitlement' when making allocation decisions (with the important caveats that enough water is available to make this extra allocation sustainable; and that any service provided is financially sustainable).

b) Adopting a holistic approach to development projects that involve water
If there is a core message from the papers presented at this symposium it is that narrow sectoral approaches do not, in the long run, work or generate the benefits required to impact significantly on poverty. Whether it is in dealing with the use of wastewater from a city in India for small-scale irrigation (Bradford *et al*, 2003); dealing with domestic use of water from irrigation canals in Morocco (Boelee & Laamrani, 2003) or designing domestic water supply systems to take account of people's use of these supplies for backyard vegetable production in South Africa (Pérez de Mendiguren Castresana, 2003); it is essential that development of water resources and services is based on a clear understanding of the full range of uses to which people put (or might put) the water provided.

1.2 Why provide household water supplies for productive uses?

At the heart of the question as to 'why' water should be provided for productive uses are the twin desires of reducing poverty, and developing and managing water resources to maximise the sustainable economic and social value added per unit volume. For many of the papers, these aims are addressed through the productive use of water at the household level, which effectively channels relatively small quantities of water to poor households where it is used directly to reduce poverty in the widest sense.

In discussing the potential benefits of improved water supplies we will concentrate on the productive uses of water. This is not because the health benefits are not critical to people's livelihoods: they are. Safe and secure water is essential to poor people's health and survival, but meeting basic needs is not just about health and hygiene, nor do people always see clean water as their most pressing need. These benefits are already so well accepted as to need no further discussion.

It is clear from the papers that follow that while there is a growing realisation of the potential of productive uses there is, as yet, only a limited amount of documented practical experience linked to it. The example of the rope pumps in Nicaragua (Alberts & van der Zee, 2003) is the only truly 'scaled up' as opposed to 'pilot' experience. It would seem that while there is undoubtedly a growing awareness of the importance and potential of a more holistic approach to domestic water supply, there is as yet only the start of a body of concrete experience of how to go about this.

1.2.1 Benefits of productive uses

Improved domestic water supplies and the institutions surrounding them have the potential to impact on poverty in a range of settings: they can reduce sickness, save time, generate income, enhance food security, strengthen local organizations and build cooperation between people. These benefits are summarised in general terms in the box below.

Until recently, these multiple benefits of household water supplies had received little attention within the mainstream WATSAN world. This has started to change and the recent evaluation by WaterAid – an NGO specialising in domestic water supply and sanitation (WaterAid, 2001) – of some of their older water supply projects, is a good example of this, finding (perhaps unsurprisingly!) that a much wider range of benefits were reported by beneficiaries than had been expected or targeted at inception. In a similar vein the recent Drawers of Water II (Thompson *et al*., 2001) identified a range of productive uses that were never envisaged when the systems investigated were first constructed 30 years previously.

1.2.1.1 Gender and reaching the poor

Domestic water supplies are now more or less universally acknowledged as not only a right, but a key development indicator. Domestic water supply (along with electricity and telephones) is a utility, a sine-qua-non for existing in the modern world. One definition of a utility is something you don't notice until it goes wrong!. While in much of the developing world domestic water remains a long way from reaching this utility standard, that it *should* do so is accepted by all. Because it is universally accepted that a domestic water supply should be there for everyone it is an excellent entry point to reaching the poorest. Because it is women who almost universally have responsibility for domestic water supplies it is a good way to target them. Because the amounts used are typically small they can be provided within the domestic framework – though, as we argue later, to do so will mean moving away from low 'survival norms' of the kind used in so many countries. Household water supplies therefore have the potential to reach poor people.

The case studies in this book show what is possible once the water supplies do reach women and the poor. Many of the small scale activities, vegetable gardening, brewing are uniquely or primarily the preserve of women. The money that they raise goes directly to women, who in turn tend to spend it on family wellbeing – items such as education, health-care and essential nutrition. For example, in work in Zimbabwe, Moriarty found that 40% of people involved in community gardening activities spent money on education (Moriarty, 2003).

1.2.1.2 DRA/Cost recovery/ System and service sustainability

System sustainability is perhaps the most pressing preoccupation of the domestic water supply and sanitation sector. Several papers deal with the positive impact of cash raised by productive activities in system maintenance. Demand responsive approaches (DRA) are all about matching systems to people with the primary goal of achieving sustainability. Productive uses of water have a crucial role to play in turning water into the cash with which to buy spare parts and pay for routine maintenance. Clearly establishing the link between water supply and economic benefits also seems to increase people's willingness to pay for their water in the first place.

Box 1: Benefits of household water supplies (after Butterworth and Moriarty, 2003)

Better health – it has been widely established and accepted that more and better quality water, and improved hygiene, reduces disease. Healthy people are able to work and live more productive lives.
Time savings – time and effort spent collecting water can be reduced by improved water supplies. Especially for women and children who shoulder the burden of water collection. Given suitable opportunities this saved time can be turned into money by poor people.
Expenditure savings – improved water supplies lead to reduced expenditure on the generally expensive water provided by water vendors, and less money is spent on drugs to cure sickness.
Well-being – better water supplies reduce pressure on people, especially women. As well as time saved, there is less stress, anxiety, and improved safety when water supplies are available close to home.
Education – with more time and improved health, children are able to attend and perform better at school. Adult learning can also be facilitated through water projects.
Environmental sanitation – good drainage at water-points can improve the local environment, and reduce the risks of diseases transmitted by water-based vectors like malaria
Community capacity – the ability of local institutions to manage resources and systems can be enhanced through projects that build capacity e.g. through organisational and financial skills, O&M etc.
Productivity and income – more opportunities for home-based activities lead to improved employment, productivity and incomes. Non-water-based livelihood activities are possible because of time savings, better health and opportunities to invest expenditure savings. Opportunities for water-based livelihood activities are increased because people can access improved (more reliable, greater quantity) supplies. Improved incomes lead to improved status: for example, of women when their economic contribution to the household is visibly improved.
Investment - expenditure savings and improved incomes associated with water supplies have a multiplier effect. Money can be invested in other activities leading to greater returns. This leads to improved markets for goods and services.
Food security / nutrition – is enhanced when improved water supplies make backyard irrigation or keeping livestock easier. Home-based production may be small in amount, but is often nutritious e.g. vegetables, milk, eggs and meat.

A great many of the failures found in water supplies can be attributed to a poor fit between the supply and the community in which it is installed. Management systems are ill-tuned to existing social structures, technology demands skills that don't exist in the locality, and the water provided is not sufficient for the livelihoods of the people to whom it is provided. Schouten and Moriarty (2003) identify failure to take into account the likely productive uses of water supplies as an important factor in their subsequent failure. Systems that are designed to provide minimal domestic norms do not take account of productive use, and when this takes place (often through illegal connections) the whole system fails.

The succesful cases reported in this book reflect the benefits to both system and user of tailoring water supplies to people's existing livelihood strategies, be it through providing cheap family wells for both productive and domestic purposes in Nicaragua or Zimbabwe (Alberts & van der Zee, 2003; Proudfoot, 2003), or adding a productive element to highly reliable community boreholes, again in Zimbabwe (Mathew, 2003). In this they support earlier work that found increased sustainability in systems when productive use is made of water (Lovell, 2000; Waughray *et al*, 1998, WaterAid, 2001).

Later in the paper we suggest a livelihoods-based approach as one means of practically addressing the need better to tailor household water supplies to people's needs. The livelihoods approach finds echoes in water-specific concepts such as demand responsiveness. However, what is different is that by focussing on livelihoods, stepping outside sectoral boundaries becomes both essential and inevitable.

1.3 How to provide appropriate water services to households

The previous section summarised briefly the findings of papers in terms of the benefits of adopting a flexible approach to providing water for productive use. This next section looks, also in broad brush terms, at the lessons learned in terms of how to go about this. Here we broaden

our initial focus on domestic supplies, to look at how household supplies for productive uses can be provided by a range of different sub-sectoral activities.

Many of the cases show that people frequently use water in different ways to those envisaged by the planners and developers: be it the productive uses of domestic water (Pérez de Mendiguren Castresana 2003; Hope *et al* 2003); productive uses of wastewater (Bradford *et al*, 2003); or the domestic uses of irrigation water (Boelee & Laamrani, 2003). While many of these result in beneficial impacts to users, some also bring increased risks to both people (for example through exposure to waste water in India (Bradford *et al*, 2003) or systems (through over use (McKenzie *et al*, 2003)). However there are also several striking examples of *how* to consciously provide mixed use water supplies. In this section the insights provided by the papers are abstracted and conceptualised under four headings: flexibility and breaking down sectoral barriers; livelihoods-based approaches; household-focused planning at community level; and avoiding technologies that 'cork the source'.

1.3.1 Flexibility and breaking down barriers

Perhaps the most important (and at the same time obvious) lesson is the need for flexibility and breaking down of sectoral barriers. It is perhaps not surprising that most of the examples of productive uses presented come from community level activities initiated by NGOs or donor funded 'projects'. NGOs have been leading the field in adopting a more flexible and livelihoods-focused approach. CARE, ITDG, and PLAN and others all to some extent or other employ a holistic, livelihoods-based approach to their development-focused activities – including provision of water. In this symposium the work of Mvuramanzi Trust (Proudfoot, 2003), and the Bikita integrated water and sanitation project in Zimbabwe (Mathew, 2003), of Bombas de Mecate in Nicaragua (Alberts and van der Zee, 2003), and SEWA in India (James, 2003) all demonstrate the benefits to be gained from being able to ignore sectoral boundaries at a project implementation scale.

The two great advantages enjoyed by both NGOs and projects are flexibility and not having to work within a sector. Both are critical in supporting communities and households in gaining the most from water supplies. It is this flexibility, to pick and choose approaches, recipients, and technologies, and to adopt a holistic approach to identifying interventions in addition to the water supply itself, that lies behind the successes reported here. Examples include the freedom to focus on families with the potential to benefit most as reported by Mvuramanzi Trust (Proudfoot, 2003), or to take a flexible approach in service levels from high yielding boreholes as in Bikita (Mathew, 2003); and, equally, to look at access to credit in conjunction with improved water supplies in India (James, 2003) or to think about training and technologies for risk minimisation for wastewater irrigators in India (Bradford *et al*., 2003).

Many cases show the importance of working across traditional boundaries. At its simplest this could mean working across tradition sub-sectoral boundaries – WATSAN people talking to irrigation experts to identify the most appropriate form of small scale irrigation likely to suit back-yard vegetable production, as Mvuramanzi trust has been experimenting with in Zimbabwe. More complex is the need to look at less obvious relations such as between credit and water supply. In a similar vein, a recent study in Nicaragua found that access to drinking water and electricity strongly influences earnings from non-farm self-employment and, along with at least a passable dirt road, appear to be prerequisites for successful rural business (Corral & Reardon, 2001). This result, which rediscovers the importance of 'the utilities' to people's lives should not be as surprising as it is! The link between rural electrification and increased use of water for productive activities is well known in India for example.

Most of the examples presented come, as already noted, from the NGO/donor funded body of experience. However, to scale up it is of course essential that the approaches are adopted at a national level – as was the case with rope pumps in Nicaragua (Alberts & van der Zee, 2003).

The critical issue of taking productive approaches to scale is further developed in the final section of the paper.

As a final point, it is important to note that the 'how' is not limited to the domestic water supply sector. While, for the majority of the world's population, their household water supply is likely to come from a 'domestic' source, there are many people for whom it is as likely to come from an irrigation source. In some areas – such as parts of Southeast Asia it may be that this is how the majority of people in rural areas will receive their household water supply. The multiple roles of irrigation systems are now recognized in providing water for livestock, gardens and other domestic micro-enterprises. Water is often diverted from irrigation canals to supply these informal activities. These smaller-scale activities, often under the control of women, have traditionally been overlooked in the same way as the productive use of domestic water. In parts of India, people rely upon collection of safe quality drinking water from irrigation wells where domestic water supplies contain high fluoride levels. The international water management institute now have several research projects focused on such multiple uses of 'irrigation' water (see, for example, Boelee, 2003). A negative example, but one which also supports the need for greater flexibility and cross-sectoral coordination, is the use of waste water for household scale irrigation in peri-urban areas as represented by the Hulwi-Darwhad case study (Bradford *et al*., 2003). Here wastewater irrigation exists currently as a totally informal activity, with a range of serious health hazards to both practitioners and users of the produce. People need to make a living, and will therefore not be dissuaded from using raw sewage to irrigate. A flexible and holistic approach – as recommended by the authors – would therefore seek to work with the irrigators to reduce the risks to both themselves and their clients.

1.3.2 Livelihoods-based approaches

To adopt the sort of flexible approach required demands a methodology that allows the link between people's needs and the design of a water supply system to be tailored as effectively as possible. One set of approaches, arising from the participatory school, are 'livelihoods approaches'. Livelihoods approaches have emerged, along with other participatory and people-centred concepts, as a key element of development thinking over the last ten years. DFID's Sustainable Livelihoods, CARE's Household Livelihood Security, or UNDP's sustainable human development are all examples of agencies taking up livelihoods-based approaches as practical tools for implementing pro-poor and poverty focused development. This section looks at the implications of taking a livelihoods-based approach to domestic water supply.

While the language and philosophy of livelihoods approaches are very helpful in examining, understanding, and planning a multi-role use of water, it should also be clear that, like so many other approaches from the participatory school they are in effect applied common sense, a point made by Critchley & Brommer (2003). Essentially, the livelihoods approach says that development interventions and planning should be based on a thorough analysis and understanding of how people's livelihoods work now, how they have changed over time and could be improved in the future, and of the critical potentials and obstacles to doing so. From the point of view of water sector practitioners, taking a livelihoods approach means identifying the existing and potential role of water in people's livelihoods – productive, health, consumptive – and identifying sustainable and effective ways of meeting these needs. For an introduction to livelihoods terminology, concepts, and how they can be applied to the water sector see Butterworth and Moriarty (2003).

The project cited in the Zimbabwe case study, and most of the other examples of productive uses of domestic water given earlier, did not explicitly follow a livelihoods approach – this has only really become a practical guide to project design in the last couple of years. Nonetheless all of the succesful interventions can be understood in terms of having provided a technology or approach that fitted well with people's existing livelihoods. The opposite would be technologies or approaches that require a radical change on the part of people from their existing livelihoods – large irrigation schemes, or complex domestic supply systems for example. Perhaps the greatest

value of a livelihoods approach to water supply is that it leads to identification of the many and complex ways in which water supply improvements *have the potential* to affect peoples lives, and from that helps to identify bottlenecks and prioritise activities.

Of course, improving water services only removes or minimises one potential constraint – or, more positively, only provides one new asset on which people can build – faced by people in pursuing livelihood activities. Other constraints, such as the availability of markets, may be of equal or more importance (James, 2003).

1.3.3 Technologies – don't cork the source!

Several papers presented suggest that technology has a critical role to play in addressing the need for productive water. In particular there is strong criticism from Alberts & van der Zee (2003) of an inappropriately applied 'small is beautiful' approach that means that in many cases expensive borewells capable of providing sufficient water for a range of activities are plugged with relatively expensive hand-pumps that are unable to deliver the full potential water of the borehole. Lovell (2000) identified a similar problem in Zimbabwe where official support for the bush-pump as the *only* technology accepted for rural water supply meant that the very low norms (25 l/p/d within 500 m) of the rural water supply and sanitation programme were effectively 'hard-wired' into the system.

While only indirectly related to technology choice – rather than simple under-design – the issue of system failure due to unplanned productive use is also important. Schouten and Moriarty (2003) identified this as among the major causes of failure in community managed systems. In South Africa where 'illegal' (unplanned) household connections are a frequent cause of system failure or under-performance (see for example Mckenzie, *et al*, 2003) people do use their household connections for a range of productive purposes.

As was already discussed in the previous section, it is the mismatch between systems and people's needs or livelihoods choices that leads to system failure. Technology choice sits at the heart of a complex network linking needs, resources, skills and support structures. As such technology choice can also benefit from a livelihoods-based analysis – looking at what the implications are for any given technology choice in terms of maintenance needs, management structures, potential yield and types of activities possible.

The great issue surrounding technology, from the planner's point of view, is, of course, cost. While sustainability should, of course, rank equally, if not more highly, it seldom does. The following section, which identifies the most important issues surrounding productive uses of water at the household level, looks in more detail at this particularly crucial area.

1.4 Key issues to providing productive water

1.4.1 Costs and benefits

At the heart of any discussion of service provision lies cost – or more precisely achieving the correct balance between cost and benefit. Most rural domestic water supply services are based on cost minimisation, with the added proviso that sustainability is achieved. In this they clearly differ from agricultural sector supplies which are targeted at maximising production. The cases reported in the book are clear on the benefits of providing mixed use water supplies. They are less clear on the costs. True, in the case of the rope pump, it seems that a genuinely win-win technology exists – both cheaper and higher yielding than more conventional hand-pumps. Nonetheless in many cases the increased supply of water needed for productive uses will bring with it increased costs – both capital and operational. However, they will also bring extra benefits, and turning these extra benefits into increased willingness to pay for supplies is therefore crucial to the issue of cost recovery. As Pérez de Mendiguren Castresana (2003) points out in his paper, no automatic link can be assumed between increased income from water

and increased ability or willingness to pay for services, a point that is echoed by Pérez *et al*. (2003) in Colombia. Nevertheless, there is also evidence that in the right settings – particularly where individuals or communities have genuine ownership of the systems – the extra income provided by the productive uses does turn into greater sustainability. This is particularly – and perhaps obviously – the case with family systems of the sort reported by Albertsand van der Zee (2003) in Nicaragua or Proudfoot (2003) in Zimbabwe, but it is also the case with community systems as reported in this book by Mathew (2003), but also elsewhere (Moriarty 2003, Lovell 2000)

When considering the cost of providing extra water for productive uses, the most important factor is the incremental cost of supplying the additional water. Capital and operation and maintenance costs for water systems in South Africa are shown in Box 2. There are huge increases in costs when moving from handpumps supplied by groundwater to any kind of piped water supply. But after, this leap has been made, the additional capital costs involved in moving from communal standposts supplying as little as 15 l per person per day to systems supplying 25, 60 or 120 l is much less then the proportional increase in water supplied. The important point is that, given universal commitment to domestic water supplies, the costs and benefits of productive water schemes should be judged against the incremental capital and O&M costs in supplying water, rather than the absolute costs of a scheme. As can be seen from the example from Bushbuckridge, the incremental costs are in any case much smaller than the potential benefits from productive use.

As a final word in this section, and one that has relevance to the discussions of the implications of productive uses for IWRM and rights-based approaches, it is worth clarifying the difference between the largely financial focus of this discussion of costs and benefits, and the underlying economic issues relating to the small-scale productive uses of water. Estimating the value of keeping people healthy, educated, employed, and all the other benefits that have been demonstrated to flow from productive uses of water is a far more complex task than working out the financial returns of a given activity. It is our belief that in most cases small scale productive uses of water are the highest economically valuable use to which water resources can be put. This has important implications for water allocation (as discussed in the next section). It is already generally accepted that the provision of 'domestic' water is the most economically important use to which water resources can be put. It is therefore not stretching things too far to suggest that water used for small scale productive purposes, with its potential to make small but measurable improvements in the lives of billions of people, should be added to this 'domestic' supply when making rights-based allocations of water resources. We propose the term 'household' water to encompass this combination of domestic and small scale productive supply. The critical question of *how much* water should be included in this expanded definition is dealt with in the final section under the heading redefining basic needs.

Box 2 Incremental costs of supplying water

Service level	Rural – handpump	Rural/ peri-urban - communal standpost	Urban - yard tank (low pressure)	Urban - roof tank (medium pressure)	Urban - piped water and house connection (full pressure)
Typical consumption (l/p/d)	15-25	15-25	25	60	120
Capital cost in (€/household)	25	305	390	470	530
O&M costs (€/household/ month)	0.4	1.4	2	2.4	3.8

Note – Figures compiled from 2 studies carried out for DWAF. O&M costs exclude capital repayment.
The extra capital cost implied in designing a system to supply 60 l/p/d from roof tanks compared to 25 l/p/d from yard tanks is €80 per household. The extra O&M costs over 20 years would be €96. For this extra cost, an additional 35 l/p/d is available, equivalent to over 1,500 m^3 over twenty years! The combined additional cost per m^3 is therefore €0.11.

Potential benefits of extra water
A study in the Bushbuckridge area, South Africa (Pérez de Mendiguren Castresana and Mabelane, 2001) showed that economic returns from productive uses of domestic water were relatively high. Even in this 'rural' area (being a former homeland it still has fairly high population densities), benefits ranged from €1-2 per m^3 for vegetable gardens and fruit trees (the most common use of 'extra' water) to €120-160 per m^3 for beer brewing and ice block making (assumed 1€ = 10 South Africa Rand)

1.4.2 Demand management and maintaining system integrity

While we advocate the position of small scale productive uses at the top of the water allocation pyramid, second in line only to core domestic needs, there are clear problems where unplanned productive use takes place – particularly using water from under-designed 'domestic' systems. Unrestricted productive uses of domestic water may not always be positive and desirable. Irrigation of low value crops like cassava on some relatively large plots (up to an acre) around houses in villages and towns in the Nkomati area of South Africa close to the Mozambique border, for example, does not produce that much income compared to the cost of piped water supplies (Butterworth and Moriarty, 2003). And this causes problems for domestic water users at the tail-end of the system and in the higher parts of the towns. Clearly there are limits to what is desirable and higher value uses are preferable. Also, beneficial use of water by poor people who may not be served by other systems, and for whom any diversification of livelihoods is critical, should be encouraged.

By explicitly recognising that productive use is inevitable, it is possible to take account of it in planning and to include it in demand management, for instance by introducing stepped tariffs. In South Africa the recent draft water policy proposes that productive activities should utilise water services on a full cost recovery basis, unlike water for basic domestic needs which is free (up to 25 l/p/d). However, it is likely to be very difficult in some circumstances to charge for water use for informal sector home-based activities, especially where cost recovery systems are not already in place for domestic water. Some subsidies may also make sense on equity and practical grounds – and the South African policy recognises this. By their very nature these activities are irregular, happening seasonally or on an occasional basis. Enterprises with their own premises and operating formally and more regularly can be more easily charged for water.

1.4.2.1 Is productive use a waste of 'drinking quality' water ?

An oft heard criticism of designing productive uses of water into 'domestic' supplies is that this represents a waste of expensively treated drinking quality water. This argument is in general wrong (for a number of reasons) and only occasionally right. Firstly, and perhaps most importantly, it is wrong because it ignores the historic reality of the domestic water supply sector: it is only comparatively recently (within the last couple of decades) that even in the north has it been the norm to provide drinking quality water from taps – it continues to be the norm in many developed countries to use the tap water supply for all activities except drinking, with drinking water being sourced from springs or bottles as is the case in Colombia (Pérez *et al*., 2003). Secondly because it ignores the reality of how domestic water supplies are used worldwide – after all if it is wasteful to use drinking water for irrigating vegetables, how much more wasteful to use it to float faeces down a sewer, not to mention watering lawns, washing cars etc. Thirdly, in the vast majority of cases, the water that flows from developing country taps, standposts or handpumps is only rarely of true drinking water quality. This is particularly true of 'treated' surface water supplies, where problems of quality control at treatment works, lack of chemicals, intermittent pressure, leaks, etc. mean that water coming out of the tap is seldom safe for immediate consumption. In the vast majority of groundwater fed systems in rural areas there is no treatment at all. Achieving drinking water quality is almost always in practice a household level activity, where good hygiene education is as, or more, important than technological fixes. Finally, as the cost benefit analysis developed earlier shows, at the end of the day the costs of providing a limited quantity of productive water (treated if necessary) through a domestic network will almost invariably be lower (and lead to a more sustainable result) than developing a second parallel network.

There are of course exceptions to any rule, and there are cases, particularly where chemical contamination renders some water unfit for human consumption and expensive to treat, where drinking and productive sources and supplies should be managed separately. This is the case in many parts of India and Bangladesh where chemical contamination (fluoride and arsenic being the best known) means that drinking quality water needs to be carefully managed.

1.4.3 Scaling up productive uses

In this section we look at the issue of taking productive uses to scale under two sub-headings. The first, breaking down sectoral boundaries and re-defining the role of government, deals with the institutional and implementation aspects of scaling up productive approaches. The second, the right to an equitable share, deals with it from a water resource management point of view.

1.4.3.1 Breaking down sectoral boundaries and re-defining the role of government

As was noted earlier, many of the successes related to small-scale productive uses of water come from the NGO or donor funded sector. In the past they have often had the advantage of working largely outside government frameworks (although this is now changing), particularly those represented by line ministries with their narrow sectoral remits. As a result they have been able to take a more flexible and livelihoods-centred approach. However, the down-side is that their successes tend to remain limited to the projects and communities where they work – and even these can fail once the agencies 'hand-over' and move on. Alberts and van der Zee (2003) highlight this problem in their paper on the success of rope pumps in Nicaragua (and their failure to take off in similar ways elsewhere). In Nicaragua, following initial pilot success, the rope pump was taken up by the national government and included in the norms for domestic water supply. Elsewhere, largely due to vested interests of those linked to the importation of expensive hand-pumps, the rope pump has not gained this stamp of approval and remains a technology used on the fringes by NGOs, and increasingly by famillies who opt for it independently as they see its effectiveness and relevance.

Taking productive use to scale therefore requires all those involved in supplying water, but most importantly governments and responsible ministries, to change how they work. Much of that change is already underway through decentralisation and deconcentration of responsibilities.

Policy and legislation such as that from South Africa show the way, with devolved decision making and legislative encouragement to break down sector barriers.

Probably the single most crucial legislative change is the acknowledgement of productive uses in national domestic water supply legislation, and related domestic water supply norms. Without this, those working in line ministries will continue to find it difficult to take up the challenge of incorporating productive uses into the mainstream. An important issue here is the wider recognition within national policies of the informal sector. Many of the cases presented in these proceedings revolve around informal activities and, while a reliable water supply is a crucial input in many, it is far from the only one.

However, changing policy and legislation is just the start. To take advantage of the opportunities offered by such changes, it will be necessary to develop a whole new cadre of professionals trained in providing and supporting small scale productive uses of water. It will also be necessary to change training programmes and curricula to incorporate designing for productive uses of domestic water, and to increase the ability of professionals to work across sectoral boundaries. For this to happen, a wider range of experiences and models will be needed. The papers presented here identify a number, however there is still a need for larger, more detailed case studies to underpin the redesign of norms, tariff structures and economic models, and for tools to support system design that incorporates productive uses.

1.4.3.2 Rights, priorities, and implications for investment and water resources management.

The final paragraphs of this section are devoted to Integrated Water Resource Management (IWRM), and the related issue of rights-based approaches, both of which are strongly linked to productive uses of domestic water. Integrated water resources management is defined as being:

'a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems'. (GWP, 2000)

IWRM, as expressed in the above definition, and in the four Dublin principles (WMO, 1992) is based on the holistic management of water across disciplines and sectors; decentralised approaches; the importance of women; and water's role as a crucial economic and social good. The gradual blurring and breaking down of the boundaries between water supply projects providing water for drinking and other domestic users, agricultural departments supporting community gardens, and departments or autonomous parastatals supporting larger scale irrigation schemes are fully in line with the holistic principles of IWRM. Decentralisation is called for in the Dublin principles, and is also an ally of more holistic approaches generally, with line ministry branches under local control less able to function autonomously without reference to local reality than is the case where they are centralised.

What then are the IWRM implications of promoting more productive use of domestic water supplies? Firstly, and most importantly, accepting the potential of the household water concept clearly means a need for more water for small-scale users even if sound principles of demand management are employed. As well as imposing demands on infrastructure to supply water and management systems, it is likely to mean greater abstractions from aquifers, rivers or reservoirs or, more contentiously, a need to reallocate existing abstractions. These need to be decided upon within an IWRM framework that considers issues such as the potential impacts on downstream users and the benefits associated with alternative uses. These issues will be particularly important in water-scarce river basins.

But, because productive uses of domestic water often relate to the less visible informal sector and do not fit neatly into the categories in which most sector professionals have been trained, they are in danger of being left out in the hierarchy of water allocation priorities. These uses may fall between domestic needs – invariably given highest priority – and the needs of industry or agriculture which come next and are typically represented by powerful, well-organised bodies.

Productive users of domestic water on the other hand are scattered, poorly represented, and therefore easy to overlook. We believe that household water supplies should be treated as domestic water already is, and should not normally be subject to the same allocation processes as water for 'commercial' uses. In other words, a proportion of water for productive use (as part of a household allocation) should therefore be included in rights-based allocations. This argument is based primarily on principles of equity, however it is also underpinned by the hypothesis that a proper economic evaluation of water use will show that small scale productive uses are generally more economically important than other uses.

Finally, it is worth briefly addressing the issue of the absolute quantities of water used for household use, and whether these in themselves may become unsustainable. In many countries of the world this is a non-issue, with the problem continuing to be one of inadequate supply rather than serious resource shortage. However there are also many countries, including South Africa and India, where over-use of water-stressed basins - or over-abstracted groundwater aquifers – mean that water may be physically scarce, if not all the time at least during dry seasons and periods of drought. However, even there small-scale uses are minimal compared to the larger irrigation farmers and industries (especially mining – a major user and polluter) which use relatively much more water. Here the issue becomes one of allocation, or reallocation. Demand management should target those large-scale users – however difficult that be politically. Refusing productive use of water to the poorest on the grounds of future water resource scarcity is rather like saying that a young child should not be given food because then it will grow up and die. In the typically data-poor and rapidly changing environment of many developing countries an adaptive management strategy – in which cautious and sensible development is carefully monitored for any signs of adverse impact and adjusted accordingly - is often more effective than attempts to make 'rational' long term decisions based on analysis of inadequate information.

1.4.4 Community level planning for household level use

A final issue worth considering in this section is that of the level at which household water supplies should be planned. We have suggested the concept of household water supply as a replacement for the overly narrow existing concept of domestic water. However, the reality is that – despite successes such as Zimbabwe's household wells, or Nicaragua's rope pumps - most households' water supplies come through communal water systems of one sort or another. So, while we advocate planning on the basis of household use of water, this will need to be done at a community level.

In terms of equity the lesson of decades of developmental effort is simple. Any developmental activity that does not either aim for total coverage or specifically target the poor will end up leaving them out. So, for instance, household water supplies from individual household level water points are unlikely to be spontaneously adopted by the poorest (as noted by Mvuramanzi in Zimbabwe (Proudfoot, 2003)). Only by planning at a community level can total coverage be ensured. Only by ensuring total coverage can the poorest be reached.

With regard to the efficient use of resources, planning at the scale of the community allows a balance to be made between a variety of sources. So, for example, within a community average household need may be assessed at 150l/p/d which may be sourced from a mix of private, public, low and high quality sources, different sources being used for different purposes - a dam for cattle and laundry, boreholes and rainwater harvesting for drinking water supply, rooftop rainwater harvesting for backyard gardens, and stand-alone boreholes for a community garden.

1.5 Moving forward, next steps

1.5.1 Developing a policy environment favourable to mixed use household water supplies

In the previous section we identified the need for a paradigm shift away from existing sector-based water supply models to a new concept of 'household water supply'. In the longer term we

believe this should mean a goal of piped (preferably from sources close to the community) water supplies in each household. In the shorter term it will imply developing planning tools for matching multiple sources with multiple uses at the community level. Essentially we are advocating a change in the way in which people working with the poor and women work with and develop water. This is needed primarily at the level of those agencies whose task it is to provide water, where managers and decision makers in the various water sub-sectors should start to view their primary goal as the tackling of poverty through the supply of sustainable and appropriate household water services.

The ground is shifting. In particular, the widespread advocacy of demand-responsive approaches within the WATSAN sector should lead to the voice of household water needs becoming more generally heard and recognized. An encouraging indication that this shift is happening is seen in South Africa's recent draft white paper, which explicitly recognises productive uses of domestic water – although it maintains its focus on domestic water supply and does not explicitly mention 'informal' activities (Box 3).

Box 3 - In the recent draft white paper on water services in South Africa, economic activities are explicitly recognised:
'Municipalities do not, and should not, only provide water services necessary for basic health and hygiene. It is important that municipalities undertake health education, facilitate the provision of higher levels of services for domestic users and provide services which support the economic development and well-being of communities.' (DWAF, 2002)

The final section of this paper therefore looks at what the next steps are to enabling this change, in terms of research for new approaches, and advocacy aimed at supporting the concept of household water supplies, but also at creating the necessary changes in the policy environment to allow the concept to be implemented. However, before moving on to these future issues we try to develop an initial estimate of just what a household water supply might look like in terms of quantity and quality of water supplied.

1.5.2 Redefining basic needs

The traditional definition of basic needs (for drinking, sanitation, bathing and cooking – see Box 4) means that design norms are often insufficient to provide for the range of household-based activities desribed in the papers in these proceedings. A supply-focused approach based upon norms that do not take account of productive water uses has been dominant in WATSAN over recent decades. When, as is the case everywhere in the North, and in many urban areas and cities in the South, these norms are set to very high levels, this does not cause a problem. However when extremely low 'survival' norms are set, such as South Africa's benchmark short-term target of 25 l/p/d, opportunities to engage in productive activities are severely constrained.

Box 4 Domestic water supply norms
The traditional approach to 'basic needs' excludes water for productive activities within the household. Gleick (1996), for example, proposed 50 l per person per day as a recommended minimum based on the following figures.

Purpose (l per person per day)	Recommended minimum
Drinking water	5
Sanitation services	20
Bathing	15
Cooking and kitchen	10
Total	50

In different countries there are different 'basic needs' targets. Sometimes these are as low as 25 l per person per day (e.g. rural South Africa), or as high as 55 l (India's recently revised target). Targets are best reviewed and revised to suit circumstances. For example, South Africa proposed short, medium and long-term targets to pragmatically address water supply backlogs.

So, given that 25l/p/d is not enough, how much is? Firstly we should be clear that good IWRM practice, and good common sense, make it obvious that such a figure should not be decided on a one size fits all basis. Household water supply norms should be decided on a national (or ideally) catchment basis, and should adopt a building block approach starting with water needed for drinking and bathing and working up to possible productive activities. Box 5 below sets out the water use associated with a number of productive activities such as livestock watering and growing tomatoes.

Box 5 Water use associated with different activities

Some examples:

- In India, design norms assume that large stock (cow or buffalo) will need 50l/d, while small stock require 10 l/d.
- Using FAO's Crop Water Requirement guidelines, a conservative estimate of water requirement for irrigating tomatoes is 100l/d for 24m^2 (this could yield 100 kg every 120 days)
- Polak *et al.* (2003) in their description of hybrid systems state that a backyard drip irrigation system needs 500l/d

Depending on the setting, different elements could be added to the calculation of the norm – so, for example in arid areas with pastoralist inhabitants, livestock-based norms would be used, while in less arid rural areas the importance of being able to grow vegetables around the house might predominate, and in peri-urban areas commercial uses would have the leading role.

Given the need to tailor norms to local realities, we nonetheless feel confident in suggesting that in all but the most extreme cases (such as desert dwellers) a norm falling in the range 100-200l/p/d would be both adequate and, from a water resources point of view, sustainable. This represents a huge increase from the survival norms of Africa and India, but is comparable with most urban utility supplies. With such a supply, a family of five could comfortably irrigate 100m^2 of garden (assuming that they have access to the necessary land), or water 5 cattle, or a mix of the two. The benefits to the household concerned and society as a whole of the productive uses of this water are, we believe, been amply demonstrated in the papers that follow.

In terms of quality, as we discussed earlier, treating water supplied through piped networks to full drinking water quality may not be the best use of scarce resources. Rather a greater quantity of domestic (but non-drinking) quality water, underpinned by good hygiene awareness raising, is more likely to impact on both poverty and health. When household water supplies are being met by a mix of sources (rooftop, borewell, piped network etc.) then clearly the most appropriate quality norm for the planned use should apply.

Finally , we briefly look at what is required to move the discussion of productive uses of household water forward in terms of a) advocacy for policy change, and b) research to underpin the development of new models and tools

1.5.3 Advocacy

In this paper we have advocated the concept of a multi-purpose 'household supply' as an alternative to the current domestic supply. Whether the concept is taken up under this or another name, there is a need for a concerted effort to ensure that those responsible for providing water to people – be they from the domestic, or agricultural water sectors – take a needs-based and

inclusive approach that recognise the potential for water to serve multiple roles within people's livelihoods. This advocacy should focus on a number of distinct priorities.

1.5.3.1 Multi-use water supplies – water as a key element in planning for development

Water should, in planning terms at least, escape from its current sectoral straight-jacket and be planned at a local level to satisfy all household needs. In practical terms this means that irrigation schemes need to take account of domestic needs and requirements, and domestic schemes need to take account of the need to provide water for productive use (at least up to the threshold norm for household supplies – see next point). Planners need to be encouraged to seek to match available water from all sources (conventional, and non-conventional) with needs in a sustainable manner.

1.5.3.2 Quantity – 100-200l/p/d as a threshold norm for household supplies

Firstly, there is the issue of what is considered an adequate quantity to supply to people. The figure of 100-200 l/p/d is one that we believe to be both realistic and reasonable, and based on a growing body of experience as presented in this symposium. Survival norms of 25 or 50 l/p/d should be recognised as appropriate in only the most extreme emergency or drought scenarios.

1.5.3.3 Equity – poor people have a right to an equitable share of water resources

Secondly, this threshold household use norm should form the basis of water resource management and allocation. Using the concept of the pyramid of need, the apex of the pyramid should be reserved for survival levels of domestic water, and the next step for the basic level of household supply. Only where sufficient quantities exist to meet these and environmental needs should excess water be allocated to other sectors and uses.

1.5.4 Further research

These proceedings include twenty case studies. However, far more are needed, from a wider range of countries. A body of strong case study material will be instrumental in persuading the various water sub-sectors to change their approach. However, in addition to general success stories and 'how to' cases, specific research in a number of areas is particularly important. Three of these are considered:

1.5.4.1 Hard evidence of costs and benefits of supplying increased quantities of water for mixed use

One of the most compelling critiques of providing increased quantities of water for domestic use is that 'it is too expensive'. 1.1 billion people lack any safe water supply and, while various figures are floated as to how much it will cost to meet this need, they all have in common that they are hugely greater than current investment levels. To then recommend that water supply norms should be doubled or tripled is open to accusations of being grossly unrealistic.

To counter these arguments two sorts of evidence are necessary. Firstly, better data on the *incremental* costs of supplying increased quantities of water - and the *incremental* benefits of an increased water supply. How much does it cost to provide each extra litre of water above the 25 or 50 l survival norm? And how does it compare to the extra benefits gained? While these figures, particularly the first, would seem rather basic, they are extremely difficult to find (Fonseca, pers. comm.). Evidence reported at the symposium certainly gives reason to form a strong hypothesis that, within the sort of order of magnitude of supply we are talking about, the benefits will considerably outweigh the costs. There is clearly a need for more and better data.

With these figures it is at least possible to make the financial and economic arguments for increased supply. Nonetheless this is only half the argument. Secondly, therefore, there is a need for more studies showing that not only do benefits outweigh costs, but also that this in turn leads to increased willingness to pay and actual cost recovery. At the end of the day, if the huge deficit in water supply is to be met, new forms of financing are going to have to be identified. Proof that increased water supplies can be turned into increased revenue flows would give very

powerful ammunition to the argument that not only is increased supply for productive use economically sensible, but it leads to more profitable water supply options.

1.5.4.2 Required changes to policy, legislation and institutions

Finally, while advocacy for change is needed, and evidence on which to base the advocacy essential, on their own they are not enough. Once people have been persuaded to take a new approach, they still need to be told how to do so. This requires models, tools, and training materials: models for legislation, policy and financing mechanisms, tools to support holistic, livelihoods- and poverty- focused planning for water supply services, and training materials to teach people how to use them.

1.6 Conclusions

- People draw multiple benefits from access to small-scale water supplies – it is the combination of these benefits that add up to an appreciable impact on livelihoods and poverty. Artificial distinctions between domestic and other water use should be abandoned in favour of the concept of a 'household water supply' which is sufficient for a range of domestic- and household-scale productive activities suitable to the livelihoods of the people concerned.
- Narrow approaches to water supply, that neglect the potential of productive uses, are an opportunity missed. Worse than that, because in practice people will use water for productive activities anyway, ignoring productive use leads to undersigned systems that fail through unplanned use. It is therefore much better to include small scale productive use in initial system planning and design.
- One of the major reasons that projects fail to address these needs is that such small scale productive uses slip between sub-sectoral remits. A sub-sectoral approach, where irrigation, industrial, drinking and waste water services are treated separately, often fails. Projects implemented under these rigid sub-sectoral approaches usually don't recognise multiple benefits, and therefore don't impact on poverty as effectively as they could.
- Low and inflexible norms-based 'basic needs' or rights-based approaches can also be a handicap – by setting targets too low they fail to provide for the very productive activities that could help people grow food, make money, and escape poverty. These uses should be considered basic or standard. Norms are required for proper planning, but they should be based on at least some productive use, and should in any case act as benchmarks and not upper limits. A norm of 100-200 l/p/d depending on setting should be adequate to provide sufficient water for productive uses while not placing (in any but the most extreme emergency or drought situations) an unbearable strain on water resources.
- There are many positive examples now emerging of how better water supplies do impact on livelihoods and poverty. This is good news, but they need to be supplemented and reported more widely. While research findings are now strong, there continue to be few (if any) models, or toolkits that address the wider needs of people for multi-purpose water supplies. In addition, examples reported tend to be project- and location-specific and have not yet been taken to scale. Monitoring indicators in particular need to be expanded to capture the full range of benefits of improved water supplies to women and the poor.
- There is a genuine increase in recognition, across the water sub-sectors, of the need for a holistic approach to meeting people's water needs at household level, and there is some convergence between sectors. In particular, the domestic and irrigation sector are both starting to recognise the importance of household water supplies (albeit from different starting points). These trends are encouraging evidence of a more integrated approach to water resource development and management.
- Livelihoods-based approaches to developing water resources offer a potential justification of and incentive to genuinely bottom up Integrated Water Resource Management. They also provide a challenge to all those who claim to represent the largely poor and scattered small scale users of water: to include their demands within rights-based approaches, to ensure that

their voice is heard at the catchment management table, and to ensure that they get a fair share of available water resources.

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