Multiple-use water services: climbing the water ladder

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This article presents findings of the action-research project on the what, why and how of 'multiple-use water services' or MUS, supported by the Challenge Program on Water and Food (active in 30 sites in 8 countries in Latin America, Africa and Asia). The consortium of partners from the domestic and productive water sectors pioneered the implementation of two models of MUS on the ground: homestead-scale MUS and community-scale MUS. Further, through learning alliances of 150 institutions, the project pilot-tested ways to scale-up MUS among intermediate- and national-level water service providers. Key lessons for scaling up by water users' movements, NGOs, the domestic sector, the productive sector and local government are discussed. Also in the light of the growing recognition of MUS across the globe, further innovation and implementation at scale are warranted to tap the many identified opportunities of MUS compared with single-use approaches.

Keywords: multiple-use systems, community-scale MUS, homestead-scale MUS, learning alliances.

What are multiple-use water services (MUS), why are they important and how can they be run? This article derives from the action-project supported by the Challenge Program on Water and Food 'Models for implementing multiple-use water supply systems for enhanced land and water productivity, rural livelihoods and gender equity'. This project pioneered, tested and analysed the implementation of MUS on the ground and its scaling-up at intermediate, national and global levels (MUSproject www.musgroup.net/musproject; Van Koppen et al., 2009). The consortium consisted of the international partners International Water Management Institute, IRC International Water and Sanitation Center, and International Development Enterprises, and a wide range of national partners in eight countries: the Andes (Bolivia and Colombia), Indus-Ganges (India, Nepal), Limpopo (South Africa and Zimbabwe), Mekong (Thailand) and Nile (Ethiopia). Fieldwork took place in 30 rural and peri-urban communities, districts or regions. In each country learning alliances were forged for scaling up MUS at intermediate and national levels. Together, 150 institutions were involved, including water user groups, community-based organizations (CBOs),

Fieldwork took place in 30 rural and peri-urban communities

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(International) NGOs, domestic sub-sector and productive sub-sector agencies, local government, private service providers, rural development agencies and financers, and knowledge centres. The national experiences were also disseminated and discussed in global networks and forums, in close collaboration with the global MUS Group. This section introduces the general 'what' and 'why' of MUS as developed in the course of this project. The following sections present lessons on 'how to do' MUS on the ground and for scaling-up.

People need water for drinking, hygiene and sanitation, vegetable irrigation, cattle watering, food processing and more

What is MUS? In MUS, governments, NGOs and private service providers take people's multiple water needs as the starting point of service delivery. People need water for many purposes: drinking, hygiene and sanitation, domestic uses, vegetable and crop irrigation, cattle watering, tree growing, fisheries and aquaculture, food processing and small-scale enterprise, brick-making, handicrafts and cultural purposes. Water needs are especially wide-ranging in informal rural and peri-urban settings in low- and middle-income countries where people depend on water in many ways for their diversified, agriculture-based livelihoods. People meet their needs by taking water from multiple sources, depending on seasonal availability of rainfall, surface water, groundwater or wetlands, and their access to storage and infrastructure for improved access to water during longer periods of the year, if not year-round.

However, while people's water needs are multiple, the water sector is structured according to single uses. Professional education, specialization and job reporting structures tend to focus on one single water use and one preferred site of use. The domestic sector looks at domestic uses in residential areas; the irrigation sector focuses on water for plant roots in distant agricultural fields; the fisheries, forestry or livestock professions look at open water bodies and surface streams. However, single uses or urban–rural zoning fails to match rural reality, where water uses and sites are scattered across communities' entire 'land- and waterscapes'.

Systems designed for a single use are invariably used for multiple purposes

Water service providers across the globe became well aware of people's multiple water needs, because systems designed for a single use – as either a 'domestic' system or a 'productive' system – are invariably used for multiple purposes. Cattle drink from irrigation canals and people bathe in them (Meinzen-Dick, 1997). Water from domestic schemes is used for homestead cultivation, livestock watering and small-scale enterprises (Moriarty et al., 2004). These uses provide vital livelihood benefits. However, as they have not been planned, such uses may lead to damage to canals or deprive tail-end users of the same piped system of their basic domestic needs. Some service providers were aware of but ignored these non-planned uses. Or they declared them illegal and tried to forbid them – usually in vain. Other service providers recognized the livelihood benefits and made small 'add-on' structures, at least to avoid damage. Irrigation canals were equipped with washing and bathing steps, in what can be called an 'irrigation-plus' approach. Cattle troughs were added to 'domestic' standpipes in 'domestic-plus' approaches.

In MUS, water service providers realize that they are investing in a full range of livelihood benefits resulting from improved access to water

So why MUS? MUS taps the new opportunities arising from a fully integrated approach. Essentially, in MUS, water service providers become full-fledged bankers who realize that the returns to their investments are the full range of livelihood benefits resulting from improved access to water. This is improving health, reducing workloads, providing more food and generating more income during longer periods of the year, to mention the most important ones. Instead of purposively ignoring part of these returns to their investments, or even forcefully trying to stop them, a MUS investor actively looks for even more possible returns to the investment. Sectoral boundaries and single-use mindsets fall away. Instead, the optimal range of diverse livelihood benefit returns for multi-faceted well-being are planned for and included in the technical and institutional design. Even more, MUS recognizes how these different livelihood benefits can mutually reinforce each other into virtuous circles out of poverty. Thus, MUS can contribute directly and indirectly to all Millennium Development Goals, at least if services are well targeted to the poor and to women. Obviously, accompanying measures such as hygiene education, extension and market development further increase the benefits of water use.

There are two 'models' of MUS: homestead-scale and community-scale

From this perspective of the 'what' and 'why' of MUS, the action-project focused, above all, on the 'how to' implement and scale-up MUS. In the 30 sites in 8 countries, the project innovated, analysed and documented in particular how to do two 'models' of MUS: homestead-scale MUS and community-scale MUS. Homestead-scale MUS promotes domestic, sanitation and productive uses at and around homesteads – an often preferred site of water use, certainly for the land poor and women. Community-scale MUS encompasses the many uses by people on all sites of use, so includes open water bodies and fields at greater distances. Community-scale MUS is integrated participatory service delivery in the spatial 'land- and waterscape' of a certain community, area or sub-basin, in which the marginalized can be explicitly targeted. At the intermediate and national level, the learning alliances of representatives of governmental, non-governmental and private service providers from various backgrounds pioneered both in transforming their conventional intervention approach into MUS and in scaling-up MUS to create, ultimately, a supportive environment for MUS that allows everybody to receive the multiple-use water services they need. Our main conclusions with respect to the opportunities and constraints of MUS are presented below. The article concludes with the project's contribution to and recommendations for global initiatives to foster MUS.

How to implement MUS on the ground

Homestead-scale MUS

The single most important factor to enable both domestic *and* productive uses around the homestead is simply ensuring more water nearer to homes. In all 30 project sites it was found that wherever water is available at and around homesteads from one or more sources, a significant proportion of users, if not everybody, uses it for domestic and productive uses. This finding differs from the domestic sector's common understanding. In its concept of a 'water services ladder', in which quantities of water uses are linked to service levels of access to safe water, the domestic sector assumes that at each level of 20, 50 and up to 100 litres per capita per day (lpcd) water is only used for domestic purposes (Howard and Bartram, 2003). However, the project found that, even far below 20 lpcd, water is also used and re-used for productive purposes. Cattle watering is more important than personal hygiene, for example. And water is re-used for fruit trees. At every higher step even more water is used for productive purposes, besides its domestic uses. This empirical relationship between access to water and multiple uses is reflected in the 'multiple-use water ladder' (Figure 1).

Even far below 20 lpcd, water is used and re-used for productive purposes

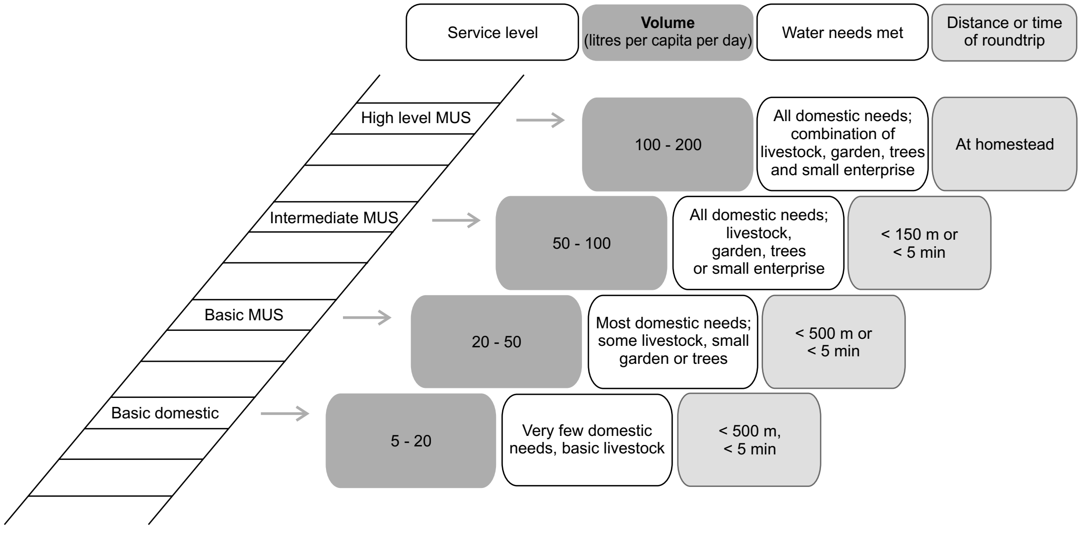

Figure 1. The multiple-use water ladder
Source: Renwick, 2007; Van Koppen et al., 2009

Homestead-scale MUS not only allows full cost-recovery but can even cross-subsidize domestic water uses

The far-reaching policy implication of this empirical relationship between water availability and uses is that by providing 'intermediate-level MUS' of 50 lpcd or 'high-level MUS' of 100 lpcd, or more, significant productive uses are promoted. The project found that this brings annual income increases in the order of several hundreds of US dollars, as confirmed in Renwick (2007). Renwick (2007) also calculated that the potential income from such productive uses is often sufficient to pay for the total infrastructure investment and operational costs within 0.5–3 years. So homestead-scale MUS not only allows full cost-recovery but can even cross-subsidize domestic water uses. Financial sustainability is potentially much stronger, also for the poorest who need minimum domestic water services *and* water for food and income most urgently. For the poorest, the homestead is especially important. Without much access to farm land, the homestead is often the only piece of land where they can use water productively. Homestead-based production is equally important for women and youth-headed households, who also lack access to land for productive activities in their own right. The sick and elderly lack the ability to produce at a distance. Thus, it is likely indeed that homestead-scale MUS gives 'most MDGs per drop' in a cost-effective and sustainable way.

There is no need to provide expensive treated water for purposes that do not need such high-quality standards

Homestead-scale MUS underscores that better targeting of water quality measures to drinking and cooking – the only uses requiring a high quality – can save costs. Obviously, at all steps of the multiple-use water ladder, at least 3–5 lpcd should be safe for drinking. However, there is no need to provide expensive treated water for purposes that do not need such high quality standards. This concerns not only most productive uses (with the exception of food processing for sale), but also many domestic uses, such as personal hygiene, sanitation, cleaning, bathing or toilet flushing. Moreover, for health it has been well established that water quantities count even more than water quality (Van der Hoek et al., 2001).

This potential cost-saving of targeting water quality standards to more limited quantities goes hand in hand with the growing realization by the health experts in the domestic sector that in many rural settings centralized treatment has so many sources of pollution between the treatment and the point of use, that point-of-use treatment of just the quantities needed for drinking and cooking gives cleaner water – if people are applying measures adequately. In other words, better targeting of water quality measures not only ensures sufficient quality but is also cheaper, leaving more funding for improving water quantities for sanitation, hygiene, other domestic uses *and* productive uses.

Technically, in the 30 project sites, water was brought to homesteads with old and new combinations of well-known technologies. These included homestead-based technologies (wells, high-discharge lifting devices, run-off ponds, rooftop water storage) and communal distribution systems with sufficiently frequent standpipes or with household connections that allowed productive uses. Scattered standpipes and communal single access points (e.g. a communal groundwater well or borehole with hand pump) were generally too distant for carrying sufficient water to homesteads for productive uses. The project also found that people combine many water sources. In Thailand, it is a national policy, which is realized by the Farmer Wisdom Network, to promote intensive production and recycling of water and nutrients at homesteads up to a level of household economic self-sufficiency. Up to nine water sources were used. In this part of Thailand, stored rooftop water for year-round use was set aside for drinking and cooking. This was preferred over piped supplies that were seen as much less safe. Rainwater use for drinking and cooking is also increasingly promoted in gravity piped supplies in mountainous Colombia. Elsewhere, groundwater is of good quality for any use.

> People combine many water sources for different uses

Managerially, the main difference between conventional domestic water services and multiple use water services is the growing differentiation between users. Also, overall water quantities increase (but they are still considerably less than community reservoirs or irrigation schemes). This is no problem for individual technologies, but can be problematic in communal systems, where those with more land or initiative or money use considerably more water than fellow scheme users. Construction of homestead reservoirs may somewhat mitigate acute deprivation of other users. In such cases of intra-scheme differences and competition, stricter rules and enforcement are needed and also differential tariffs. Some communities use the rule that first everyone should get a certain quantity of water (for basic domestic and productive needs), before the larger users can negotiate among themselves on further priorities. As domestic water uses are only a tiny proportion of overall water resource uses, doubling or tripling those quantities for intermediate- or even high-level MUS by everyone still represents only a small fraction.

> Everyone should get a certain quantity of water before the larger users can negotiate on further priorities

Community-scale MUS

In 20 of the 30 project sites, project partners also engaged in community-scale water management issues. This was especially the case in communal schemes for homestead-scale MUS which required moving up to the broader, community-scale water management issues. Other partners, such as Catholic Relief Services, started from the outset at a community scale, taking the community as its entry point and considering holistically all water resources, technologies, uses and re-uses and institutional arrangements in the community's entire land- and waterscapes. In this community-scale MUS, homesteads were recognized as an often preferred site of multiple water uses, particularly by women and the land poor. However, it was also realized that water needs and uses, and sites of use, are wider and include irrigated fields near springs or surface streams, cattle dams, fishing waters or village reservoirs for multiple uses.

This holistic approach of community-scale MUS appeared to unlock many new potentials. First, cost-saving economies of scale were achieved by constructing bulk storage and conveyance infrastructure for multiple needs at multiple sites. Second, using and re-using water from multiple sources, including existing infrastructure for any use and conjunctive uses of surface water and groundwater, greatly enhanced resilience and water efficiency. Third, the holistic approach also allowed pollution prevention and water treatment at the most appropriate level. Fourth, in arid areas such as Maharashtra, India, community-wide NGO-initiated water budgeting exercises revealed how groundwater overdraft was primarily caused by thirsty, irrigated sugar cane fields. This holistic, area-wide water-resource mapping allowed more effective targeting of water-saving measures to the large users, while assuring that everybody had access to basic water needs for domestic and small-scale productive uses (Mikhail and Yoder, 2008). Fifth, by taking the community as the entry point, the different users within the community could be well distinguished. This showed how the most vocal (male) elite tend to benefit most from external resources if there are no well-managed participatory procedures. Awareness and facilitation of social heterogeneity allowed the identification of the targeting approaches required to reach the marginalized, and the implementation of those measures. In any case, public funds for water development appeared a much scarcer resource than water resources.

Water budgeting exercises revealed how groundwater overdraft was primarily caused by thirsty, irrigated sugar cane fields

The sixth advantage is that community-scale MUS fully aligns with communities' own water development and with management for self-supply which, since time immemorial, has always considered multiple uses and multiple sources in an integrated way. Sectoral divides are alien for communities. It was also found that community members had a clear vision of future possibilities and tried to adapt whatever support interventions were on offer to those longer-term ambitions (see Box 1). Building upon communities' existing infrastructure as sunk costs and upon their precious social capital of local water management institutions taps existing assets. Intervening according to communities' own priorities and longer-term ambitions through iterative processes of participatory planning and implementation are an absolutely necessary condition for sustainability of investments. It avoids the situation where each subsequent short-term and single-use focused project takes communities as a *tabula rasa*, adding layer after layer of infrastructure into a spaghetti-like layout of underused, if not

Building upon communities' existing water management institutions taps existing assets

Box 1. Community-scale MUS by IDE/Winrock in Nepal

In the middle-hills of Nepal, project partner International Development Enterprises (IDE), in collaboration with Winrock International, installed communal multiple-use systems, taking water from springs and streams. In their consultations with the mountain communities they followed the suggestions of these communities who had managed their water resources for so long.

In one water-scarce community, Krishnapur, traditional irrigation canals for distant paddy plots had been lined and this saved water. The water saved was diverted to a new, large, storage tank that was connected to off-takes near to the homesteads. However, during the dry season water rotations took a long time and were unreliable. Moreover, water needs differed for the various types of vegetable grown. So, community members opted to build large individual household storage jars, even though they were expensive. They already had a separate drinking water system that was insufficient for all domestic needs, particularly in the dry season. Thus, with stored water available at the household, they used the water from the jars not just for irrigation of vegetables, but also for domestic purposes other than drinking. Still, the community found that the water channelled from the canal was not quite enough for all of their needs, so they extended the multiple-use system by connecting a small spring to their large storage tank. They continue to lobby for development of additional sources of water to meet their multiple needs.

Another community, Chhatiwan, had negotiated with their local council for provision of a ½ inch pipe 'for irrigation' before they became aware of the IDE/Winrock project. When the IDE/Winrock hybrid system was designed, they incorporated this pipe into their multiple-use system. The third community, Senapuk, had a previously built domestic water system that was insufficient even for their domestic needs. IDE/Winrock incorporated this existing infrastructure into a new design which tapped an additional spring and collected the water in a 'domestic' storage tank which overflowed into a 'productive' tank with two separate distribution systems: one to tapstands near homesteads and one to off-takes near fields. They chose this design to safeguard the domestic supply in the dry season. Many other communities requested help from IDE/Winrock to assist in the creation of multiple-use systems. In all cases, people's prior claims to springs and streams were respected and negotiations led to win–win solutions for both the existing users and the newcomers. Transparency about all infrastructure and all uses allowed both technical and institutional devices to ensure that domestic uses were prioritized during the dry season.

Source: Mikhail and Yoder (2008); see also the article by Mikhail in this volume.

abandoned infrastructure, as was found in the former homelands of South Africa.

Indeed, community-scale MUS is participatory planning in the water sector. Participatory approaches have been developed in virtually all fields of rural development. In fact, the domestic sector has applied participatory approaches, but only for domestic uses. Irrigation professionals focused on participatory approaches within the limited frame of irrigation. Community-scale MUS overcomes these single-use foci, which hide a priori priorities, and leaves it to communities

Box 2. Community-based water resource management in Southern Africa

The Southern Africa Development Community (SADC), supported by the Danish International Development Agency (DANIDA), has piloted local-level IWRM using MUS approaches in Malawi, Mozambique, Namibia, Swaziland and Zambia. In each community, a participatory process was facilitated in which communities make their own spatial water resources assessments of all existing water resources, informal and formal technologies, and their uses and users. Problems are identified and a long-term vision is formulated of the desired water resources development and management situation in their community. This generates a number of options for short-term intervention. Then, representatives of all women and men, the poor, crop cultivators and cattle owners, irrigators and farmers of rainfed land, members of the traditional chiefs' clans, and elected political party members in local government negotiate the ranking of these priorities. Activities are then selected within the available budget. After elaborating concrete action plans with price tags, the budget allocation is finalized and implemented. Monitoring allowed the synthesis of lessons learnt in generic 'Guidelines for Local-level IWRM'.

The communities prioritized a wide range of interventions: new boreholes with hand pumps; rehabilitation of existing boreholes; excavation and lining of wells; new construction and rehabilitation of cattle dams; rehabilitation of a dyke in a flood plain for water retention; upgrading village reservoirs; a new weir in a hill stream; new irrigation schemes; improved toilets; piped water supplies to homesteads for multiple uses; electric boreholes for both homesteads and gardening; a communal solar pump and individual petrol pumps for field irrigation; invasive tree species eradication and commercialization; market linkages and training in conservation agriculture.

Source: Houmoller and Kruger (2008); SADC/Danida Regional Water Sector Programme (2009)

to decide about their priority water needs and sites. This one-window service saves on transaction costs.

'How to do' community-scale MUS boils down to the well-known steps of participatory approaches

Thus, the answer to 'how to do' community-scale MUS boils down to the well-known steps of participatory approaches, in which support agencies facilitate decision-making processes in communities. That means first, an in-depth participatory mapping and diagnosis of existing water resources, technologies, uses, users and institutions; second, the identification of problems and aspirations, and ranking and deciding about priority hardware and software interventions; third, the compilation of action plans, including budgeting and contracting; fourth, implementation; and fifth, continuous participatory monitoring. If such processes are inclusive and give a voice to women and the poor, it is likely (but this needs much further testing) that water supplies to homesteads emerge as their priority. As illustrated in Box 2, such participatory approaches, or local-level IWRM, are also applied elsewhere.

How to scale-up MUS at intermediate and national level

The aim was to contribute to a supportive environment that would be able to deliver MUS ultimately to everyone

The above-mentioned innovations for homestead- and community-scale MUS on the ground became the key message in the efforts of the learning alliances in the eight countries to institutionalize MUS at intermediate and national level. In order to avoid isolation of the innovations as 'islands of success', learning alliances were formed to better understand, discuss and sensitize service providers about the 'what', 'why' and 'how' of MUS. The aim was to contribute to creating a supportive environment that would be able to deliver MUS to many more communities and, ultimately, everyone. The project partners leading the learning alliances came from different backgrounds and the composition of learning alliances also varied. Overall they covered water users' movements, NGOs, domestic sector, productive sector, local government and knowledge centres. Each of these stakeholder groups innovated and implemented homestead-scale and often also community-scale MUS. However, because of their different starting points, they encountered different sets of obstacles in transforming intermediate and national level service providers towards a common understanding and implementation of homestead-scale and community-scale MUS. Some key opportunities and constraints identified by each stakeholder group are discussed below.

Water users' movements

For water users, multiple uses from multiple sources are obvious. In the two water users' movements in the project, the Farmer Wisdom Network in Thailand and the Water for Food Movement in South Africa, the leaders' own life-long experimentation and 'learning by doing' led to models of homestead-scale MUS that attracted much attention by other rural households. A voluntary, loosely organized movement for mutual learning and sharing about multiple uses of multiple sources around homesteads for food security and empowerment emerged. The movement leaders' proactive advocacy with the highest-level policy-makers met a positive response. At these highest government levels, well above the levels where government structures are compartmentalized into single-use and single-mandate top-down bureaucracies, policy-makers realized how homestead-scale MUS fully fitted national goals of poverty alleviation, gender equity and economic sufficiency through water. This led to further roll-out of homestead-scale MUS, both through the same bureaucracies and through the movements' networks.

Policy-makers realized how homestead-scale MUS fully fitted national goals of poverty alleviation

NGOs

Many NGOs are livelihood oriented. In the last decade, this holistic focus on well-being rendered NGOs the pioneers of public interventions for homestead-scale and community-scale MUS. Technology-oriented NGOs invented low-cost individual wells, boreholes and rope-and-washer pumps and other lifting devices with the higher discharges that allowed individual homesteads to buy and use them for both domestic and productive uses. Through wide dissemination of these technologies, for example through private supply chains, also in collaboration with local government, these NGOs scaled-up MUS at the 'intermediate MUS' level. International poverty-focused NGOs are equally livelihood oriented. They often fill the voids in service delivery that are left by under-sourced governmental service delivery structures. Their holistic focus also enabled pioneering homestead-scale MUS and especially community-scale MUS.

The challenge for these NGOs was to ensure institutionalization beyond their 'projects'

The challenge for these NGOs was to ensure institutionalization beyond their 'projects'. For the communal schemes of IDE/Winrock in Nepal, for example, IDE/Winrock sought collaboration with local government and other permanent local institutions. This not only facilitated implementation of the pilot schemes, for example by negotiating budget allocations from various sources to complete the full amount needed, but IDE/Winrock also ensured after-care for newly implemented schemes. Moreover, by turning these implementation processes into learning processes, broad awareness was raised and the most appropriate applications were tested. Once more communities were informed, they also expressed their interest in multiple-use systems. These joint positive experiences of local government, technical officers and communities, in their turn, were brought up for successful advocacy and buy-in by a range of national level agencies (Mikhail and Yoder, 2008; see article by Mikhail elsewhere in this volume).

Domestic sector

The domestic sector consists of international agencies, national and local governments and NGOs whose programmes aim at nationwide provision of water for the most basic needs: drinking and domestic purposes. Project partners and learning alliances, from the domestic sector especially, documented intensive productive uses of so-called 'domestic' systems, which gave important livelihood benefits. Such productive uses were possible because schemes are often oversized to account for future population expansion, peak demands, design uncertainties, and so on. Moreover, water was cheap in the gravity schemes in mountainous areas in Colombia and Nepal.

Although service providers in the domestic sector who worked with communities quickly recognized the livelihood advantages, Managers at higher scales were less eager to hear of such productive uses, whatever the benefits

their managers at higher scales were less eager to hear of such productive uses, whatever the benefits. At the very best, they tolerated such uses temporarily as long as the designed overcapacity would allow. This strict focus on domestic uses only was compounded by strict adherence to national-level quality standards for all water provided, whatever alternative and cheaper ways there were to obtain that same quality for drinking and cooking. If events in the irrigation sector are any guide, a future step in the domestic sector could well be that the sector at least claims the hidden benefits of productive uses as important returns to their investments.

Irrigation sector

The irrigation sector has a longer tradition than the domestic sector of recognizing multiple uses at least to some extent. In arid areas such as Pakistan and Morocco, where large-scale irrigation canals are virtually the only water source, the irrigation sector has long recognized that irrigation schemes are typically used for multiple purposes (Boelee et al., 1999). Elsewhere as well, at least some design provisions are made for domestic and cattle uses and increasingly also fisheries (Nguyen-Khoa et al., 2005). With growing scepticism about investments in irrigation in the past two decades, an understanding of all its benefits became more pressing. Various studies have quantified the benefits of these non-irrigation uses (Meinzen-Dick, 1997), for example by providing clean seepage water for drinking and gardening (Molle and Renwick, 2005), or fisheries (Renwick, 2001). These multiple uses are also increasingly being accommodated in scheme management arrangements, as shown in Renault's (2008) overview of the types of use addressed in the formal management of 21 large-scale irrigation systems in Asia, Europe and the Middle-East.

In Nepal, IDE/Winrock succeeded in convincing the irrigation engineers to look beyond their conventional focus

While the Challenge Program on Water and Food (CPWF) project did not include these larger-scale irrigation schemes, its focus on homestead-scale issues brought an important change in the irrigation sector as well. In Nepal, IDE/Winrock succeeded in convincing the irrigation engineers to look beyond the conventional focus on small-, medium- and large-scale irrigation systems to consider the benefits of small-scale production around homesteads in homestead-scale MUS. The fact that benefits came within a very short time span and that villagers were very satisfied convinced most. Initially, the irrigation engineers found it difficult to deal with domestic uses at the same site. Their jobs required promotion of irrigation, not domestic water uses. Pipes funded for irrigation could formally not be used for a system that was used for both irrigation and domestic purposes, even though it was the same infrastructure that channelled the same water resources to the same site where it was used by the same people. This was gradually overcome. These single-use foci were much less of a problem for the next service provider: local government.

Local government

Local government appeared to be the agency most suited for massive scaling-up of MUS, but its main problem is lack of resources, decision-making power and capacity. Project partners worked with local government on a number of issues. This collaboration highlighted numerous features of local government that hold great potential for scaling-up MUS, even though they are hardly realized as yet. In all countries, many roles and responsibilities are currently further decentralized to local government, including mandates for encompassing service delivery and public asset and natural resource development and management. In the past, NGOs, domestic water programmes and line agencies for rural infrastructure, health, agriculture, irrigation, fisheries or livestock, all tended to operate through parallel structures. This approach is expensive, top-down and only reaches the few. Interventions also risk collapsing as soon as the time- and budget-bound 'projects' close down. So permanent local government can mediate, plan and coordinate the many pressing integrated local needs and the services on offer, and also ensure after-care once projects are over. Local government has some space to pool public and private resources as needed, although this is severely constrained by the top-down budget conditions and planning cycles of each different intervention. This ability to pool would allow the combination of water engineering and management skills for smaller quantities of water in the domestic sector with essentially the same engineering and water management skills, but then for larger quantities, of the productive sector. Moreover, local government's longer-term planning processes allow for step-wise implementation of longer-term goals and ambitions. Elected representatives bring some degree of accountability and fairness in resource allocation to every citizen – although political favouritism may overshadow this. In this sense, community-scale MUS is nothing more than the iterative loops of integrated participatory planning processes for water that local government is supposed to implement, if it had the resources, skills and decision-making power.

Local government can mediate, plan and coordinate the many pressing integrated local needs and the services on offer

In some instances, this potential was also realized. In countries such as Colombia, Bolivia and Nepal, local government can already call upon more permanent expertise seated in government and other agencies. In that way it can tap the respective water sectors' skills as needed: for example, health, hygiene, sanitation, irrigated cropping or marketing.

The first steps of such local government planning for community-scale MUS were taken in Bushbuckridge, South Africa, with the support of the NGO AWARD. This participatory diagnosis of resources, infrastructure, uses and users and institutions, and priority setting for follow-up activities fitted seamlessly in the municipality's Integrated Development Plan. In Nepal, IDE's scaling-up through the learning alliance has led to the adoption of national guidelines on eligible activities for funding by local government that explicitly include MUS. Nepal has now become the front runner in implementing MUS, including micro-electricity generation, through local government in various locations.

Conclusions: Scaling-up MUS at global level

The past five years have seen significant changes in the appreciation of MUS among international water agencies, financing and banking institutions, rural development organizations, international NGOs, professional networks and knowledge communities, and United Nations institutions, including UN Water. A global MUS Group with 13 core partners and over 300 members (www.musgroup.net) from both the domestic and productive sectors provides a platform for members to share experiences, also lessons from this action-research, and further operationalize MUS.

The global recognition of MUS is perhaps best illustrated by the events at *World Water Forum 5* in Istanbul, 2009, where a topic session on MUS was facilitated by FAO as chair of UN Water, the MUS Group and others. The Global Water Framework (World Water Council and T.C. Dişişleri Bakanliği, 2009) explicitly draws attention to multiple uses and functions of water systems. In points 52–56, this global consensus calls for the acknowledgement of widespread practice of multiple uses; recognition of the many yet-to-be-tapped benefits especially for the most vulnerable users; the more cost-effective and enhanced sustainability of integrated MUS approaches; and the need for national-level engagement of policy-makers to operationalize MUS as relevant in their countries. Moreover, the framework reflects consensus that MUS is a local-level and service-oriented application of the principles of integrated water resource management.

> The experiences of the public sector with innovating MUS on the ground are all still relatively recent

This article has shown that the experiences of the public sector with innovating MUS on the ground and scaling-up at intermediate, national and global levels are all still relatively recent. By recognizing the many ways in which people's water needs and fugitive water resources and infrastructure are interlinked, new opportunities for better service delivery open up. They can be further explored and pilot-tested across the world, so that global understanding, implementation and scaling-up of MUS spreads and deepens among policy-makers, legislators of water quality standards, programme managers and implementers, financers and private service providers.

To summarize these opportunities for all professionals irrespective of the sector:

- Better meeting women's and men's priority water needs at any site of multiple uses.
- Potential cross-subsidization or substantive cost-recovery of domestic uses, especially for the still unserved poorest and women, while also allowing for flexible productive uses that can mitigate shocks, so using water for 'most MDG per drop'.
- Building on communities' existing institutions and infrastructure, while recognizing intra-community differentiation and the need to effectively target external support to all.
- Tapping community-scale economies of scale in bulk infrastructure.
- Re-using water and nutrients and pollution prevention at the optimal levels.
- Combining multiple water sources for more efficiency, resilience and setting aside of cleanest sources for drinking and cooking.
- Lowering transaction costs of participatory processes, because water development for various uses by the same community is improved simultaneously.
- Allocating water holistically considering all uses and users, including the poor and women.
- Strengthening local government planning and implementation processes and identifying possibilities to pool engineering and water management resources, with the domestic sector moving up to community-scale MUS and the productive sector moving down to also include homesteads as sites of multiple water uses.
- Enhancing returns from any water investment.

Water can be allocated holistically considering all uses and including the poor and women

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