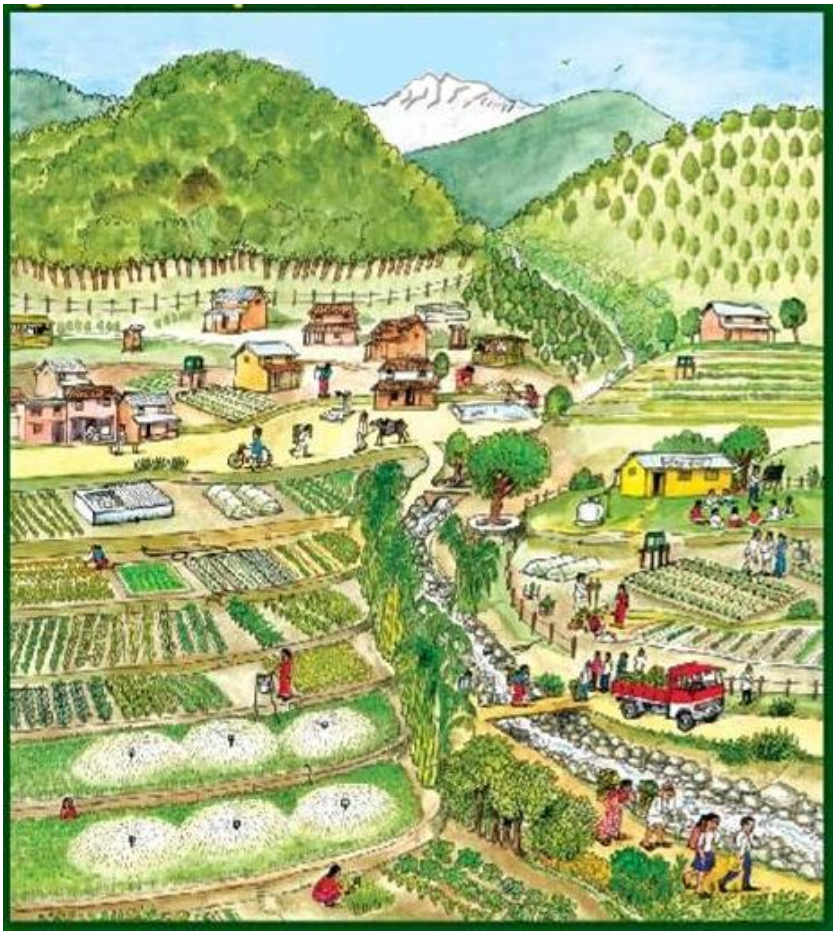
Multiple Use Water Services Scoping Study Synthesis



Supported by

IWMI International Water Management Institute

THE ROCKEFELLER FOUNDATION

IRC

Acknowledgements

The authors gratefully acknowledge the support provided by the Rockefeller Foundation for this scoping study and synthesis.

This report synthesizes the findings of five MUS country scoping studies conducted by the following research teams:

India: Shilp Verma with contributions from Baby Kurian, R.P.S. Malik, Tushaar Shah and Barbara van Koppen

Nepal: Govinda Basnet and Barbara van Koppen

Ethiopia: John Butterworth, Jan Teun Visscher, Frank van Steenbergen, and Barbara van Koppen with contributions from: Eline Boelee, Sally Sutton, Marieke Adank and Zemede Abebe

Ghana: Stef Smits, Jeremiah Atengdem, Bertha Darteh, Barbara van Koppen, Patrick Moriarty, Kwabena Nyarko, Alex Obuoubisa-Darko, Eric Ofosu, Jean-Philippe Venot and Tim Williams

Tanzania: Barbara van Koppen and Bernhard Keraita, with contributions from Charles Sokile, Willie Mwaruvanda, Dinie Nijssen and Stacey Noel

Under the direction of:
Barbara Van Koppen
Project Manager

This synthesis report was prepared by Barbara van Koppen and Stef Smits.
A draft was presented to the Rockefeller Foundation on 12-13 January 2012. This final version is much improved with feedback from Cristina Rumbaitis del Rio, Robert Marten, John Thomas, colleagues from Rockefeller Foundation, and other grantees of the MUS Search.

Editing and layout:
Terry Clayton

Published March, 2012

Cover Photo: Book cover: Harnessing small water sources and integrating with affordable technologies, information and access to markets makes a significant improvement in rural livelihoods. By Mr Surendra Pradhan, Kathmandu, Nepal.

CONTENTS

Acronyms and Abbreviations

AGRA	Alliance for a Green Revolution in Africa
iWASH	Integrated Water, Sanitation and Hygiene project.
MASSMUS	Mapping Systems and Services for Multiple Uses
MG-NREGS	Mahatma Ghandi National Rural Employment Guarantee Scheme
O&OD	Opportunities and Obstacles to Development Tool
TASAF	Tanzania Social Action Fund
WASH	Water, Sanitation and Health
SADC	Southern African Development Community
WUMP	Water Users Master Plan

List of Boxes

List of Figures

List of Tables

EXECUTIVE SUMMARY

Multiple use water services (MUS) is a holistic and participatory approach to water services in rural and peri-urban areas. MUS places poor people at centre stage and takes their multiple domestic and productive uses as the starting point of planning new construction or rehabilitation of infrastructure and governance. In this way, MUS builds on people's holistic integrated management of multiple water sources for multiple uses and livelihood benefits.

MUS has three advantages over conventional single use water approaches:

- **Multi-purpose infrastructure** enables more uses and brings more livelihood benefits in a cost-effective manner. This widens the basis for cost-recovery and financial sustainability. Failure to plan for multiple uses leads to *de facto* non-planned uses that cause damage and conflicts and jeopardizes technical and institutional sustainability.
- **Community-driven development** increases the financial, institutional and technical sustainability of public support. These general advantages of participatory approaches hold even more for water projects.
- **People-centred resource management** recognizes improved services as a driver of institutional sustainability. Poor people's diversified agriculture-based livelihoods depend in many ways on water. The poor find sustainable water availability more important than anyone else.

These advantages are obvious to people in poor communities. That is how they have developed and managed their multiple conjunctive water sources for multiple uses since time immemorial. The problem today lies in the overly compartmentalized institutional structure of governments, donors, financing agencies, and many NGOs involved in the water sector. Professionals in each sub-sector define their own narrow mandate from the top down. Each water service sub-sector promotes one water use as the solution, without much attention to other uses or to the resource. Integrated water resource managers and environmentalists focus on the resource and see water uses as the problem.

Over the past decade, professionals from different sub-sectors have overcome these institutional barriers. They have realized that each sector can better meet its own mandate and beyond as a result of more participatory planning of multipurpose infrastructure according to communities' priorities. They have created a multiple use water services approach by leveraging existing approaches. Their own professional communities are the primary scaling partners. Coming from different entry points, each approach has to overcome different institutional barriers. Four scaling pathways or 'MUS modalities' have emerged.

- Domestic-plus with the WASH (Water,Sanitation and Health) sub-sector: providing higher service levels to homesteads to enable domestic and small-scale productive uses.
- Irrigation-plus with the irrigation sub-sector: enabling access for non-irrigation uses and managing conjunctive surface and groundwater sources.
- Self supply with various sub-sectors: promoting people's own investments in infrastructure and governance which is usually for multiple uses.

- Community-based MUS: people decide about improvements in sustainable water uses, including self supply. Each water services approach and water resource management and conservation approach can widen to community-based MUS by putting people and their multiple needs in the driver's seat. Outside the water sector, community-based MUS can be further scaled up as part of the global trend towards decentralization of public service delivery and participatory development.

The present MUS Scoping Study assessed the robustness of MUS and identified barriers and potential scaling pathways and partners in five countries where the potential for scaling MUS is high. From July through to December 2011, the country teams conducted interviews and held workshops with key informants and reviewed literature. In all countries except India, all modalities were studied and showed potential for innovating MUS. In each country, initiatives in one or two modalities have the highest potential for further scaling up.

In **India**, community-based MUS emerged at massive scales in the Mahatma Gandhi National Rural Employment Guarantee Scheme (MG-NREGS). Communities and local government agencies decide on how to allocate labor and additional funding. Most often they prefer construction and rehabilitation of water assets for multiple uses and conservation. In Kerala's successful implementation of MG-NREGS, women are the main beneficiaries. In Gujarat, NGO support to watershed management is strong.

In **Nepal,** Winrock/IDE innovated domestic-plus in over 200 multi-purpose piped gravity flow schemes. Other projects developed and implemented community-based MUS as the Water Use Master Plan (WUMP) in hundreds of villages. WUMP has recently moved up to district scale for decentralized integrated planning in line with the country's peace process.

In **Ethiopia,** past action research on MUS informed a large-scale domestic-plus project led by UNICEF. Government also launched a Self Supply Acceleration Program to promote multiple uses. Sustainable land and water management programs become more people-centred.

In **Ghana**'s WASH sub-sector, service levels are increased where possible, among other means by limited mechanical schemes in small rural towns. Research on the country's many single use designed small village reservoirs highlighted the need to retrofit multiple uses in their rehabilitation.

In **Tanzania**, the iWASH project introduced self supply for multiple uses, for example, through rope pumps. Irrigation-plus, which includes livestock watering, is practiced but has not been formalized. Community-based MUS is explored in the country-wide Opportunities and Obstacles to Development methodology for decentralized service delivery by local government and line agencies. There is also potential to explore community-based MUS with local government as a form of bottom-up IWRM in Tanzania's IWRM plans.

In addition, in **Nepal, Ghana, and Tanzania,** large-scale community driven development programs are implemented. They target poor women and men. In all countries, communities choose water services and conservation projects.

For all modalities in all countries, the first barrier to scaling up MUS is that past innovation experiences have not yet been consolidated into **robust evidence-based modalities** with clear advocacy messages, tools, guidelines and performance indicators.

In the **domestic-plus and irrigation-plus** modalities, the 'why' and 'how' of widening single use mandates have been well conceptualized. There is evidence, financial analysis, and there are general guidelines. Country-specific advocacy messages need to be derived to convince both sectors to move beyond their main barrier: single use mandates.

Self-supply as a modality needs more evidence and more support for developing low-cost technologies including point-of-use treatment; establishing inclusive and gender sensitive supply chains; ensuring financing facilities for poor women and men; and creating an enabling policy environment.

Participatory programs have resulted in **community-based MUS** at large scales, certainly in India's MG-NREGS. Scale is being reached, but documentation and support tools are lacking. Evidence needs to be generated for best practices and guidelines with special attention to avoiding elite-capture; meeting integrated bottom-up demands with earmarked or unconditional funding streams; integrating services and resource management; technical and institutional capacity building; and planning and monitoring tools for all levels.

The second cross-cutting barrier is lack of capacity among local support staff. Engineers' standard designs are for single uses and they lack participatory design skills. **Capacity building** is needed to design multi-purpose infrastructure in a participatory manner. Other staff also need skills in inclusive planning, budgeting, implementation and monitoring.

A third set of barriers to adopting MUS are professionals' contradicting views as a result of being locked within silos. A next step is to develop a **holistic, cross-sectoral view** on: water quality of all sources used for drinking; targeting of public funding to reach equity in minimum services for all uses stipulated in the MDGs and broad socio-economic human rights; reinforcing the legal priority for domestic uses and other small-scale productive uses without burden of proof; and operationalizing ecosystem services for justice. Overcoming these contradictions prepares the way for implementing community-based MUS.

A final step for MUS adoption is to establish **national learning alliances**. The proposed partners for these networks cover all modalities and include MUS champions, senior policy makers in strategic positions and implementers, NGOs, and researchers. They will share findings of the proposed scaling pathways, develop country specific action plans and leverage their own and other institutions for funding for multi-purpose infrastructure, participatory planning and integration of services and resource management.

Linking the national learning alliances to the global MUS Group exposes them to lessons about scaling MUS in other countries, and vice versa. The findings in the five countries are similar to MUS innovation elsewhere. With progress towards decentralization, the rural and peri-urban poor with multiple water needs from multiple sources will have a stronger say in the planning of public support. They will call more strongly for community-based MUS and self-supply.

BACKGROUND AND RESEARCH DESIGN

Rationale and research focus

Multiple Use water Services (MUS) is a new participatory and holistic approach to water services for the rural and peri-urban poor. MUS takes people's multiple domestic and productive needs as the starting point of planning and providing water services. Instead of treating the poor as passive aid recipients waiting for hand-outs, MUS places the poor in the driver's seat of the development and management of their water resources. The rural and peri-urban poor need water for multiple purposes to meet their diversified, agriculture-based livelihoods, for example: drinking, other domestic uses, livestock watering, irrigated horticulture and crop cultivation, tree growing, fisheries and aquaculture, processing, brick making and crafts, small-scale enterprises, and cultural uses. Since time immemorial, people have managed multiple conjunctive water sources to meet these needs combining rainwater, run-off, soil moisture, streams, lakes, wetlands and groundwater.

In contrast, water service providers focus on infrastructure development and governance arrangements for one single use such as domestic uses, or irrigation, or livestock watering, or fisheries. Formal professional training in colleges and universities is structured along similar lines. A single use focus is a sub-sector mandate. Thus, the performance of the WASH sector is measured in numbers of people using infrastructure for domestic uses to improve health and reduce drudgery for women and girls. The irrigation sector measures performance as hectares of irrigated crops and yields for food and income. Water resource management approaches, like Integrated Water Resource Management and ecosystem services operate in parallel and separately. They focus on physical water resources. This compartmentalization, with vested professional interests and upward accountability, produces sub-optimal interventions. The challenge is to change these institutional barriers and professional biases to better align with the holistic perspectives of people on the ground.

MUS emerged in the early 2000s as a water services implementation approach that addresses these challenges. Pioneers in the domestic water, hygiene and sanitation (WASH) sub-sector and the irrigation sub-sector have implemented this approach on a pilot basis in over 20 countries (see Figure 1). Action-research generated more than 100 documented cases of MUS innovations. Guidelines were produced. A MUS Group was formed for advocacy, exchange and synthesis of lessons learnt (www.musgroup.net). The concepts and experiences of MUS were introduced in national and international policy forums, such as the World Water Forums in Mexico (2006) and Istanbul (2009). After the mid-2000s, approaches to provide for multiple water uses from multiple sources also emerged spontaneously in decentralized and participatory rural development initiatives outside the water sector that reached massive scale in India.

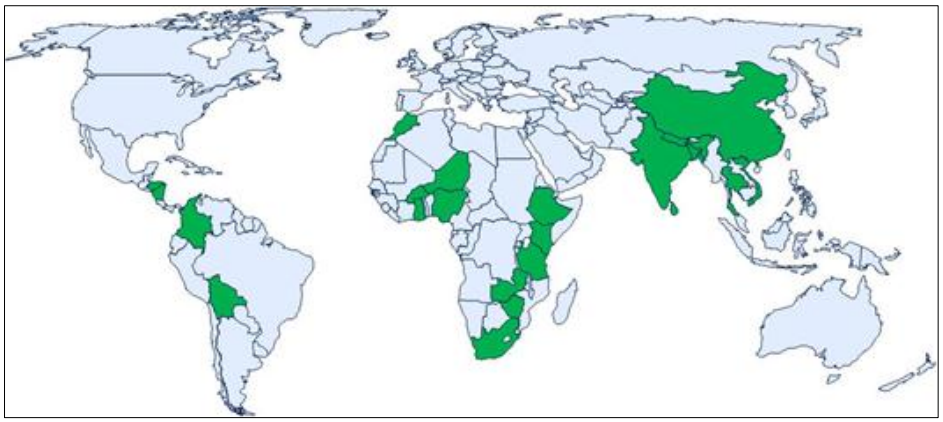


Figure 1: Countries where MUS has been applied

This past decade of pioneering highlighted three main strengths of the MUS approach that have been fully or partially proven or are now considered plausible hypotheses. First, research proved that MUS generates more livelihood benefits in a cost-effective manner because of multipurpose infrastructure (Renwick 2007). Second, MUS is likely to be more sustainable in technical, financial and institutional terms compared to single use services. This is because of multipurpose infrastructure and its participatory approach. Third, MUS is likely to be environmentally more efficient and sustainable because MUS builds on people's traditional knowledge of how to develop their multiple local sources most efficiently for different uses.

These past experiences have also shown that the potential scalability of the MUS approach is wide indeed. All peri-urban and rural water services, water resource management approaches and general participatory development approaches can benefit from recognizing people's use of multiple sources for multiple uses. While the starting points for adopting MUS are different, moving to MUS enables each sub-sector to better achieve its mandate and more.

Research objective and questions

The paradox which led to this research is that MUS has hardly been scaled up within the water sector. Outside the sector, integrated water development initiatives in participatory programs have already reached scale, but this has hardly been documented. This raises the general question: What are the barriers and constraints that currently limit the scaling up of MUS and what is their comparative importance (e.g., financing, governance, policy, awareness, implementation capacity)? A next question then arises: How can these barriers be overcome and what are the pathways and who are the partners for scaling up MUS? The Rockefeller Foundation posed these questions to the International Water Management Institute (IWMI) in collaboration with the International Water and Sanitation Centre (IRC). The objective of this MUS scoping study is to answer these questions in five countries in South Asia and Africa with a high potential for scaling up MUS.

The research questions are:

- What are the different MUS modalities that have emerged and how are they related to specific scaling pathways?
- What are the most important barriers limiting greater adoption of these modalities?

What specifically could be done to overcome these barriers?
What specific organizations are best placed to overcome these barriers?
What geographic conditions would be most suitable for scaling up each kind of MUS model?
What policy incentives are needed in each case?
What capacities and skills are needed?
What information dissemination and engagement/partnership building needs to occur?
What is the optimal sequencing of interventions needed to enable broader scaling up?

Geographic focus, methodology and report structure

The geographic focus of the scoping studies is five countries where IWMI and IRC see strong potential for scaling up MUS modalities. These are:

- India (the Mahatma Gandhi National Rural Employment Guarantee Scheme as the world's largest laboratory for spontaneous community-based MUS);
- Nepal (global leader in innovating domestic-plus and community-based MUS);
- Ethiopia (past action-research, scaling and policy interest in MUS);
- Ghana (emerging MUS approaches, a P1 country of the Alliance for a Green Revolution in Africa (AGRA); and,
- Tanzania (MUS innovation for self supply, also an AGRA P1 country).

In each country, teams coordinated by IWMI reviewed available literature and conducted interviews from July to December 2011. Respondents included water users and key staff from different sectors in government, NGO and international organizations, including AGRA, from local to international levels. The research findings are presented in five stand-alone country reports. They include names and addresses of scaling partners identified. The present report synthesizes the findings of the five country studies.

The report structure is as follows: In the next section, we define MUS and scaling to operationalize the research questions. We trace in further depth the contrasting approaches of, on the one hand, rural and peri-urban communities in low- and middle-income countries and on the other hand water and development professionals. We then describe professionals' step-wise recognition of this contrast over the past three decades and the emergence of MUS. The three proven or plausible strengths of MUS are detailed next. These are visions of the impact that could be achieved at much wider scales if MUS were scaled up. Turning to the research questions then, the theory of scaling is presented. MUS innovation since the early 2000s has taken four different entry points or MUS modalities. Each has its own scaling pathway. The practice of MUS innovation through learning networks, in particular the MUS Group, also guided the country studies. After this, we present key findings per country. This is followed by a synthesis of the general findings by MUS modality, and overall conclusions.

WHAT IS MUS?

MUS as a paradox in the water sector

Multiple sources for multiple uses: an obvious and resilient reality for communities

MUS recognizes what is obvious for people in rural and peri-urban areas in low- and middle-income countries: people need water for multiple uses. Each use requires specific quantities of a specific quality at certain times and certain sites. People adjust to unpredictable climate variability, floods and dry spells by lifting groundwater and developing surface storage to harness the surplus of water in the rainy seasons for use in the dry seasons. Conveyance infrastructure brings the water where needed. When the poor invest in capital-intensive infrastructure for self-supply, they design systems for multiple uses. This is the most cost-effective way to provide for multiple needs.

For communities, water services for self-supply and water resource management overlap. Except in extreme arid areas, they manage the use and re-use of multiple natural and human-made sources to provide for multiple needs. The continued availability of water resources is a lifeline for current and future generations of people who depend on agriculture-based livelihoods. Environmental sustainability is more vital to them than to anyone else. Knowledge about the local hydrological cycle of water resources and links to land and other natural resources determines survival. Integrated and holistic self supply is at the heart of community resilience in often harsh ecological environments. Such efficiency and resilience will become ever more important as the impacts of climate change become more visible.

The scale of people's integrated water management for self-supply starts at the lowest appropriate level: the homestead. Even at homesteads, households can use up to nine different water sources, as found in north-east Thailand (Penning de Vries and Ruaysoongnern 2010). Depending on their livelihoods, people's scale of water management moves up to the hamlet or community level where landscapes and waterscapes provide for the totality of their water needs. This is usually still within walking distance, although some plots or herding zones may be at longer distances. Pastoralists cover much larger areas, even crossing national and basin boundaries.

While water resources are largely used and managed at local scales, upstream and downstream uses or uses of the same aquifer can warrant management at larger scales. With population growth, increasing water consumption, and extreme events due to climate change this becomes more frequent. Communities take up these challenges as well, moving to the next-lowest appropriate level. In mountainous areas in Nepal or Tanzania, people introduced rotation schedules over large upstream and downstream stretches. A people's movement took the initiative for massive groundwater recharge in India's depleted aquifers (Shah 2007). Moving up is based on needs.

Some forms of self supply for multiple uses such as wells or household storage are owned by individuals. Other forms of self supply for multiple uses are communal (Sokile 2005; Boelens *et al.*, 2007; Van Koppen *et al.*, 2007). Communal river diversions, night storage and canals have long been in use in the mountainous areas of Tanzania, Nepal and Colombia. Flash floods have been harnessed in Africa and Asia (Mehari *et al.*, 2007). Multiple cascading

village tanks as in Southern India are also forms of communal self-supply for domestic and productive uses (Palanisami *et al.*, 2011). Individual self-supply has grown exponentially in recent years. The availability of new plastics, motorized pumps, and fuel and electricity in rural areas has drastically improved access to water for multiple uses by the poor. The poor are not passive. They respond dynamically to new opportunities to meet holistic livelihood needs.

This is not to romanticize peri-urban and rural communities. Gender and other social hierarchies intersect with water and natural resource management and perpetuate inequities and exclusion. Poverty is widespread. Knowledge about hidden groundwater sources and impacts of rapid changes may be limited. New opportunities and new risks in land and water uses warrant new public responses. There is a genuine need for public support by governments, NGOs, donors, and the private sector. The point is placing the poor at centre stage of holistic local-level integrated management of multiple sources. That is what MUS does: MUS follows their priorities and welcomes their knowledge and skills on holistic water management for self-supply as a major untapped asset.

Water professionals moving to MUS

Public water service providers and water resources managers have paid little attention to people's own integrated water resource management for self supply. These practices have largely been informal. Even in research on how different groups in communities manage water, there was often a professional bias for one particular use.

The main 'confrontation' between people and professionals, one which triggered the emergence of MUS, was about people's practices in single-use designed public infrastructure. Both the domestic sub-sector and irrigation sub-sector observed that their schemes designed for one single use were invariably used for other purposes as well. Any public scheme designed for a single use is a *de facto* multiple use scheme. People see public schemes as another water source to meet their multiple needs. Professionals' responses to people's practices are quite comparable in the WASH and irrigation sector. These responses are subsequent steps in moving towards MUS (Renault 2010).

A common first reaction among professionals is to ignore or deny non-planned uses, or to declare those uses illegal and charge fines. The fear is that unplanned uses cause damage to the infrastructure and disturb allocation schedules for the planned uses. In practice, it is virtually impossible to prohibit people from using domestic schemes for livestock and small-scale gardening or to keep cattle away from canals. Fines have little effect. The next response from the professionals is to accept unplanned uses as a reality, turn a blind eye, and say, "not my job".

When professionals start accepting unplanned uses as part of their job, they often realize how these *de facto* non-planned uses generate many livelihood benefits and returns on investments, often at no extra cost. There have been numerous qualitative and quantitative valuations of the benefits of domestic water uses, fisheries, livestock watering and horticulture in irrigation schemes (see Yoder, 1983; Meinzen-Dick 1997; Bakker *et al.* 1999; Renwick, 2001; Van der Hoek *et al.* 2002; Moriarty *et al.*, 2004; Nguyen-Khoa *et al.,* 2005). Productive uses of domestic schemes are more frequent when the water supply is more reliable. Water professionals do what any banker or investor would do: they quantify and

value all returns on investments. With MUS, rates of return become higher with little or no extra cost. These steps make common sense. Awareness of the occurrence and the livelihood benefits of *de facto* multiple uses is not 'rocket science'.

After turning the blind eye and after accepting *de facto* uses, water professionals finally discover MUS. MUS is a proactive and explicit change in service delivery to accommodate multiple uses. Providing for multiple uses can be done on an *ad hoc* basis and informally by operators on the ground. However, full-fledged MUS goes further and takes people's multiple needs as the starting point for planning and providing water services from the onset. People's unplanned uses stop being a problem and become an opportunity. People's holistic water management practices for self supply become an asset to support and build on. People's priorities guide public support.

MUS, however, is not necessarily pro-poor and gender-equitable. MUS only becomes pro-poor and gender-equitable by consciously targeting poor women and men. Pro-poor and gender equitable MUS places them in the driver's seat of deciding about public support for water services and water resource management. The MUS Group champions this pro-poor perspective.

MUS focuses on water services and water uses but recognizes that water is just one input in people's livelihoods. Much more is needed to generate livelihood benefits from water. Sanitation and hygiene training are necessary to improve health. Extension services, fertilizers, and veterinary care are needed for growing crops and breeding animals. Without markets there is no income from produce. Water is the limiting factor if these other factors are already in place. People may find their own solutions once water is available. Or public support can be extended to address those other needs.

Before addressing the question of how to scale up MUS, we summarize past evidence on 'why to scale MUS'. This is a vision of the benefits that can be achieved at large scales and is based on evidence or evidence-based hypotheses. The country studies explore which benefits are seen as most attractive to people interviewed and may induce change to MUS.

The benefits of MUS

Multi-purpose infrastructure: more livelihood benefits and higher ability to pay

The incremental costs needed to turn single-use designed infrastructure into infrastructure for multiple uses are relatively small, but generate many incremental livelihood benefits. The study by Renwick (2007) came to this conclusion for both communal domestic schemes and irrigation schemes. Multiple uses improve multiple dimensions of well being, in particular health, food security and income, and reduce women's and girls' drudgery. These livelihood benefits mutually reinforce each other, also over the generations. Better health boosts productivity. Girls' school attendance better prepares them for the future and delays their marriage and child bearing age. In this way, MUS gives 'the most MDG per drop' (Renault 2008).

The high benefit-cost ratios of multi-purpose infrastructure are well known at higher aggregate scales. No one would suggest constructing one large-scale dam for domestic uses and one dam nearby for irrigation or hydropower. Yet, that is precisely what single use

water services do at local levels. MUS applies the benefit-cost principle of large multi-purpose dams to the levels of homesteads and communities in the same ways communities have done for generations.

Multi-purpose infrastructure contributes to financial sustainability. More livelihood benefits broaden the potential basis for payment for the service. Income from productive uses in 'domestic' schemes increases the ability to pay. Fees can be charged for forestry, livestock watering, and municipal uses from irrigation schemes or village tanks (Palanisami *et al.* 2011). Better revenue collection contributes to the sustainable operation and maintenance of a scheme. (Whether scheme managers charge and collect fees for those uses, and whether users are willing to pay are other issues).

Schemes also become more sustainable in a technical sense because damage is avoided. Institutionally, conflicts from deregulation due to unplanned uses reduce. MUS anticipates and plans water allocation for institutional sustainability.

Participatory demand-driven services for more sustainability

The second set of benefits is related to the participatory nature and downward accountability of MUS. Single use water services operate top-down within narrow frameworks of pre-set technologies or service levels. Supply- and technology-driven support for pre-set single uses fails to meet people's needs. This contributes to the notorious degree of sub-optimal use and lack of maintenance, if not abandonment of infrastructure, both in the domestic and irrigation sub-sectors. MUS is participatory and based on people's needs and priorities. Not surprisingly therefore, MUS emerged spontaneously in participatory initiatives where people got the choice and preferred multi-purpose infrastructure and the conjunctive management of multiple sources. India's Mahatma Gandhi National Rural Employment Guarantee Scheme (MG-NREGS) and community-driven development programs are examples and elaborated in the country studies. The global shift towards decentralized decision-making since the mid-2000s has created fertile ground for MUS.

The benefits of participatory approaches in development are well known. These same benefits hold for water projects, probably more so. The poor are acknowledged as actors who shape their own destiny. Participation is based on a diagnosis of technical, social, institutional, human and physical capital that already exists. This implies recognition of community capital of earlier self-supply and of earlier projects. This also shifts priorities. In the Southern African Development Community (SADC) and IWRM Demonstration projects, rehabilitation of existing assets proved to be a higher priority for communities than spending all their resources on new construction. The latter is common in conventional water services (SADC/Danida 2009a; 2009b).

Public support adjusts to local barriers and opportunities. Considering local diversity is certainly important for highly variable, unpredictable and fluctuating water sources. Adjustment to local conditions is also important because of the diverse nature of productive water uses. Water needs for drinking and basic domestic uses are universal. However, opportunities for productive uses greatly differ according to locally specific livelihood strategies of farming and enterprises. Socio-economic opportunities to use water profitably also greatly vary. Each of these advantages of participation positively affects the technical, institutional and financial sustainability of infrastructure and governance investments. The

impact of participatory approaches is difficult to measure in general. Moreover, participatory planning of water services is still relatively new and piecemeal.

Participatory approaches also face challenges. Elite capture is frequent and is more negative for water development. Those with more land, more capital and better access to markets have more means and opportunities to use larger quantities of water for productive uses. Existing social inequities lead to even wider inequities in water use and control. Under physical water scarcity, this easily affects other people's absolute access to water. Elite capture in projects can only be avoided through purpose-designed inclusive planning processes. Women and other marginalized groups need to be organized to ensure their voices are heard. This requires time, resources and capacities which are often lacking. Capacities for project management need to be built, including general administration and accounting skills.

Moreover, water infrastructure and governance are technically complex. For smaller infrastructure people need to be well informed about various technologies and their options for siting and lay-out to make an informed choice. Local manufacturers and operators need to be trained. Such resources are scarce in mainstream public development support. Larger-scale infrastructure which can capture economies of scale require forms of co-management between communities and state organizations or parastatals. In co-management, downward accountability remains important.

People-driven sustainable water resource management

Benefits of MUS are further related to the recognition of the link between service provision (through infrastructure and governance) and the management and allocation of multiple water sources. This approach has been little applied or studied as yet. The benefits are plausible because two professional communities who hardly communicated in the past, and were sometimes in opposition, are willing to merge their expertise. These are the service providers who focus on people and see their improved water use as the solution for their well being. The others are water resource managers and environmental experts who take the resource as an entry point. They tend to see people's expanding water uses, including their waste discharge, as the problem.

For people on the ground there is no separation. Concern for their own well being drives water management and is not short-sighted. Agrarian livelihoods are water dependent for each next season. The basis of well being is sustainable water resource availability through an integrated local water cycle, both quantitatively and qualitatively. People choose efficient combinations of water sources and use and re-use. Communities also realize that allocation of water is mainly affected by new construction of infrastructure (for multiple uses), so with the arrival of newcomers or those expanding water uses. Distribution among all water users is a secondary allocation issue. Communities are not compartmentalizing water allocation by single uses. They are not allocating water to all domestic uses separately from all irrigation uses or separately from all livestock watering or brick making. Allocation of water is to people with multiple needs. The social fabric shapes these investments and allocations.

Putting the poor and their knowledge of water resource management and socio-political dynamics at centre stage improves service provision. It opens up the choice to more water

sources that can be tapped. For example, instead of treating large quantities of water, the 3 to 5 litres per capita per day needed for drinking can be met by rainwater harvesting. Allocation issues are not confined anymore to the one infrastructure designed for a particular use. Single use planning dictates that any non-planned use is 'stealing' water. In 'domestic' schemes, productive water uses are seen as stealing. In 'productive' schemes, the opposite holds. Reference to professional mandates never solves a dispute; compartmentalized professionals will never agree.

Water resource managers and ecologists also gain from recognizing the strong link between water resource management and service provision. Water allocation changes most drastically as a result of the construction of new infrastructure, from local to transboundary scales. When basins start closing, the question of who invests in new storage and other infrastructure is even more important as the impacts on others become ever more tangible. If the poor are excluded from these processes, they will be excluded forever. Yet, water resource managers in IWRM tend to focus on secondary water allocation. Zimbabwean villagers without access to infrastructure described this IWRM focus as "buying a maternity dress for a woman who is not yet pregnant" (Chikozo and Latham 2005).

Putting the poor at centre stage further strengthens water resource management because it challenges the assumption that one can 'manage water resources' as if 'managing' were a goal on its own rather than a means to an end. It overcomes unrealistic ways of casting allocation issues in terms of monolithic single use sectors. Allocation is between people and people have multiple water needs. Quantification of the distribution of water use by individuals, each with multiple water needs, is revealing. In rural South Africa for example, half of one percent of users use 95 percent of the water resources. More than doubling current estimated water access by every rural user from 116 to 277 liters per capita per day would require the one half of one percent large-scale users to share only six percent of the water they currently use (Cullis and Van Koppen 2007).

An explicit goal of water allocation should be to safeguard the multiple water needs of the poor. This includes the priority for domestic uses which is widely adhered to in formal national water laws. Clearly, this priority is important for women to carry out their domestic chores. However, this multiple use perspective recognizes that neither poor women nor men with agriculture-based livelihoods survive on domestic water alone. A multiple use priority safeguards all water uses that contribute to meeting the Millennium Development Goals and human socio-economic rights of water for domestic and productive needs. MUS operationalizes this priority.

Another potential benefit of pro-poor MUS is that it fills the void that IWRM has left at the bottom of the pyramid. Most IWRM initiatives have been from the national and highest basin scales down, i.e., a push from above. The legitimacy of those institutions is increasingly challenged as both non-democratic and ineffective. MUS starts from the bottom-up, so from people's already integrated management of multiple uses and multiple sources, and integrates services and water resource management. MUS links with formal institutions, in particular elected local government. Thus, MUS is the bottom-up pull for integrated water resources management, which finally gives a voice to the poor.

MUS strengthens the operationalization of ecosystem services on the ground. Both recognize the intricate multi-functionality of water and related natural resources and the complex interactions of multiple conjunctive uses. Both are concerned with community landscapes and waterscapes from which people derive their livelihoods. Relationships between people and their environment are shaped at community scales. They go well beyond artificially delineated wetlands. They also occur outside well-fenced nature parks. Depending on the issue at stake, scales vary from local to higher scales. Indeed, communities are most vulnerable to changes at the largest scale: the planet's hydrological cycle. This cycle is the main vehicle for the impacts of climate change.

Putting people first in defining and managing their ecosystems ensures that their long-term livelihood needs are served. This is a condition for sustainability. Accepting people as the solution instead of the problem resolves the tensions between conservationists who take the integrity of the ecosystem as their entry point, and communities as owners and managers of their ecosystems. Putting people first ensures that technical support on appropriate conservation measures is demand-driven and that payment of their ecosystem services is a win-win arrangement. MUS also operationalizes ecosystem services into concrete and measurable benefits because it includes water storage and conveyance. These are key elements in adapting to less predictable seasonal fluctuations and more extreme events. As the Mapping Systems and Services for Multiple Uses (MASSMUS) methodology of FAO showed (Renault 2010), infrastructure has been the missing link in ecosystem services. Infrastructure is vital to realizing provisioning and regulatory services. Without infrastructure, provisioning services remain a potential service, not an actual one.

Box 1: Merits of MUS

Box 1: Merits of MUS

- Improving multiple livelihood benefits, including health, nutrition, food security, and income to meet MDGS and human rights to water, food and livelihoods.
- Generating high incremental benefits at low incremental costs.
- Ensuring more uses for cost-recovery.
- Enhancing technical sustainability by avoiding damage from unplanned uses.
- Enhancing technical, financial, and institutional sustainability by meeting a community's priorities.
- Mainstreaming women's priority for domestic and productive uses across the water sector.
- Building on communities' existing infrastructure, skills and institutions.
- Enhancing resilience through the use, re-use and recharge of multiple sources.
- Bottom-up IWRM to fill the void of top-down IWRM.
- Improving transparency in the allocation of public funds and water resources and prioritizing poor people's shares.
- Operationalizing ecosystem services and demand-driven conservation.
- **In sum: innovative solutions to sustainably achieve the MDGs and the human rights to water, food and livelihoods.**

Box 1 summarizes the proven and plausible benefits of MUS. They would apply across the developing world if MUS were scaled. These benefits of MUS render the central question of this scoping study even more pertinent: Why have the *de facto* multiple uses not convinced many more professionals to adopt MUS? Why is it so difficult to change the arrangement of professional water service providers, integrated water resource managers and ecologists? What are the barriers? Are there opportunities for change? What can we learn from the spontaneous applications of forms of MUS in participatory development initiatives?

Below we focus the issue of scalability into more precise research questions for the country studies. This general understanding of scalability can be equally applied in other countries.

Theory of scaling up MUS: MUS modalities and scaling pathways

We define scaling up MUS as: better institutionalization of robust MUS in water and development initiatives, and achieving a wider geographic spread. MUS is relevant for any form of public support to water. Each sector better achieves its own conventional single use mandate and more if it better aligns to the holistic perspectives of people in communities. Adopting MUS means widening narrow conventional mandates to encompass people and all their uses and water resources. Poor people are the guide in moving to MUS in a more downward accountable system instead of single use specialists with upward accountability. The provision of specialist expertise remains much needed, but becomes demand-driven.

There are many entry points for moving towards MUS. Promoting diverse entry points leverages more water and development initiatives through which MUS can be scaled. To date, MUS Group members have mainly innovated four entry points with four sets of primary scaling partners. This has led to four MUS modalities: domestic-plus, irrigation-plus, self supply for multiple uses, and community-based MUS. Each MUS modality has its own scaling pathway and primary scaling partners. These categories are dynamic and bound to evolve. In this study they are used to systematize the assessment of past MUS, the robustness of the modality, and scaling potential in the country studies (or any MUS scoping study elsewhere). They also allow a more general synthesis by modality.

A modality is defined on the basis of the investor in the infrastructure. In domestic-plus, irrigation-plus, and community-based MUS, the public sector (government or NGO) bears the bulk of the capital costs. Public infrastructure tends to be communal. In self-supply, users bear the costs. Traditionally self supply was both individual and communal. With greater government involvement in communal works and co-management, self supply is mainly individual to date. The other criterion for categorization is whether professionals implicitly keep setting priorities for certain uses and sites of use or not. As the name implies, in domestic-plus, the priority remains on delivering water year-round to homesteads, with a priority for sufficient water for all domestic uses and safe water for drinking and cooking. In irrigation-plus, the priority is seasonal or year-round water delivery to crops in fields. The +plus approaches are typically used for rehabilitation, but can also be applied for new construction.

Table 1. MUS modalities

MUS modality	Priority setting	Implicit priority use and site	Main investors	Primary scaling partners
Domestic-plus	WASH sector	Domestic, near homesteads	Public, standard communal technologies and service levels	WASH sector
Productive-plus	Line agencies NGOs	Single productive use, designated sites	Public, standard communal technologies	Agricultural line agencies and NGOs
Self-supply multiple uses	Users	Multiple uses, where appropriate	Individual users	NGOs, private sector, government
Community-based MUS	Users	Multiple uses, where appropriate	Public	Local government, line agencies, NGOs, water resource conservation, private sector

In self-supply, the choice of water uses is left to users. Many use infrastructure for multiple purposes but single uses are possible. This largely depends on the site of use. Motor pumps in distant fields are often single-use, for example. Filters for point-of-use treatment also have one specific use. Self-supply complements public sources. Together, they meet all livelihood benefits. The choice of water use is also left to people in community-based MUS. Table 1 summarizes the four modalities.

Each modality is, in principle, relevant everywhere. They overlap and merge. Boundaries will gradually further blur to serve the same people with regard to the same water resources. Domestic-plus approaches may widen their sites of water use to the community scale, and become community-based MUS. Irrigation-plus in larger irrigated areas can become community or district-based or sub-catchment MUS. Communities can chose any of the other three modalities or combinations thereof. Communities can prioritize a +plus approach. Women, for example, are likely to prioritize domestic-plus.

The distinction of modalities makes it possible to judge whether MUS is robust and how it can be scaled up. 'Robust' means that a certain modality is ready for scaling. This implies that the modality is conceptually clear and that evidence is becoming more generalizable and is based on at least several pilots in sufficiently different socio-economic and ecological conditions. 'Robust' also implies that the model is well documented and communicated in the form of guidelines and tools. These assessments are an on-going endeavour. Further application at larger scales would enable a new round of assessing robustness. The link between modalities and primary scaling partners guides the identification of partners for the next scaling steps in any country.

As summarized in table 2, scaling MUS entails two components. Each component has its respective activities. One is to render the model more robust, based on pilot testing, documentation, synthesis, and tool development for advocacy and dissemination. The other is to replicate the models with primary scaling partners through awareness raising, capacity building, implementation and continued evaluation and impact assessment.

Table 2. Scaling MUS

Scaling MUS	How	Activities
Rendering MUS robust	Each sector: MUS as solution for own mandate and beyond Through four MUS modalities: domestic-plus, irrigation-plus, self-supply, and community-based MUS	• Establishing MUS networks • Pilot testing • Analyzing, synthesizing • Tools/guidelines
Scaling MUS modalities	Leveraging large-scale programs and influencing policies	• Awareness raising • Financing, planning and implementing • Analysing, synthesizing for MUS networks

The current evidence base of each modality is presented below. This gives some indication of robustness at the start of the study.

Domestic-plus

The domestic-plus modality builds on the water services ladder of the WASH sector. The WASH sector used to assume that water quantities at higher service levels are still primarily, if not exclusively, used for domestic uses. However, empirical research confirmed that poor rural and peri-urban users in agrarian societies use and re-use water for livestock and other productive uses well below even basic service levels (see Figure 2). Similarly, studies have shown how higher service levels in terms of quantities, nearby availability and reliability lead to more productive uses. Domestic-plus builds on this evidence and plans for higher levels of service. In largely unserved areas, as in most of sub-Saharan Africa, this means roughly doubling or tripling current supplies to 'intermediate-level MUS' of 50 or 100 litres per capita per day. This allows for backyard gardening, livestock and home-based industries. Renwick (2007) calculated that intermediate MUS service levels of MUS at 50 to 100 litres per capita per day generate income which allows repayment of the infrastructure investment and operational costs within 6 months to 3 years.

Three to five litres per person per day should be safe for drinking and cooking. It is noted that higher quantities of water for personal hygiene and sanitation are equally important for health (Van der Hoek *et al.* 2002). They can be of lesser quality, like all productive uses.

The domestic-plus modality maintains a priority for meeting people's domestic needs near to or at homesteads, so productive uses also tend to concentrate there. This site is especially relevant for women, who tend to have a stronger say over income from

productive activities around their homes than from distant household production. For the land-poor, sick and elderly, the homestead may be the only place where they are able to use water productively.

Scaling up domestic-plus occurs via the WASH sector, increasingly in collaboration with local governments. The basic performance of this MUS modality is measured in terms of service levels. Further indicators could be the proportion of users taking up water for production. This proportion is higher in rural areas than in peri-urban areas. The wealth and gender composition of these users can be used to measure the success of targeting. There is a sliding scale from accepted *de facto* productive uses to MUS by design. In sum, 'climbing the water ladder' is a conceptually robust and evidence-based modality.

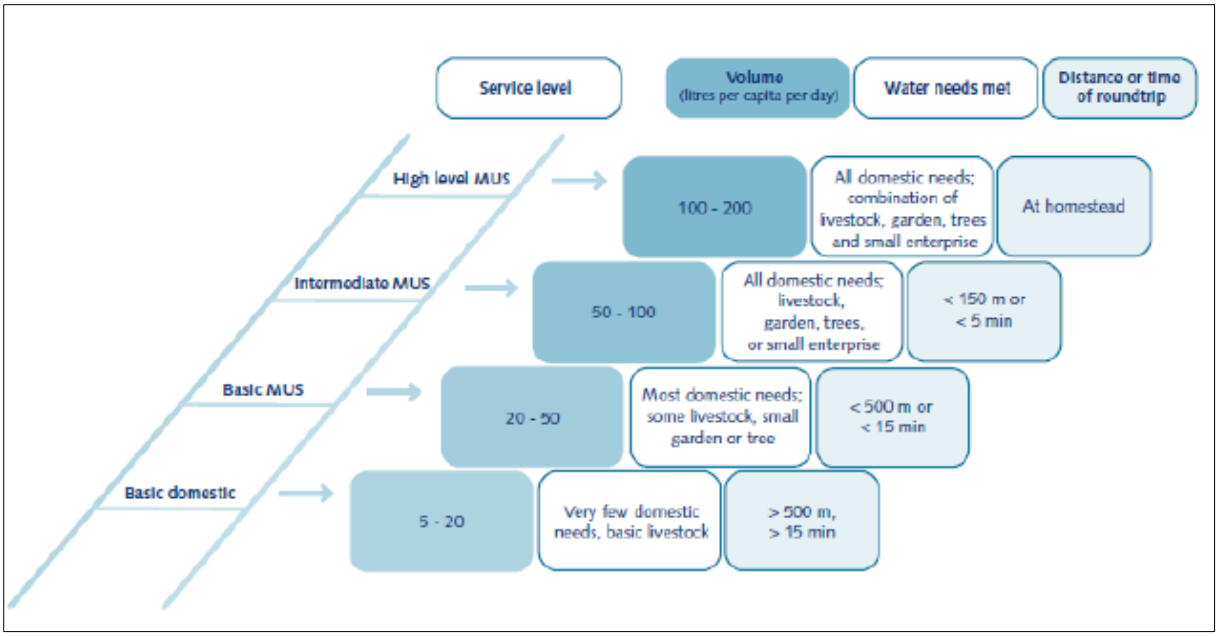


Figure 2: The domestic-plus water ladder (Renwick, 2007; Van Koppen *et al.*, 2009)

Irrigation-plus

Irrigation-plus is most advanced in the Mapping Systems and Services for Multiple Uses (MASSMUS) methodology for the modernization of governance of large-scale irrigation systems. This methodology, developed by FAO, has been applied in India, Vietnam, and China. Relatively small incremental improvements are added on to existing irrigation infrastructure. They mostly improve access to surface water (cattle entry points, washing steps, small diversions for laundry, bridges, roads, etc.). Conjunctive use of seepage for groundwater recharge for irrigation and domestic uses are considered when planning to line canals or not. In areas where canal water is the main source of water, water is supplied year-round and reservoirs are filled for livestock and residential areas. Groundwater recharge can be accelerated by avoiding cement linings. Water allocation schedules accommodate these uses. However, water delivery to crops remains the priority. Only in areas with upcoming urbanization and substantive municipal water needs do we see that the priority for crops is challenged.

The MASSMUS methodology further includes the different use requirements, valuation of different uses including ecosystem services, and the subsequent planning steps to modernize water services governance and, where needed, infrastructure from a multiple use and multiple source perspective. MASSMUS has specific domestic water and gender modules. MASSMUS is conceptually robust for large-scale irrigated areas. The same approach can be applied to small-scale communal irrigation schemes as well. This has not been done as yet.

Other productive-plus modalities

Fisheries experts also conducted research on how to alter management to better integrate fish rearing and other productive activities into water bodies (e.g. dams or irrigated fields). This was a 'productive-productive' approach (Nguyen-Khoa *et al.*, 2005). Ancient and modern small village reservoirs have been operated and studied from various productive and domestic entry points, including irrigation, fisheries, forestry, livestock and domestic uses (Palanisami and Meinzen-Dick, 2001; Venot *et al.*, 2011). Documentation and implementation of these productive-productive and productive-domestic approaches is still fragmentary. More consolidated effort and coordination are needed for a robust MUS modality. Scaling up irrigation-plus and other productive-plus modalities is largely through technical line agencies and NGOs. Line agency collaboration with local government tends to be underdeveloped.

Self supply for multiple uses

In self supply, users themselves invest in most infrastructure capital costs, often on an individual or household basis, although some arrangements are communal. They use infrastructure as they need it, mostly for multiple uses. Scaling up self-supply is largely through effective and sustainable market-led supply chains. Public sector support focuses on technological innovation, supply chain development, financing facilities, and an enabling policy environment. NGOs have been particularly active in introducing affordable technologies and setting up supply chains. Both the irrigation and domestic sub-sectors have started acknowledging the existence of this MUS modality. The main reason for this shift was the vibrancy and robustness of these formerly ignored practices. Water needs are met at low or no cost to the public sector. This renders self supply a robust modality.

Community-based MUS

In community-based MUS, government or NGOs fund communities for what communities set as their priorities. If water is the priority, they usually finance the bulk of the labor and cash costs of mainly communal infrastructure construction or rehabilitation. Technology choice, siting, and lay-out are in the hands of the community. As for irrigation schemes, multiple conjunctive sources are relevant at community scales. Integrated management and conservation allows for water efficiencies and environmental sustainability. In participatory planning processes, community members, including women and marginalized groups, are empowered to articulate their needs and demands, access information, and make choices regarding their assets and resources. Long lists of community needs are priority-ranked and conceived as time- and budget-bound 'bankable projects'. These projects are then matched with available top-down financing streams. This can be achieved by loosening up single-use and single-livelihood strings tied to funding. Another way is to pool (or 'converge') parallel

financing streams into the project. This MUS modality applies the general principles of community-based natural resource management (CBNRM) to water resources.

Community-based MUS emerged first in Nepal as the Water Use Master Plan (WUMP). Within the water sector other pilots also emerged, as in SADC (SADC/Danida 2009). Community-based MUS is being applied at much larger scales in the participatory rural development initiatives since the mid-2000s. The guidelines for planning and providing multiple use water services of the MUS Group synthesize these experiences as subsequent steps of participatory planning (Adank *et al.*, 2012). They indicate the similarities between community-based MUS and more participatory domestic-plus and irrigation-plus, within the conditions set in the latter two approaches. In this way, this modality is rapidly becoming more robust.

There are many scaling partners for community-based MUS. Each water services and water resources approach within the water sector can benefit. Outside the water sector, any rural and peri-urban participatory project can lead to community-based MUS without an explicit intention but as a result of a community's own prioritization for improving the use of multiple sources for multiple uses. In line with the global trend toward decentralization of decision-making of public support through local government, local government agencies become increasingly important in public service delivery. These long-term institutions can provide for financial and institutional sustainability of communal water systems. They offer scope for nation-wide scaling. Global debates of MDGs and human rights can be equally applied to holistic community-based MUS.

These four modalities enable practitioners to classify the entry points for MUS. They also guided the country studies. In India, we fully focus on MG-NREGS as community-based MUS. In other countries, we explore the modality with most experience, but also each of the other modalities in greater or lesser depth. We assess how robust the application of each modality is, and what are the barriers and potential for scaling.

The practice of scaling up MUS: MUS Group networking

The theory of change for MUS modalities is about 'scaling what'. The country studies assess the 'how' question by identifying partners and ways to organize for innovating MUS. Past experience has shown that learning alliances are important. From 2003 onwards, MUS proponents from local to global levels organized a network: the MUS Group (see www.musgroup.net). Professionals from 14 core partners and others regularly meet for exchanges on new pilots and action research, advocacy, and synthesis. Other members follow a newsletter and the website. The MUS Group also presents progress on lessons learnt at international fora. Depending on resources and specific pilot activities, district and national learning alliances are formed. Joint selection of strategic pilot activities and their sites ensures interest in the answers at all levels. Joint visits to success cases are most convincing.

The network brings professionals together who otherwise would not meet. They constitute a good mix of government, donor, NGO, private sector, and knowledge centres. All bring

their specific contributions to institutional transformation for MUS. Governments are strategic gate keepers who set policies, laws, and programs. They allocate budgets according to line departments and local government structures. They also shape the country's education and training. MUS champions in national government have wide impact – and are still rare. Most donors reinforce single-use funding streams. Others increasingly apply community-driven development programs. Financing agencies like USAID, IFAD and FAO proactively promote MUS. Livelihood-oriented NGOs have generally been MUS innovators. The development of appropriate technology that allows for multiple uses has also been a driver. The private sector is client-oriented and welcomes multiple uses. Knowledge centres play an important role in bringing people from different sub-sectors together. Implementing agencies are usually weak in providing credible and in-depth documentation of their experiences and creating any institutional memory; knowledge centres fill this gap. They analyse and document case studies, facilitate reflection, and publish research and advocacy materials. Knowledge centres also educate and train students and build capacity.

The MUS Group networks are broad, both vertically from local to global level, and horizontally, covering Latin America, Africa and Asia. Indeed, it is the complementarity of these five groups and their networking that has innovated MUS in the past, in particular for developing the four broad MUS modalities and raising awareness. For implementation of the MUS modalities at scale and for assessing impacts of such larger initiatives, significantly more resources are needed. The country studies also identify the scope for national networking along these lines.

We now turn to the findings of the country studies. Findings on the identified scaling pathways and partners are presented by country. The type of innovation, potential and barriers are related to the modality. They appeared quite similar across the countries. Therefore, those findings are presented by modality.

FINDINGS INDIA – GUJARAT AND KERALA

The India scoping study focuses on the participatory creation of water and drought proofing assets under the Mahatma Gandhi National Rural Employment Guarantee Scheme (MG-NREGS), the world's largest laboratory for community-based MUS. The MG-NREG Act of India provides a legal guarantee for 100 days of employment per year to adult members of any rural household willing to undertake public works at the prescribed minimum wages. In 2010-11, the program provided more than two billion person-days of employment to roughly 50 million rural households. With an annual outlay of close to USD 9 billion, MG-NREGS is arguably the world's largest rural livelihoods security program. The Act provides for a bottom-up participatory approach to planning and implementation of public works.

Studies by IWMI and others suggest that 60 percent of the assets created under MG-NREGS are water-related. Most are multiple use structures that improve surface storage and recharge groundwater. Data from a study of 140+ best-performing MG-NREGS water assets in 75 villages across 8 districts of Bihar, Gujarat, Kerala and Rajasthan shows that, on average, these assets were able to recover their investments in a little over a year. We also found that MG-NREGS implementation deeply influences and is in turn influenced by the farm and non-farm labor markets. While the wage-benefits of MG-NREGS are clear from the data on number of person-days of employment generated, the benefits from the social assets created and their distribution requires deeper investigation. Wherever village communities have taken enthusiastically to the idea of MG-NREGS and where their enthusiasm has been supported by an able, well-staffed administration and capable local governance institutions and leadership, the results have been exemplary. IWMI studies indicate that five factors make or mar successful MUS implementation via MG-NREGS: a) contextual fit; b) village preparedness and attitude towards MG-NREGS; c) proactive and well-equipped MG-NREGS administration; d) empowered and enlightened village communities; and e) incentives and inventive flexibility.

While scale has been reached, the modality of community-based MUS should become more robust. We propose the creation of a MUS-NREGS Network and, as a start, a three-district pilot project which will, through an *action-research – capacity building – experience sharing* protocol, aim to overcome the barriers to MUS and maximize the net positive outcomes from MG-NREGS. The network will focus on:

- interactions between labor markets and the scheme;
- potential to reconcile supply-driven high coverage targets and demand-driven participatory local planning for multiple uses from multiple sources;
- performance assessment of water works for multiple uses and multiple sources (cost-benefit, technical, institutional sustainability and incentive deficit and trade-offs between equity and effectiveness for rehabilitation of existing and new public works);
- involvement of women and men wage-workers in work and site selection and prioritization of communal and individual works;
- reviewing the potential and challenges of adopting a river basin-watershed approach; and
- lessons from innovative government-government and government- NGO convergence mechanisms.

The MUS–NREGS network proposes to liaise with central government and to work in Gujarat and Kerala. In Gujarat, MG-NREGS is implemented in collaboration with Sadguru, an NGO with renowned expertise in sustainable water and land development and conservation. Kerala is a leading example in terms of mature local government and women's involvement in MG-NREGS, because implementation is carried out through Kudumbashree, the government-linked women's organization. Kerala also pioneered watershed approaches.

The Network will target three primary outputs: a) science-based knowledge products (e.g. research papers and policy briefs) aimed at making practical policy recommendations; b) improved capacities of local government *Panchayati Raj* Institutions (PRIs) and MG-NREGS administration; and c) wider dissemination and interaction to promote cross-learning, including with African partners. The 12-month pilot will be hosted and incubated within IWMI India. At the end of the pilot, we expect that the initiative will spin-off into an independent entity for expanding its work and activities to other parts of the country in partnership with IWMI and IRC. India's MG-NREGS's senior managers welcome such support.

FINDINGS NEPAL- MIDDLE HILLS

Global MUS innovation is most advanced in Nepal. In the middle hills, two robust MUS modalities have been conceptualized and implemented at scale. First, in the early 2000s, Winrock and IDE introduced piped gravity flow systems that provide sufficient water for domestic uses and vegetable cultivation at homesteads. Water efficiency is improved by drip irrigation. Other components of the market-led supply chain, such as marketing, are addressed as well. Over 200 of these domestic-plus systems have been implemented, partly in collaboration with the Non-Conventional Irrigation Project of the Department of Irrigation. Learning alliances were established to document and exchange these experiences, and policy interest was raised. NEWAH/WaterAid increased its system design norms. NEWAH, SAPPROS, CARE and other NGOs also diversified, for example, by adding fish ponds. There is strong potential for further scaling piped gravity flows on the 875,000 ha of arable land that are not irrigable with conventional irrigation and that the government seeks to develop. Given the high rates of male outmigration and the feminization of agriculture in the middle hills, women are an important target group. Domestic-plus aligns well with women's stronger roles in homestead-based cultivation. The WASH sector is especially interested in income from productive uses to improve the ability to pay for scheme sustainability. However, a rigorous consolidation of past experiences is still lacking. Such **consolidation** is recommended as evidence-based lessons for further advocacy and scaling up.

Second, in the late 1990s, well before the notion of community-based MUS was coined, Helvetas introduced it as the water use master plan or WUMP. It has been widely applied at village level by the Water Resource Management Program of Helvetas, and by the Rural Village Water Resource Management Project, supported by the Finnish government. Different WUMP modules exist and can be applied depending on available project resources. WUMPs have been applied by a few other organizations, but only for the single uses of their domestic or irrigation mandates. WUMP will soon be scaled up to district level. This will fully align with the restructuring of government under the peace process. Government and development partners emphasize decentralization and devolvement of resources and decision-making power to the lowest village development committees and district development committees. Again, past experiences of WUMP have not yet been consolidated. It is recommended to conduct such **consolidation** and identify a more robust WUMP.

A third potential pathway for scaling MUS identified and recommended for further exploration and documentation water projects in the multi-donor Poverty Alleviation Fund, which applies the World Bank's community-driven development approach. Funds are directly channelled to communities according to their priorities. Water projects are reported, but it is unknown whether and how the possibility of integrated design for multi-purpose infrastructure has been tapped.

Fourth, there are various soil conservation and watershed management initiatives. They seem disconnected from service provision. A study of current and potential links would identify the **scope for people-led sustainable water development and management**.

Across all modalities, a main barrier to scaling MUS is top-down single-use standard design by engineers from the lowest levels of local government up to highest management levels of single-use earmarked donor funds. **Training of engineers** in participatory design of multipurpose infrastructure with multiple sources is recommended.

The recommended consolidation of past experiences with piped gravity flow systems and with WUMP; the exploration of MUS in the Poverty Alleviation Fund and of current and potential links between water conservation and water services initiatives; and the MUS training for engineers should be guided by a **national MUS network**. This network should be composed of the above-mentioned partners and also include potential irrigation-plus champions and agencies that already promote self-supply for micro power plants, eco-sanitation, roof water harvesting, and biogas, grafted onto water provision. This network would take up further policy advocacy and strategize on new pilot projects.

FINDINGS ETHIOPIA

There is reasonably wide recognition of the potential merits of multiple use water services in Ethiopia as a result of innovation by NGOs and advocacy by research institutes, including participation in the global MUS Group international conference held in Addis Ababa in 2008. Several NGOs have been implementing and upgrading community managed systems that cater for domestic and productive water uses like irrigation, watering livestock and other micro-enterprises, and integrating these different uses to try and maximize the broad livelihood benefits that are linked to various health, food security and economic development outcomes. The provision of livestock troughs with community domestic water facilities is also fairly standard. In addition, households have been implementing systems that serve their multiple needs for water through the approach known as self-supply. Family wells have been developed by tens of thousands of households, and more often than not are used for multiple purposes with increasing productivity being a key driving force for making this private investment.

The acronym 'MUS' is itself increasingly a part of the sector discourse and interest in MUS is on the rise given the growing awareness that food insecurity, health and water insecurity are related. MUS could play an important role in helping the domestic water sector achieve its target of universal access by 2015 by generating the income needed to drive private investment in self-supply, and potentially improving the sustainability of communal water supply schemes. From an agricultural perspective, there are ambitious plans to develop 1.5 million hectares under smallholder cultivation over the next five years, which represents a seven-fold increase. The scoping study identifies four priority opportunities for support to acceleration of MUS within Ethiopia. These focus on exciting new opportunities for implementation of MUS that are more likely to go to scale, and other supporting activities that could encourage wider uptake.

A first 'best-bet' opportunity identified is to support development of the **Self-Supply Acceleration Programme** (SSAP). Family wells are used for multiple uses (by design) and there are existing experiences at scale to learn from, but weaknesses in the enabling environment currently hamper acceleration and do little to encourage safe water quality and sustainability. However, the self-supply approach has recently gained recognition in the national domestic water sector policy. The agricultural sector also has ambitious plans to extend self-supply and there is potentially much to gain in terms of access to safe water and increased productivity through linking these efforts. Program funding is required by the new and currently unfunded SSAP initiative focusing on technical support to help government reform the enabling environment to accelerate self-supply as a service delivery model.

SSAP involves providing support in four main areas: technology options and advice, strengthening the private sector, supporting financial systems and enabling government policies. Research on potential for self-supply combining groundwater availability and other indicators of potential could also contribute to acceleration. The efforts and impacts of several agencies could be further supported through funding to develop more coherent approaches to technology introduction and related learning (e.g. rope pump and manual drilling), that have a focus on users, supply chains and introduction processes rather than

individual technologies. The Self-Supply Acceleration Programme is being developed by a national working group led by the Ministry of Water and Energy.

The second best-bet opportunity identified is implementing MUS through the Community Managed Projects (CMP) approach. This is a nationally recognized approach for rural WASH, in fact now the priority approach for communal supplies, and being rolled out to all regions. Funding is channelled to communities through micro-finance institutions. In theory, the decentralization of decision-making to communities in CMP ought to facilitate MUS. However, this has not been actively promoted or facilitated to date by agencies involved in CMP. Research on multiple uses of existing systems developed using the CMP model in Amhara and Benishangul Gumuz regions is recommended. Promoting multiple use modalities is an option where communities express demand through training of support staff, development of MUS training modules, and action research/pilots. In these cases, documentation and learning would be opportune and could also include themes on MUS and sanitation links.

Working with the micro-finance institutions involved, this best-bet could pilot mixes of 100 percent grant (the current modality) for basic WASH infrastructure, mixed grant/loan for some add-ons/additional 'productive infrastructure' at community level, and 100 percent loans for household level investments. A new integrated **UNICEF-led project called WASH, Multiple Use Services, and Community-based Nutrition for improved Food Security and Reproductive and Sexual Health,** also uses the CMP approach. It is of major interest given its aims to test MUS approaches at scale through a domestic-plus approach. Additional investments could support this project in monitoring, documentation and lesson learning, or scaling up in other regions. It is, we believe, the most substantial effort to implement MUS at scale through a 'domestic-plus' modality anywhere.

Thirdly, further **scoping of productive-plus and resource conservation opportunities** is recommended. Although there is evidence of the non-irrigation uses of irrigation systems and the damage caused, this has neither been studied systematically nor have there been intervention suggestions for designing for multiple uses. A scoping study is proposed, in collaboration with AGRA Ethiopia, to explore the potential of taking people and their multi-faceted livelihoods as the entry point in the design and implementation of water and land resource interventions. The hypothesis to test is that a people's entry point instead of resource conservation or crop yields as entry points better meets the mandated goals of the soil and water conservation measures and infrastructure by increasing ownership and hence, sustainable maintenance. In addition, more livelihood benefits may be generated.

One specific opportunity already identified from the small-scale irrigation perspective is to support Technical and Vocational Education and Training (TVET) program development on small-scale irrigation, groundwater development and integrated approaches. There are major gaps in existing capacity building efforts in these areas and a MUS element could be included. The Guided Learning on Water and Sanitation training approach (currently WASH focused) could be expanded. A TVET **capacity building program** is proposed that would include curricula development, material development, training of trainers and training replication including MUS and related topics in an integrated multi-sectoral approach to water development. This could benefit from good practices and standard designs

disseminated among the organizations directly responsible for small scale irrigation development, the Regional Water Resources Bureaus and Agricultural Bureaus and, where they exist, the Water Works Design and Supervision Offices in the Regions.

Finally, and importantly given current new initiatives, there is an opportunity for a **learning network** on MUS focusing on policy and practice in Ethiopia to learn from and leverage the activities of various partners. This would be timely given that there are several new MUS initiatives in the country and rising interest. Coordination and learning is generally weak within the Ethiopian water sector (especially between sectors like water, health, education and agriculture) and between levels (national, regional, *woreda*). A well run and well documented capacity building and learning platform or network on MUS could create synergies and maximize impacts. Activities might include workshops, training courses, a dedicated website, additional case study documentation to support ongoing initiatives and seed funding for new initiatives. The MUS Group provides an international model that could be replicated with adaptations in Ethiopia. The network will include representatives of AGRA and the Growth and Transformation Plan.

FINDINGS GHANA

In Ghana, nine MUS sub-modalities and their scaling pathways were identified, each with their scaling pathways and potential beneficiaries.

There are three **domestic-plus sub-modalities**: increasing service levels of rural point sources, limited mechanical schemes, and utilities in small towns. This has high potential in terms of the number of people to be reached, with a combined total of **3.8 million people** in the northern belt. However, there would be a relatively small impact per person in terms of improved livelihoods. Total investment costs for increasing service levels is 30-60 USD/capita. Cattle troughs could be added to rural manual point sources. Limited mechanical schemes are community-managed boreholes with motorised pumps, an overhead tank and a distribution system with a few public standpipes, usually without household connections. This sub-modality offers basic to intermediate service levels. In towns, utilities already provide higher service levels, in part because some 20 percent of the people here have household connections. In towns, 30 percent of the population is engaged in productive activities such as small-scale commercial and industrial uses.

Scaling partners for domestic-plus are in the WASH sector, particularly the Community Water and Sanitation Agency (CWSA) as the lead government agency. They are willing to increase levels of service to accommodate multiple uses. Utilities will receive more revenue. This modality can be made more robust by documenting, for example, the innovative limited mechanical schemes and by sharing knowledge through existing WASH networks.

For the **irrigation-plus modality**, the rehabilitation of public irrigation schemes can be for multiple uses. The scope needs to be assessed in more detail, as there is hardly any information on these public irrigation systems. It is estimated that the maximum number of beneficiaries would not surpass **55,000** people, probably at modest per capita incremental investment costs. FAO's MASSMUS methodology can be adjusted to inform rehabilitation for multiple uses in Ghana.

A fifth modality is a form of irrigation-plus: retrofitting multiple uses in the rehabilitation of **small reservoirs** with **1.25 million** beneficiaries, or in new construction as currently planned. The reservoirs were initially intended for livestock and domestic uses, although there were no specific designs to facilitate access. Later, irrigation became the main focus, implemented by the Ghana Irrigation Development Authority. Risks include the current under-performance and poor sustainability of small reservoirs. The modality can be made more robust by scoping, pilot-testing and developing guidelines for participatory planning approaches and designs for multiple uses (gravity irrigation, pump irrigation from the reservoir, fenced livestock watering, and people's safe domestic uses through nearby wells). Incremental investment costs would start somewhere between 30-60 USD/capita. Both irrigation-plus modalities would best be implemented through consortia with GIDA and its donors and NGOs.

The promotion of complementary **self-supply** is particularly relevant for the booming adoption of water lifting devices for irrigation with a potential number of irrigators of 1.85 million. Self-supply is also relevant for domestic supplies, especially in the southern region

with more water resources. Point-of-use treatment is little developed as yet. Scaling would start with further scoping on current technologies; on strengthening market supply chains; financing facilities and a more supportive policy environment. As self-supply tends to self-target the wealthier, possibilities to better reach the poor and women need specific attention.

The participatory integrated projects, such as the Community-Based Rural Development Project and Social Opportunities Project, can reach **1.5-1.8 million people.** If given the choice, communities also opt for water projects. It seems, though, that these water projects are often implemented through the existing WASH or irrigation sector so may still be single-use. It needs further study to see whether the potential for **community-based MUS** has been tapped and how this modality can be made more robust. A barrier to scaling this approach through local government is that Ghana has no clear policy framework as yet for integrated planning through local government. District collaboration tends to focus on WASH and small reservoirs modalities.

Lastly, waste water is often used in urban agriculture as part of a full hydrological and nutrient cycle. A possible MUS modality is to promote peri-urban agriculture through improved **reuse of wastewater** (and other low quality open water sources). The total number of direct beneficiaries is small at **10,000 farmers.** The intervention would require engagement in broader issues of urban sanitation and wastewater management.

For rendering the +plus approaches more robust and for scaling, consortiums should be formed within the respective sectors. Together with researchers focusing on self-supply and community-based MUS, they should form a national network for action-research, training, and institutional development towards MUS.

FINDINGS TANZANIA

MUS has been introduced in Tanzania by the USAID-supported Integrated Water, Sanitation and Hygiene (iWASH) project. In this project Winrock, SHIPO and other partners develop low-cost technologies for multiple uses for self-supply (e.g., rope pump, rota-sludge drilling, water filters, groundwater recharge). The project also sets up market-led supply chains. The rope pump is particularly relevant because it provides more water than other manual techniques and costs are significantly less than cheap motorized pumps. Low cost water filters are also introduced to ensure the quality of the 3 to 5 litres water needed for drinking wherever centrally treated water is unavailable or ineffective because of recontamination. However, the poor may lack the funds to invest. Hence, the first proposed step in scaling up MUS through self-supply is **accelerating the MUS approach of iWASH and partners.** Action-research should further identify how rope pumps, filters and other low cost smart technologies strengthen poor women's safe and productive water uses in particular.

Another self-supply option that optimizes the multiple uses and re-uses of the local cycles of water and nutrients is **eco-sanitation.** Scaling eco-sanitation can be through the Stockholm Environment Institute, which conducts action-research on eco-sanitation in Tanzania.

The scoping study revealed considerable potential for the other three MUS modalities as well. WASH sector specialists are interested in **domestic-plus** as a way to facilitate income from productive uses and the ability to pay. Earlier work on the 'multiple use water ladder' was welcomed as advocacy for domestic-plus**.** As a first step in scaling domestic-plus, it was suggested to make a **calculation of the incremental costs and benefits** of increasing service levels in the Tanzanian context. This renders the modality more robust. The second step is **pilot testing domestic-plus** in a national learning alliance with donor support. The pilots should shed further light on solutions to the current barriers to scaling domestic-plus. One barrier is the new basket funding arrangements in Tanzania, which are entirely single use: either water supply or agriculture with irrigation. Other concerns raised were about water quality and equity issues regarding both allocation of public funds and water.

The **productive-plus** modality in the irrigation and livestock watering sectors is already quite well applied. Add-ons like special outlets or canals, troughs, washing places, or bridges are constructed to improve the access to water for livestock, domestic needs, brick making and other uses. Seeing themselves as 'livelihood engineers', the staff of the Ministry of Agriculture, Food and Cooperatives are well aware of the broader benefits beyond crop production. The proposed first step for further scaling is to render these practices more robust by **systematizing and formalizing these multi-purpose designs and explicitly including them in policies and programs**. The MASSMUS methodology can guide this endeavour. The irrigation policy emphasizes participatory approaches through local government authorities. This will strengthen bottom-up demand for multi-purpose infrastructure. However, at the moment, engineering capacity within local government is scarce indeed. Therefore, a second step in scaling productive-plus approaches is collaborating with the water supply sector and **exploring the scope for synergies in engineering support through local government authorities**. Integration of 'water supply' and 'irrigation' engineering is cost-effective and is anyhow more adequate. Tanzania's team of senior engineers would assess this. A third step in scaling productive-plus, also in

collaboration with the WASH sector, is to develop a **holistic joint vision on equity in public fund allocation and prioritization in water allocation**. Both water sectors encounter issues such as the risk that productive uses 'steal' water for domestic uses; the issue that expensive treated water would be used for domestic and productive uses that can do with a lesser quality; the implementation of the national legal priority for domestic uses; the current lack of targeted water services and legal protection for water uses that meet people's basic socio-economic human rights to food and livelihoods. The outcome will create consistency in pro-poor policies for allocating funding for infrastructure and services, and for legal prioritization of domestic and small-scale water uses.

Community-based MUS has a unique and high potential for scaling in Tanzania. The first step in scaling community-based MUS in Tanzania is **to assess whether and how community-based MUS is *already* coming up in two large-scale programs**. One is the Opportunities and Obstacles to Development tool. This is developed for all local government authorities to implement their growing responsibilities for decentralized service delivery. The other is the Tanzania Social Action Fund (TASAF) for community-driven development, which has already reached half the population. Comparison of the water components of these two initiatives will lead to more conceptual clarity.

The proposed comparative assessment will identify best practices to tap the advantages of integrated water planning. The assessment should especially identify solutions for the major challenge to scaling up MUS: that is matching bottom-up integrated demands with either parallel sector-based and single-use funding streams from baskets (which is complex) or with untied funding (which is straightforward). The assessment should explore how accountability systems to monitor public spending can move away from monitoring just one single use and livelihood benefit, as is done in sector-based funding. Instead, new criteria and procedures could be identified for accountability for public spending. These can be: targeting the needy; transparent and inclusive planning processes with clear budget guidelines from the outset; and transparency in budget allocation with equitable and performance-related criteria. The second step is scaling up this modality either by **supporting the implementation of community-based MUS in these two initiatives or by scaling through other water or rural development initiatives**. The potential scale is every village in Tanzania.

Community-based MUS can also be scaled through Tanzania's well advanced operationalization of IWRM. MUS as **bottom-up IWRM** complements and strengthens the top-down basin governance structures and water law of Tanzania's water resources management component. This warrants **a conceptual reinterpretation of IWRM in rural areas**. Currently, basin boards allegedly reach downward to all citizens. However, citizens first need to establish voluntary Water User Associations and (sub-) Catchment Management Committees. MUS, as bottom-up IWRM, starts with communities' traditional local integrated water development and management. This is already the formally recognized basis for participatory planning for service delivery. Service delivery already encompasses major water allocation and quality issues. Local government authorities already are the country's democratic representation upwards. Local government and line agencies already address inter-basin issues at the appropriate higher levels. Instead of discarding these practices and structures both institutionally and legally, MUS can be scaled

through IWRM if government would **formally recognize communities' existing customary water use and law without burden of proof**. Water for any basic human right would have highest priority in water allocation. Local government authorities would be recognized as democratic representatives in basin institutions at whatever higher level needed. The extremely scarce basin-level resources can then be used to effectively regulate and tax the relatively few large-scale users who are the main causes of pollution and water over-use. Small-scale users are empowered vis-à-vis larger-scale users with considerable cost saving.

Finally, there is fertile ground for a national learning network given the ambitious government policies to promote both water supply and irrigation and IWRM, as well as officials' interest in participatory approaches for sustainability and the untapped opportunities of complementary self-supply for multiple uses. Such a network, which includes the Alliance for a Green Revolution in Africa (AGRA), would strategize initially on the most promising Tanzanian mix of MUS modalities. The country's senior engineers' group would also advise on the capacity building needs of their younger colleagues. A national kick-off workshop can launch this process of networking, sharing of existing MUS practices and identifying pathways to further scale MUS in Tanzania. The national network can liaise with the global MUS Group for further exchange.

Table 3 summarizes the identified scaling pathways. Each country is different as a result of past and potential innovations and champions, which usually started in one or two modalities. Yet, innovation in other modalities also appears feasible. The in-depth analysis of the barriers and potential for scaling showed that they are strongly related to the modality, also across countries. Therefore, the next sections the barriers and potential by modality.

Table 3: Summary Findings: MUS scaling pathways

Country	MUS scaling pathways
India Gujarat and Kerala	• Render community-based MUS through MG-NREGS more robust by creating an action-research – capacity building – experience sharing MUS-NREGS network for science-based knowledge, capacity building, and dissemination, linked to national NREGS management and global MUS Group • Collaborate in Gujarat with NREGS administration and the NGO Sadguru on drought proofing • Collaborate in Kerala with NREGS administration and the state women's organizations Kudumbashree; pilot-test convergence with watershed management
Nepal Middle hills	• Consolidate and disseminate past innovation of piped gravity systems for multiple uses • Consolidate and disseminate past innovation of Water Use Master Plan methodology • Conduct scoping study of water component in Poverty Alleviation Fund, including the links between water resource conservation and water services • Train engineers in participatory multipurpose designs • Create national MUS network with key stakeholders, including innovators in self supply and irrigation-plus, linked to Global MUS Group
Ethiopia With AGRA	• Support the Self Supply Acceleration Program of Ministry of Water and Energy for documentation, pilot-testing and advocacy for self supply for multiple uses • Document, evaluate and disseminate the innovative 'community-managed projects' approach, in particular through the large-scale domestic-plus UNICEF-led project WASH, Multiple Use Services, and Community-based Nutrition for improved Food Security and Reproductive and Sexual Health • Conduct scoping study on an irrigation-plus modality and its scaling that links with resource management initiatives; train engineers in participatory multi-purpose infrastructure design through the Technical and Vocational Education and Training program • Create a national MUS network with key stakeholders, AGRA and the Plan for Transformation and Growth, linked to Global MUS Group
Ghana Northern region – with AGRA	• Develop and disseminate guidelines to increase service levels through urban utilities, small town 'limited mechanical schemes' and rural point sources, with Community Water and Sanitation Agency and national WASH working groups • Develop and disseminate guidelines to retrofit multiple uses in the rehabilitation of small reservoirs and irrigation schemes, with the Ghana Irrigation Development Authority • Conduct scoping study on scaling self-supply for multiple uses • Create a national MUS network with key stakeholders, including AGRA, linked to Global MUS Group
Tanzania Southern highlands with AGRA	• Calculate the multiple use water ladder for Tanzanian domestic-plus context • Systematize and formalize current irrigation-plus practices and integrate in policy • Conduct scoping study on integrated engineering services through local government, led by senior government engineers • Document and pilot test iWASH approach to pro-poor and gender-equitable self-supply (rope pumps, filters) and on eco-sanitation, with Stockholm Environment Institute • Study and compile guidelines on water projects in the Opportunities and Obstacles to Development methodology • Study and compile guidelines on water projects in Tanzania Social Action Fund • Integrate community-based MUS as bottom-up IWRM into IWRM plans • Create a national MUS network with key stakeholders, including AGRA, linked to Global MUS Group

FINDINGS DOMESTIC-PLUS

Applications of domestic-plus

The country studies highlighted significant progress over the last decade in applying domestic-plus approaches. From 2002 onwards, Winrock/IDE Nepal was the world's first to implement domestic-plus by design through over 200 piped gravity flow schemes. Gravity is free energy. Widening the pipe diameters and distribution network to allow for domestic and productive uses is a relatively low incremental investment with multiple incremental livelihood benefits. Costs were even lower when CARE combined one system intended for irrigation and another one for domestic use into one multiple use system. The concept has also been scaled to some extent. NEWAH expanded its design norms for piped gravity flow schemes by 20 percent.

Domestic-plus has recently been adopted at an even larger scale in Ethiopia. The UNICEF-led project Integrating WASH, Multiple Use Services, and Community-based Nutrition for improved Food Security and Reproductive and Sexual Health stimulates scheme development for multiple uses and multiple livelihood benefits. The communal technologies are simple and sited near homesteads. This project also applies the Ethiopian methodology of Community Managed Projects. This means that money earmarked for water is directly channelled to communities through local micro-credit institutions. The Community Managed Project method addresses the widespread problem of under-spending of budgets for capital investment in WASH. An evaluation showed that implementation rates were five times higher (1,000 water points per year compared to 200 water points per year) with above average functionality rates (94 percent using the approach compared to an average of 75 percent) and more effective use of budgets (100 percent compared to 53 percent).

In Ghana, municipal utilities can deliver large quantities of water and they recover costs. They favour selling more water as it brings in more income. In contrast, in Dar-es-Salaam, the low capacity of delivery networks led the Prime Minister to publicly discourage widespread water use for urban agriculture, although enforcement appears impossible. Ghana's domestic sub-sector started implementing limited mechanical schemes with motorized pumps in rural towns. Small devices are often added to improve access to water and re-use of drainage water (troughs, drainage, grey water re-use, etc.). As IRC's research in Ghana confirmed, service levels are the sum of what various water sources contribute, whether formal schemes or informal self-supply.

In Tanzania, domestic-plus has not yet been implemented. The concept of 'climbing the water ladder' for cost-effective generation of livelihoods was welcomed.

Scaling potential for domestic-plus

Expanding WASH sector

Given the high levels of expanding investments by the primary scaling partners, the WASH sector, the scope for scaling domestic-plus is substantial.

Recognition of benefits

The multiple benefits of domestic-plus are enshrined in the project goals of Winrock International/IDE and the UNICEF-led project in Ethiopia. Awareness that benefits mutually reinforce each other is growing.

For advocacy, various country studies noted that respondents find that "MUS is a MUST" because of the income generation possibilities. This increases people's ability to pay. As under-use, breakdowns and abandonment of communal domestic schemes are notoriously frequent, this income could, in theory, provide in part for operation and maintenance, capital investment and depreciation costs.

Barriers to scaling domestic-plus

Lack of evidence for a robust modality

Although the concept of domestic-plus is widely accepted, evidence is still limited. Even the MUS pioneers in Nepal suggested to first further consolidate the experiences of their domestic-plus systems. Some earlier studies have been done on these schemes and their scaling through learning alliances. However, institutional memories appear to be short and more and longer experiences entail new and more robust lessons. For Ethiopia's domestic-plus project, close monitoring and documentation is also recommended. At this larger scale, the relationship between the sustainability of the schemes and productive uses can be examined in more depth. This seems a chicken-and-egg causality: reliable water provision stimulates productive uses; higher benefits stimulate better cost-recovery and maintenance. Empirical studies of *de facto* non-domestic uses of 'domestic' systems also provide important basic information.

With such generation and consolidation of further evidence, 'climbing the water ladder' will become even more robust. Translation of the incremental costs and benefits along the ladder to the national context strengthens its relevance, as suggested in Tanzania. Evidence, guidelines and lessons learnt will be more effective in convincing colleagues to adopt domestic-plus. This implies addressing the following barriers and counter-arguments raised by respondents.

Single use mandates and engineers' designs

As the mandate of the WASH sector is only about domestic water uses, implementers have no incentive to also provide for water for productive uses. Accountability is upward and performance is measured in terms of single water uses only. The shift of international development agencies to pool resources into baskets may strengthen joint decision-making with the national authorities. However, it further reinforces single use mandates. This was found in Tanzania's new basket funding arrangements. Funding is separated from the top-down for water supply, agriculture with irrigation, and water resource management. In line with this, engineers keep designing for lower service levels.

Water safety

Another counter-argument concerned the sector's priority for drinking water quality. Researchers on local water governance in Tanzania described this endeavour as paying too much attention to 'the drop to drink' while ignoring the need for 'the bucket to bathe', without a mention of 'the flow to grow'. In this light, WASH professionals find it a waste to use expensive treated water for uses that can do with lower quality.

This objection is stereotypic. It holds in some situations but not in others. It is true that centralized treatment has economies of scale and is easier to enforce in well functioning schemes. On the other hand, groundwater and even a few surface streams are sufficiently clean. If water is paid for, the users decide whether it is a waste to use treated water for certain uses. Moreover, many domestic uses can also do with lower quality water. Centralized treatment is often no guarantee for water quality because of the re-contamination of treated water in leaking and low-pressured pipes and during water transport and home storage. Therefore, the WASH sector is exploring point-of-use treatment in certain conditions as a potentially more effective means of ensuring the quality of the 3-5 litres per person per day needed for drinking and cooking (UNICEF/WHO 2011). Point-of-use treatment ensures drinking water quality from any source. In sum, further insights are needed into the conditions under which each solution works and how it would promote productive uses or remain a barrier.

The consideration of multiple sources at a higher community-level opens up more solutions. Household protected groundwater wells or roof water harvesting can also serve for drinking purposes. Domestic uses of multiple sources differ per region. For example, Ghana's communal schemes in the wet southern regions are mainly used in the dry season just for drinking water. There are sufficient alternative sources for other uses. In the drier north, water points are more often the main source of water for both domestic and productive uses. Recognizing alternative sources is also important when users vote with their feet and abandon an expensive new domestic scheme for which they must pay. They prefer reverting to the own free well or mountain stream, which may even taste better. If there are alternatives and no effective demand, bringing water quality hardwired in an expensive scheme risks becoming a waste of public money.

Equity in fund allocation

A third recurrent argument against enhancing service levels for multiple uses is about equity in public fund allocation, and the sector's firm commitment to achieve more equity and coverage for minimum service levels of safe water. Funds are always limited for such ambitions, so one wonders: How can one spend more money on a multiple use water scheme if other villages are still totally unserved? The fear is that domestic-plus would increase existing inequities between villages and within villages. These inequities are severe, as research by WaterAid and partners in both Nepal and Tanzania revealed. New water supply programs often widen these gaps. The Tanzania Water and Sanitation Network discovered this in the first phase of Tanzania's Water Sector Development Programme. Disparities are the result of more dynamic and vocal water councillors with more political and administrative connections who find funds more easily. Fearing failure of new schemes, district officials tend to select villages with a proven track record of sound financial management, which perpetuates exclusion. WaterAid and partners developed a Water

Point Mapping technique at district level precisely to enhance transparency on past allocations to inform and promote future allocation of funds to unserved areas.

Another fear is that bringing more water to homesteads may exacerbate existing inequities in access to land and other assets. The wealthier have more means to use more water for more benefits. For the land poor and disabled, productive uses often remain limited.
These concerns are well grounded. Yet, current inequities in service levels can also be the very reason to adopt domestic-plus approaches. The issue is targeting. The challenge to achieve more equity and higher coverage is to *target* those services to the have-nots, and to reduce subsidies and leakage of public funds to the relative 'haves'. Directly targeting the poor and unserved with a higher service level for multiple uses would bridge the gap even more quickly. Domestic-plus is a better service for the poorest and most marginalized because for them the homestead may be the only place where they can use water productively. Women's say over production tends to be stronger for homestead production than for cropping on distant fields. Domestic-plus is the minimum modality for achieving at least some equity in both domestic and productive water uses.

The real issue of equity and targeting of limited public funding lies at higher levels where the overall available development budget is allocated. Currently, articulating a different use or livelihood dimension enhances an applicant's funding prospects because funds are allocated on the basis of a specific single use. However, if single-use irrigation funds and domestic water supply funds were pooled at central level, the same total amount of funds could finance a higher number of more cost-effective multiple use schemes. Moreover, if investments perform better by giving 'more MDGs per drop', donors might increase their overall contributions to an integrated water sector.

Equity in water allocation: stealing water?

The fourth concern around scaling up domestic-plus is the fear that the promotion of productive uses will 'steal' water from domestic purposes. There is full agreement, also in the national laws of the five countries, that domestic uses should have the priority. The question is whether higher service levels aggravate or mitigate the risk that some are deprived of water for domestic uses, while others use water abundantly for any use. Under-design of water supplies may also aggravate competition for water, with the weaker groups losing out even more. In any case, current domestic schemes are already used for productive purposes, lawful or not. Prohibiting non-domestic uses is rarely effective, unless it builds on community norms. Anecdotal evidence suggests that norms exist that allow people to meet their basic needs. Within schemes, stepped tariffs or higher tariffs for productive uses, proportionate to, for example, number cattle or size of garden, can address this fear.

Technicians have also tried to 'hardwire' priorities into their designs. In some cases, throttling supplies to volumes that are just sufficient for drinking and some domestic uses may promote equity, for example, if upstream users would otherwise over-use. In other cases it is harder. Winrock and IDE in Nepal paid much attention to prioritize domestic uses. They changed their normal one-tank-one-distribution network into a model with separate reservoirs and distribution networks. That model has a domestic reservoir and distribution network, while only the overflow of the domestic reservoir is channelled to an irrigation

reservoir with its related distribution network. When homesteads and irrigation fields are well separated, this works.

However, as found during the study in Magargaun, Banepa, if domestic water uses and productive uses take place around homesteads, these opportunities for water use at homesteads influence actual water use more strongly than the technical design. After the project, villagers retrofitted to the other model of one-reservoir-one-distribution-line. Instead of two taps around the homestead from two distribution networks linked to two nearby reservoirs, one bigger line has the same effect and is cheaper overall.

The question of whether and how priorities can be hardwired requires further study. In any case, one has often to consider more sources and larger spatial scales than just the 'domestic' hardware. Given that such prioritization is largely governed by community rules and institutions, engineers have little other choice than to "throw the issue back to the community", in the words of one engineer. Worldwide, amazingly little is known about the ways communities set priorities for domestic and different productive uses. Broad social power relations and hydrological upstream-downstream dynamics of one common scheme seem to play an important role. For the enforcement of the national legal priority for domestic uses, women's effective participation from the planning phases onwards is vital.

Conclusions scaling domestic-plus

The domestic-plus modality of increasing service levels and add-ons for more water to homesteads is conceptually robust. Contextualization of the concept, also in *de facto* multiple uses, and documentation of applications of domestic-plus will strengthen the modality within each project and country (and elsewhere). Better guidelines and clearer advocacy messages on the broader livelihood benefits at lower costs can be identified to convince WASH sub-sector colleagues to institutionalize MUS. Reference to the logic of large-scale dams also clarifies.

The typical counter-arguments to be addressed concern:

- drinking water quality (but only in few specific conditions and this issue is solved where point-of-use treatment is adopted);
- the fear of widening gaps in access to public funding (although well targeted domestic-plus serves the poor and women especially); and
- the fear that domestic uses lose their priority in allocation (which requires a better understanding of communities' broader water allocation, women's strong inclusion in the planning phase and considering other water sources, also at higher aggregate scales)

As elaborated below, these counter-arguments strongly diverge in the productive sector. They can best be addressed through a holistic cross-sectoral view that also underpins community-based MUS.

FINDINGS IRRIGATION-PLUS

Applications of irrigation-plus

The country studies confirmed the issues addressed in FAO's MASSMUS methodology, including the different steps in professionals' response to *de facto* multiple uses. Unlike the tendency for under-design in the domestic sector, the design of irrigation schemes is for ample water quantities, which can easily accommodate other uses. Quantities of water for such other uses were generally seen as negligible compared to crop water requirements. The issue is access and year-round provision. Fisheries, for example, may need some minimum storage. Surface and groundwater sources require conjunctive management.

In Tanzania, the senior irrigation engineers in government are well aware of the livelihood benefits of non-irrigation uses and call themselves 'livelihood engineers'. Especially livestock watering needs are addressed, also because "cattle will come to drink anyhow". The special water services section in the Ministry of Livestock and Fisheries Development in Tanzania supports these multi-purpose designs. Dams built for irrigation in Tanzania include a specific outlet for livestock. However, similar dams that are built primarily for domestic uses may not have such outlets.

There are examples of implementing marginal practices on the ground to accommodate multiple uses and accommodating some *de facto* multiple uses at management level. In southwest Tanzania, many people settled in the downstream drainage area of a large formal irrigation scheme. These *de facto* multiple uses were included in allocation schedules. However, these adjustments were only made 'along the way' without distracting from the primary purpose: crop watering.

Nepal's experiences with irrigation-plus centre around the gravity piped systems to homesteads. The Non-conventional Irrigation Technologies Project of the Department of Irrigation collaborates with Winrock-IDE and supports piped gravity flow systems with micro-irrigation for multiple uses. It has become a national goal to expand irrigation to areas that cannot be irrigated with conventional canals, in particular the upland areas around homes. This is an achievement because the irrigation sub-sector in Nepal and certainly elsewhere often hesitates to take up such small scale projects around homesteads. Homesteads are hardly ever included as potential sites of productive water use.

The Ghana study highlights the many village reservoirs that have been constructed by government and NGOs over the past five decades. They are all used for multiple purposes, but there was no formal design. Gravity irrigation canals were often added later. The proposed scaling pathway for the rehabilitation of such reservoirs is to retrofit for multiple uses from multiple sources by design, taking into consideration fisheries, disease prevention, cattle troughs at appropriate locations, brick making, wells constructed adjacent to reservoirs for drinking water and cooking, and institutional development.

In spite of widespread non-irrigation uses of irrigation schemes in Ethiopia, no information could be found on irrigation-plus approaches.

Scaling potential for irrigation-plus

Expanding irrigation development

The potential for scaling up irrigation-plus is significant because irrigation development and rehabilitation goals of governments are ambitious. The Nepali government seeks to add over 400,000 hectares to cover 80 percent of its total area that is irrigable land by conventional means. Moreover, 'unirrigable' land around homes is targeted for piped systems and micro-irrigation irrigation. Ethiopians irrigate only between 107,265 and 184,238 ha but have a potential 2,700,000 ha. In Ghana, government seeks to expand its current 15,000 ha of formal irrigation to the country's 500,000 ha that are irrigable. Tanzania has an irrigation potential of 29.3 million ha, out of which only 289,245 ha were irrigated by 2010.

These figures correspond with the average total abstractions of renewable resources across Sub-Saharan Africa, which is estimated at six percent. Countries are not physically water scarce, but face economic water scarcity for lack of the financial, technical and institutional means to develop their abundant water resources. The issue is storage and conveyance, including storage of groundwater to bridge seasonal variations in resource availability. Domestic water consumption in rural areas is such a small fraction of total water resources that irrigation engineers and water resource planners ignore such quantities. Doubling or tripling these quantities under domestic-plus hardly makes a difference. A common understanding of total water resources availability and quantities of water use across both sub-sectors would clarify.

Participatory planning

Another trend also facilitates the scaling up of irrigation-plus: irrigation policies increasingly emphasize participatory planning. This was found most explicitly in Tanzania. Participation is expected to address the same persistent problems of public communal schemes as in the WASH sector: low or no personal contributions, payment of fees, poor operation and maintenance, and lack of support for major repairs and rehabilitation after the first breakdowns. This leads to under-use if not abandonment of schemes. A stronger sense of ownership and more personal contributions as a result of participatory planning are supposed to mitigate these flaws. Hence, the WASH sector expects more sustainability from a higher ability to pay from productive uses. The irrigation sub-sector already targets productive uses and expects more sustainability from more participation.

In Tanzania, participatory irrigation development is integrated into the national policy of decentralization of planning and implementation through local government. The irrigation sector used to have expensive vertical projects, in which funding and often the main design came from the central level directly down to the local level. Today, interventions are smaller and more integrated into general district planning and financing processes. They also provide for post-construction support for repairs and rehabilitation. District and village-level planners better oversee their constituencies' integrated water needs and may see more opportunities to meet irrigation and other water needs simultaneously. They also address higher-scale water allocation issues as needed. Thus, participatory planning is bound to identify water needs other than irrigation alone. Participatory irrigation-plus, which includes homesteads, would be community-based MUS.

Barriers to scaling irrigation-plus

Lack of evidence and formalization for robust irrigation-plus

Although non-irrigation uses are accommodated to a considerable extent, these designs and allocation schedules are not yet documented, systematized into guidelines, or formalized into policies.

In Tanzania, such systematization and compilation of guidelines would be a logical next step to render irrigation-plus a more robust modality. This would fully include livestock watering needs.

In Ghana, there is evidence *de facto* multiple uses of village reservoirs. However, this has not been operationalized into best practice guidelines for retrofitting multiple uses during rehabilitation and even new construction. In both countries, the MASSMUS methodology would be a useful guide to consolidation of the irrigation-plus modality.

In the irrigation schemes in Ghana, Ethiopia and Nepal, *de facto* multiple uses and professionals' responses are still to be studied.

Especially for new investments, professionals could opt to move immediately to community-based MUS. This is most feasible in Nepal where homesteads have already been recognized in policies as potentially irrigable areas.

This study did not focus on other productive uses, livestock, forestry, and fisheries. A similar body of evidence needs to be generated to complement productive-plus and community-based MUS approaches.

Documentation, tools and advocacy messages for scaling irrigation-plus should address the barriers discussed below.

Single use mandates, top-down technologies and engineers' designs

The main barrier in scaling irrigation-plus is the same as for domestic-plus. A coordinator of a new irrigation project with local government in Nepal said, "Irrigation alone is already so complicated". Irrigation engineers work with standard designs to irrigate more hectares with specific crop-water requirements. Planning for other uses and benefits is an extra complication without any incentive or reward from their superiors. Within narrow irrigation mandates, non-irrigation uses are ignored unless they can be taken up along the way at low or no cost.

There are questions related to how a participatory approach can provide more sustainability as long as the technology, together with the budget, is already determined at central level and if participation is confined to selecting a community and a site and getting community approval for land allocation and (often paid) participation in construction. The top-down technology choice is often far from the most efficient solution. Small reservoirs in Ghana cost on average USD 300,000 and require at some point a rehabilitation cost of USD 100,000. If irrigation is considered as the only use, the development costs per hectare of irrigated land are between USD 5,000 and USD 40,000. Small reservoirs or other surface water technologies are justified when they are the only infrastructure suitable for the area,

for example, when groundwater tables are low. However, they are constructed in many other situations as well.

This barrier is addressed by widening the sub-sector's mandate for multi-purpose infrastructure and governance, and by promoting a participatory planning process. A participatory approach would offer a wide range of cost-effective infrastructure options and create a considerably stronger sense of ownership. Engineers' and people's implementation capacities to that end need to be built.

Water quality

Irrigation engineers sometimes withdraw from any formal responsibility for domestic water uses. They may even prohibit people using water for drinking from their schemes. Paradoxically, the reason is good professionalism. In the words of an engineer in Nepal: "if I allow people to drink water from an irrigation scheme, I can be held responsible if they fall sick".

In reality, most engineers either turn a blind eye or try to accommodate this widespread use of surface storage and irrigation canals for drinking. They realize that the tanks and canals offer a better alternative than people would have had without those. The barrier is overcome if irrigation engineers also take the responsibility for water quality for drinking by promoting spring protection, covering wells and other open storage facilities, recharging groundwater for well development near surface water storage bodies, and tapping into more upstream water sources that are less polluted. Such training is recommended in Ethiopia. Scaling irrigation-plus implies that irrigation engineers share a responsibility for safe drinking water.

Equity in fund allocation

In the irrigation sector, equity in public fund allocation is considerably less debated than in the domestic sector. Social differences within the agricultural sector tend to be ignored. There is at best some effort to target small-scale farmers as well. Unlike the close monitoring of the WASH sector of people, their gender and their levels of service, the irrigation sub-sector defines performance otherwise. The goal is hectares of crops. It is rare that irrigation projects seek to reach higher numbers of beneficiaries, let alone full coverage of farmers potentially interested in basic levels of irrigation or other productive uses. Nepal's recognition of homesteads as potential sites of irrigation is exceptional. In other countries, the irrigation sector tends to favour investments in large schemes, even if meant for many smallholders, because of the lower transaction costs. The future is likely to see growing inequities as large-scale farmers and even large-scale foreign investors are increasingly supported. These land and water grabs continue even though they are highly contested because smallholder farmers' access to land, water and markets are threatened.

Gender data that differentiate between women and men-headed households are scarce; married women's roles in irrigation and gender issues in wage employment are ignored. At best, the gender composition of boards and committees is traced to find that women's representation is usually lower than project goals of one third or one half. There is hardly any debate on the contribution of irrigation to the MDGs or broader socio-economic human rights.

Equity in water allocation

At higher aggregate scales, irrigation specialists tend to respect the national legal priority for domestic uses and water demands by expanding municipalities. In Tanzania, an example was found in which the irrigation department itself ordered the demolition of an upstream irrigation scheme because the scheme blocked water from downstream users' domestic water needs. Water supplies to new urbanizing areas are also widely justified on the basis of the priority for domestic water uses, even if they deny small farmers water to produce basic levels of food and nutrition. However, within irrigation schemes, domestic uses may even be discouraged. Allocation is based on sectoral single uses, and not on socially differentiated individuals who each have their multiple water needs. This excludes the poor from all negotiations about the real issue: the larger water quantities. Water for basic productive needs does not yet figure in human rights debates.

Conclusions scaling irrigation-plus

With ambitious irrigation expansion goals, the potential for scaling irrigation-plus is high. In countries like Tanzania and Ghana, there is already much evidence of *de facto* non-irrigation uses of irrigation schemes or small reservoirs. Such uses may be accommodated 'on the way'. Consolidation and formalization of experiences into best practice designs and guidelines is recommended. This will strengthen the modality for further advocacy and uptake in policies. Similar issues as addressed by MASSMUS will apply, but then at smaller scales. Elsewhere, we advise scoping studies on irrigation-plus.

Training of engineers in multi-purpose designs and participatory processes is warranted as a next step in scaling irrigation-plus.

The envisaged focus in Tanzania on participatory design will identify broader needs at larger sites, if not entire communities. This will further blur the boundaries with the WASH sector in the same local government. This will raise the same three issues as identified for the domestic-plus modality: water quality, equity in fund allocation and equity in water allocation. The views of both sub-sectors are at present opposed. Reconciliation into a more holistic view across the water sector is required. This may lead, for example, to a shared responsibility for safe drinking water of all water sources; equity in fund allocation for all basic water uses, and equity in water allocation to people with multiple needs instead of sectors.

FINDINGS SELF-SUPPLY

Applications of self supply for multiple uses

The country studies (except the study of MG-NREGS in India) identified many new forms of individual self-supply that add to widespread traditional individual and communal forms of self supply. Initiated and owned by users themselves, people tend to use water for multiple purposes. The uses mainly depend on the spatial set up of community residential, cropping, grazing and other activity areas.

New technical developments and the energy of a dynamic private sector, the primary scaling partner in self supply, further boost self supply. In Ethiopia, Ghana, and Tanzania, the 3-5 horse power motorized pumps are spreading like wildfire. These inexpensive small pumps may transform the rural landscape in Africa as they did in Asia beginning in the 1980s. In self supply, complex sharing arrangements can develop in which a technology owner shares water with neighbours (as in Ethiopia's multi-family wells), rents out a pump or sells water.

The USAID supported iWASH project introduced more affordable technologies in Tanzania. This project promotes rope pumps, cheap drilling techniques, water filters, and groundwater recharge, among other initiatives. The Stockholm Environment Institute explored eco-sanitation at homesteads as the lowest level application of multiple uses and re-uses of water and other resources for multiple uses.

In Nepal, Winrock-IDE has promoted drip irrigation as a component of piped gravity flow systems since the start. They continue exploring cheap lining of surface water bodies. Micro-hydropower, mills and biogas are other technologies that NGOs support and that people purchase to meet their multiple water needs.

Scaling potential self supply

The scaling potential for self supply in rural and even peri-urban areas is high. The private sector and NGOs are vibrant innovators and therefore strong primary scaling partners. Self supply will always remain an important component of people's multiple sources for multiple uses. If public services are sub-optimal and remote, complementary self supply is even more important. In broadening the technology choice in participatory planning, the option for self supply can well be the most important option on offer.

In Ethiopia, the Self Supply Acceleration Program of the Ministry of Water and Energy has recently been launched. We propose to support this program to scale MUS. Self supply initiatives in Nepal and by iWASH in Tanzania also have high potential for further scaling.

Barriers to scaling self supply

Lack of evidence for a robust self supply modality

As an informal practice, evidence of self supply is limited. Even documentation of NGO initiatives is still scarce. Therefore, a next step in rendering self supply more robust in these four countries is generating further evidence. Documentation should focus on the multiple uses and further possible synergies. Evidence is needed on needs, opportunities, and best practices in four domains: technology development, supply chains, financing facilities and policy environment.

In developing technologies, it is important to enhance choice, also of more affordable technologies. More insight into the respective niches of different technologies in various contexts can accelerate technology development and dissemination. In strengthening supply chains, manufacturers and retailers can receive technical training and support for after-sales care and spare parts. Financing facilities can help all actors in the supply chain. Subsidies, loans and pricing guarantees can help retailers maintain stocks. Loans or vouchers help buyers overcome the large capital investment barrier.

An enabling policy environment further promotes self supply. Government officials in the WASH sub-sector and irrigation sub-sector slowly start to recognize the potential of self supply. Evidence of impacts is also important because of prejudices. For example, the iWASH team in Tanzania encountered a politician who called the rope pump a 'dinosaur' technology. Import duty waivers or other tax measures can further stimulate sales at affordable prices. Over-regulation can block self supply. The Tanzania study highlighted the policy problem that permits are needed even for a small self supply technology like a rope pump. Implementation of these legal requirements is logistically impossible both for the user and the government.

In the identification of needs and solutions the following barriers should be addressed as well.

Lack of technical skills

Self supply supposes a critical mass of engineers, local technicians and extension workers as manufacturers. Moreover, buyers need information and training on technology choice, operation, maintenance and repair. A still less explored field of synergy is the systematic protection of springs, wells, and boreholes with seals, linings and covers. Both irrigation and domestic sector engineers should be trained in this, as proposed in Ethiopia.

Equity

As self supply requires personal investments, the poor without savings and without access to loan facilities are at risk of being excluded. Price reduction in further development of affordable technologies remains important. Manual technologies self-target the poor. The treadle pump gives sufficient water for both domestic and productive uses, but the head for lifting is only about six meters and is as expensive as the cheapest motor pumps. The cheaper rope pump may better fill the gap between mechanized and manual lifting devices for small groups or individuals. The development of more affordable point-of-use treatment techniques is also central to equitable scaling of MUS. The poor need access to financing facilities or well targeted smart subsidies. Further analysis of the experiences of projects in Ethiopia, Ghana, Tanzania and Nepal will shed more light on obstacles and solutions.

Women need water most directly for domestic and productive uses. They would greatly benefit from water lifting technologies. Yet, the country studies indicate that the less effort a technology requires (e.g. motorized pumps), the more it is monopolized by men. Perhaps with the exception of arduous manual drilling by men, women should equally acquire information, skills, and access to the male-dominated supply chains and loans.

Conclusions scaling self supply

Self supply will remain an important complement to people's access to water for multiple uses. A dynamic private sector continues to be an important scaling partner. NGOs are also important scaling partners because they better target the poor. Technologies are more affordable, although price reduction remains important. Specific activities recommended for scaling up include the recent Self Supply Acceleration Program in Ethiopia, the iWASH project and eco-sanitation in Tanzania, and various activities in the other countries. The national learning alliances that are recommended in the last section of this report should include partners working on self supply.

Scale has already been reached in certain technologies. More evidence will make the modality more robust for further advocacy and support. One important question is how technology choice can be widened and can include technologies that the poor and women can pay for and apply themselves. This includes technical training of buyers and local technicians. Other questions regard best practices for promoting supply chains and financing facilities that are also accessible for poor women and men. At policy level, the challenge is to identify measures that not only respect people's initiatives to meet their basic water needs for multiple uses and promote them. This regards import policies, taxation measures, certification, education and training, and legal permits.

The cross-cutting question is whether opportunities to promote multiple uses can be tapped even further.

FINDINGS COMMUNITY-BASED MUS

Applications of community-based MUS

In community-based MUS, government, NGOs and donors provide financial and other support, but they leave it to communities to choose how to use that support for a next incremental step in water management. This decouples financing streams from pre-set technologies and other financing earmarks. The following applications of this modality suggest that this modality has reached scale but is robust at a conceptual level only.

Participatory planning within the water sector

Over a decade of implementation experiences has led to a robust **Water Use Master Plan (WUMP) methodology** in Nepal. Helvetas' Water Resources Management Project and the Rural Village Water Resources Management Project apply WUMP. They facilitate a holistic step-wise planning process with villagers. Together, they make an inventory of all water resources, technologies and uses, also captured using GIS. Community members identify their preferred actions and rank them. The outcome of this methodology is a holistic water development plan for the next five years. The funding is untied and allocated to the identified priorities. Communities are also closely involved in the project's procurements and implementation of water works. To mobilize funding from other organizations, the project management invites potential donors to the initial meetings with the District Development Committee. They brief them on the results of the WUMP planning process. In the recently started second phase, WUMP is split into modules that include a less intensive and lower-cost version. WUMP is also introduced at district level, where it facilitates the matching of funding sources and the integrated needs of several villages. Villages and districts receive funding straight from the treasury that can be used as well. As WUMP fully aligns with the new government structures, its scaling potential is country-wide.

Participatory planning outside the water sector

Community-based MUS emerged spontaneously in participatory planning initiatives without pre-set funding earmarks. Communities prioritized improved access to water and there is evidence that this is access from multiple sources for multiple uses. The country studies highlight the following initiatives.

India's Mahatma Gandhi National Rural Employment Guarantee Scheme (MG-NREGS) is the world's largest social security scheme. The scheme has its own funding and works entirely through local government structures. According to the national Act, the government guarantees every Indian household 100 days paid employment per year. This self-targets the poor. The scheme reaches over 50 million households per year at a cost of USD 9 billion. Decision-making about the works to be implemented is devolved to communities, with the technical support of officers at village, block and district levels. Funding for both the labor costs and additional capital costs of approved proposals comes straight from the central level, through local government to the community. Every stage in the planning and implementation cycle is transparent: it is monitored and visible for everyone on an open access national website.

In addition to its own untied funding, MG-NREGS promotes 'convergence' of the many parallel government programs which each have their own earmarked funding. By pooling

financial resources, mutual gaps can be filled and overlaps avoided. For example, India's national watershed program can suggest works for implementation through MG-NREGS. The central managers give a 'push' for creative integrated program design and budgeting at district and lower levels. This enables a better match with the bottom-up 'pull' from local integrated needs and opportunities.

IWMI research showed that over half of the chosen works were for water and drought proofing. They cover irrigation canal rehabilitation, wells and ponds digging and excavation, watershed management, groundwater recharge structures, forestry and plantations for soil conservation, land erosion prevention, river check dams, gulley treatments, and even pit latrine digging. These were used for multiple purposes. Communities chose sustainable win-win interventions that integrate water services for better access and conservation for the sustainable availability of water resources. They manage the conjunctive nature of the multiple water sources in their own interests.

A second large-scale and expanding participatory planning initiative with water components is based on the World Bank's **community-driven development** approach. The multi-donor Poverty Alleviation Fund in Nepal, Ghana's Community-Based Rural Development Project and Social Opportunities Project, and Tanzania's Social Action Fund are such projects. These initiatives target poor communities and facilitate communities to decide on the allocation of funds. Money is channelled to community groups through project organizers. Village and district governments play a lesser role than in MG-NREGS.

Communities appeared to select water works, among other investments. In Nepal, selected water works included: water supply and sanitation, small irrigation, river bed land reclamation, water management, plastic tanks, sprinkler-drip systems, farmer-managed irrigation systems, and micro-hydro plants. In the Tanzania Social Action Fund, there is a specific public works component. Labour-intensive public works are often for land and water sustainability works.

A third participatory initiative with community-based MUS was found in Tanzania. This is the **Opportunities and Obstacles to Development (O&OD) methodology**. This methodology aims to strengthen participatory planning as part and parcel of formal village and district planning procedures across Tanzania. The Prime Minister's Office of Regional and Local Government develops the tool for adoption across all other relevant government agencies. O&OD is at the heart of Tanzania's current decentralization of service delivery and funding to district and local governments. Multiple water sources, domestic uses, irrigation and livestock are all mentioned in the O&OD tool.

Projects that take the resource as the entry point, such as the **Sustainable Land Management** project in Ethiopia, gradually move towards community decision-making. The selected water conservation works benefit local inhabitants and downstream users who now have more controlled flows and less flooding during the rainy season. Under communities' holistic management of their multiple natural resources for multiple uses, people's improved water uses and sustainable resource management and conservation go together.

Equitable public fund allocation

In all the initiatives described to this point, community-based MUS goes hand-in-hand with new forms of equitable and transparent allocation of public funds from central to local level. Accountability is downwards and vested in reaching the poor through improvements of their choice. The norm is that everyone is entitled to public funding. In WUMP, the only condition for funding is that it should be for water. In the three general participatory planning initiatives that condition is removed. Performance is not only defined and monitored as assets created, but also in terms of numbers of poor people reached (as in the domestic sub-sector) and in terms of participatory transparent processes according to people's choices (which is new in the water sector). This includes all steps and all levels of the planning and implementation cycle.

The initiatives show several best practices to ensure that public funding is equitable and reaches the poor. Unskilled labor creation in public works self-selects the poor. Public agencies can chose to target women workers. The best example is Kerala's MG-NREGS, which is implemented through the vibrant state-wide women's organization of Kudumbashree. The large majority of wage workers are women.

For targeting water assets and their benefits, the community driven development initiatives in Nepal, Ghana, and Tanzania target poor districts and poor communities, and they also monitor and report on beneficiaries in terms of the wealth and gender of the people reached. Tanzania's Social Action Fund reports that women were well represented in the choice and implementation of the assets.

These initiatives also actively search for the most accountable funding arrangements. For example, funding based on merit rewards sound planning and spending. Experiences with both Tanzania's O&OD methodology and WUMP show that long-term planning for three to five years is an effective remedy against elite capture. Elite capture is stronger under the *ad hoc* allocation of funds.

Transparency fosters accountable and equitable fund allocation. MG-NREGS achieves such transparency in public fund allocation on a massive scale by consistent monitoring and data entry into their open access website. This includes all steps for all works by over 50 million beneficiaries. Social audits are encouraged in which the end beneficiaries can report on their leaders to hold them accountable.

In sum, although the country studies highlight various barriers (see below), community-based MUS has become conceptually robust. This modality effectively applies the well-known principles of participatory planning to water resources development and management. The norm that everyone is entitled to public support structures the initiatives. No single uses are imposed but communities chose which water uses to develop. As for large-scale irrigation, the issue of multiple conjunctive sources comes up naturally at community scale. Improving access to water for well being and sustainable availability of the resource overlaps if people are in the driver's seat.

Scaling potential community-based MUS

Scaling within the water sector

The potential for scaling community-based MUS is the highest of all modalities. Within the water sector, professionals in **any water approach** can decide to take up this modality. The WASH sector can do this by including sites of water uses other than homesteads and residential areas. The irrigation sub-sector can include domestic uses and homesteads in its water provision. Self supply is an indispensable component of community-based MUS because it provides a wider range of technology options.

Community-based MUS can also be scaled up by leveraging water conservation programs. People become the entry point for measures for conservation and payment for ecosystem services and these measures serve their short- and long-term well being. This ends the separation between water service providers, who see water uses as the solution, and water resource managers, who see uses as the problem.

Watershed, national and basin level **IWRM** initiatives can also adopt community-based MUS to fill the void at the lowest levels. The Tanzania study identifies this opportunity. IWRM policies of basin institutions and permit systems are quite advanced on paper. Basin organizations are being formed and IWRM plans envisaged, in particular in the Rufiji and Pangani basins. However, awareness is growing that small-scale users are insufficiently represented. Currently, large private sector and government representatives dominate the new basin bodies. Climbing the five-tiered basin structure to be represented is impossible for rural water users. Also, it has become clear that government has hardly the resources to implement the colonial permit system that has been revived. At the same time, the Tanzanian government recognizes customary water arrangements, for example, traditional irrigation. Government also recognizes communities as the basis for participatory planning of water development through decentralized and devolved decision-making for water service delivery through local governments.

The hypothesis to test is that current and future water uses can be recognized without the burden of proof that permit systems require. Local and district governments who are to provide community-based MUS with the Opportunities and Obstacles to Development Tool (O&OD) can become the bottom-up representatives of the majority in the basin organizations. Local, district and regional officials can coordinate to address specific issues at higher spatial scales as needed. Accelerated water services for the poor reduce the widening gap in access to water. This protects the poor most effectively vis-à-vis large-scale users.

Finally, the **human rights movement** in all five study countries and elsewhere can become even more meaningful for the poor if they adopt a multiple use perspective. The proponents can extend their current focus on domestic water uses to encompass all water uses that contribute to meeting broader socio-economic human rights. This empowers the large majority of small-scale water users to protect their water entitlements so they can negotiate a fair share.

Indeed, putting people with multiple water needs in the driver's seat will ultimately imply that all water-related public projects can—and need to—adopt community-based MUS.

Scaling outside the water sector

The potential for scaling community-based MUS is even higher outside the water sector. Outside the water sector, it has already reached a very wide scale in MG-NREGS. Community driven development initiatives are also expanding. As the O&OD methodology is exploring for Tanzania and the WUMP methodology for Nepal, local government throughout Tanzania and Nepal can apply community-based MUS. Decentralization of decision-making on public support to local governments is also speeding up elsewhere in the developing world, so potential scaling partners and related funding streams are also multiplying in other countries. In sum, community-based MUS fully fits the global move to decentralization through local government and benefits and leverages any public support agency in rural and peri-urban areas where people depend in many ways on water,

Barriers to scaling community-based MUS

Lack of in-depth evidence

While community-based MUS is conceptually robust, evidence of experiences is still weak. It is not clear whether the theoretical opportunity for participatory planning of multi-purpose infrastructure and combining multiple sources has effectively been tapped. There is little documentation, impact analysis, and synthesis of experiences into lessons learnt and guidelines that account for the specificities of water and land resources. Even the experiences of WUMP have not yet been consolidated and disseminated. This lack of evidence is partly due to the fact that all initiatives, except WUMP, only started after the mid-2000s. The evidence base is also weak because there is limited research on community ways of managing multiple water sources for multiple uses. A bias to one specific use, or to the resource and not the people, also dominates the scientific literature.

People-driven water development is not the key focus, except for WUMP. For MG-NREGS, the primary objective is employment generation. The second objective, creating social assets, received less attention. Water assets are only one type of asset, although the most common one. The realization of the integrated nature of multiple sources for multiple uses was an unintended outcome and received even less attention, until this study alerted its staff. Community-driven development initiatives and the O&OD methodology have mainly reported on targeting processes. The water works were just one type of works among other works. Resource conservation projects focus on the physical measures taken and less on the social processes that lead to their selection and implementation. IWRM basin institutions and water laws are strongly top-down. They even ignore community water arrangements and seek to substitute another legal system.

Therefore, the recommended next step for scaling community-based MUS is **to analyse and consolidate past experiences of participatory water projects, with a focus on the specificities of water**. Science-based evidence can inform more rigorous guidelines for dissemination and capacity building. Identification of best practices and pilot tests will deepen the understanding of promising solutions. Moreover, comparative research could deepen knowledge and widen the range of scaling partners even more. In Tanzania, the Social Action Fund can be compared with the O&OD tool. The WUMP and Poverty Alleviation Fund in Nepal can be studied both in the light of Nepal's decentralization and the strengthening of governance structures under the peace process. A cross-country comparison of the water components in all community-driven development initiatives in

Nepal, Ghana, and Tanzania is recommended in collaboration with the World Bank's working group on community-driven development. As community-based MUS is anchored in community ways of managing multiple sources for multiple uses, such research will automatically create a **sound knowledge basis on community water arrangements and solutions for resilience**.

This generation of evidence should especially look into the following barriers identified and their possible solutions. This will render the modality of community-based MUS more robust.

Single-use engineering designs

In all the initiatives described above, there is theoretical space for integrated demand and solutions. However, only for MG-NREGSdo we have some evidence that that space is effectively used. In the Rural Village Water Resources Management Project in Nepal, most designs in the first phase were still single-use (domestic) schemes. The main reason was that engineers tend to stick to the standard designs of the single uses of their expertise. Communities were not aware of other options than what they were used to in the past. Time for interaction with villagers for participatory designs was limited, certainly because engineers lived far away in district or national capitals and transport costs were high. In Ghana, communities who identified water as their priority got technical support from the Community Water and Sanitation Agency. The agency's engineers brought their standard domestic designs.

For all initiatives, as for the earlier three modalities, there is a need for **training of engineers in participatory design of multi-purpose infrastructure**. In theory, participatory technical design implies that engineers inform communities and build their capacity on the range of technical options, including self-supply. Communities are enabled to compare costs and benefits of different forms of infrastructure and sites. The performance of water works for multiple uses and multiple sources (cost-benefit, technical and institutional sustainability) should be known and communicated during the planning phase. Sadguru is an NGO in Gujarat with in-depth expertise on participatory integrated watershed management of multiple water sources for multiple uses. Such expertise is still rare. The barrier of engineers' single-use biases and their limited knowledge of integrated designs for environmental sustainability can be overcome by technical training.

In addition to this lack of skills, the structuring of technical services needs to be reviewed. Technical expertise per se is both costly and scarce. Private consultants may partly fill the gap, but qualified public technical service delivery will remain important, certainly for the poor. This expertise will increasingly be channelled through local government as part of decentralization. Having one engineer for domestic supplies and one for irrigation and one for resource conservation in each local government is unaffordable. Generalist engineers up to the lowest feasible level are more effective. In Tanzania, we found engineers in district government who already take responsibility for any water infrastructure. The basics of rural civic engineering are quite similar. Therefore, we recommend that classmate engineers evaluate the structure of public engineering services from a participatory, multiple use perspective. Such **integrated technical service structures** align with community-based MUS.

Inadequate other support to intermediate level staff

All initiatives also faced challenges in forms of support other than technical. These are partly a lack of skills for inclusive participatory planning, budgeting, implementation and monitoring. **Capacity building** of local-level staff and communities is recommended.

Other challenges are structural. Local government and implementing agencies working at the interface with communities are typically short of staff with the required capacities. The design of programs and demands from superiors can further complicate equitable service delivery. The country studies highlighted in particular the problems of spending pressure and matchmaking between people's integrated needs and parallel funding streams. Possible solutions came up as well, which should be further examined for application elsewhere.

Intermediate-level staff performance on the ground can suffer from the **pressure to achieve spending targets** of already allocated budgets. This issue is most serious for the more narrow +plus approaches but can also affect participatory approaches and community-based MUS. Spending pressure may become a perverse incentive. It can encourage targeting those who can spend easiest. They are usually among the elite. This strengthens elite capture. This was reported for example in an evaluation of the early O&OD implementation in Tanzania. For MG-NREGS, the misfit between demand for minimum wage employment and administrators' ability to create such employment within the limited time set led to underperformance of assets. It also strengthens corruption. Furthermore, annually recurrent support for employment creation may overlook possibilities to strengthen independent community maintenance of infrastructure. Solutions are needed for avoiding spending pressure and for phasing out.

Top-down funding earmarks remain the main problem for the lowest level of staff in Tanzania's O&OD projects. The challenge is to match community integrated prioritized actions with various top-down narrowly earmarked funding streams. District officials are sorting by hand which project proposal might fit which sector-earmarked funding source. Even a simple excel sheet with all past and new projects in a ward or district government is lacking. Each initiative has its own upward reporting requirements and only for the period of that project.

Experiences with untied funding in MG-NREGS and community driven development initiatives entail important lessons. MG-NREGS experiences with the promotion of government-government and government-NGO convergence is equally important. In Kerala, it is proposed to pilot-test such convergence of MG-NREGS with government's large-scale watershed management program. In Gujarat, lessons from the collaboration with the NGO Sadguru are to be explored. Such funding is tied to transparent processes, and not to predetermined outputs.

Inclusion of the marginalized remains another challenge. Best practices of clear and transparent selection criteria and procedures and effective monitoring need to be consolidated. In public works programs, equity may be strengthened by better involving wage workers in the identification and site selection of sustainable water and land assets. Identifying such best practices is recommended for MG-NREGS.

Another challenge is the **lack of planning tools and maps**. Ward and district maps of water sources and infrastructure are absent. WaterAid and partners developed Water Point Mapping in Tanzania. It looks exclusively at domestic water points. This tool is indispensable for district governments to allocate public funds more equitably and especially target unserved areas. However, regular updating of the water point maps already appeared to require more resources than available. Yet, maps are needed for all infrastructure and uses, up to the national level. It should be explored how mapping exercises by sub-sectors could be integrated for higher efficiency. In Nepal, the scaling up of WUMP from community to district level also requires water-specific maps and other planning tools.

Conclusions community-based MUS

Community-based MUS is the most recent modality with by far the widest range of potential scaling partners both within and outside the water sector. If people with their multiple uses from multiple sources are at centre stage, artificial separations and contradictory views within the water sector can dissolve. Simply **more dialogue** between the water sub-sectors about obvious knowledge would lead to a more holistic vision. This would be a first step in scaling up community-based MUS through the various sub-sectors. Professionals could agree on the following:

Water safety for drinking is promoted by all water professionals and for all sources that are used for drinking often by lack of affordable alternatives. This gives more solutions.

Every citizen is, in principle, entitled to public support according to people's priorities. Practically, this means that support is targeted to the unserved, for all water uses. People can chose for a domestic-plus, irrigation-plus, or self supply or a combination. Domestic uses are likely to remain a priority if poor women are included in this decision-making. They are also key beneficiaries of small-scale productive activities at homesteads.

Water allocation is to people with multiple needs instead of socially undifferentiated sectors. National water laws can stipulate minimum allocations for all uses that meet basic needs. This aligns with the MDGs. Expanding the human right to domestic water with rights to water for other basic needs would trigger or support such law adaptation. Community rules may fail to provide for basic needs. This has still to be studied. If so, a change in national laws and human rights would empower the poorest against their wealthier community members.

People-driven water development overcomes the separation between service providers and water resource managers, environmental experts and ecologists. There is not one entry point, either the use or the resource that is more important. They go together. Environmental sustainability will enable better services and vice versa. Equity is pursued as environmental justice.

The second next step in scaling community-based MUS is **rendering the modality more robust by generating more evidence**. Community-based MUS as application of general participatory planning on water resources development and management is a robust

concept. However, except for MG-NREGS, hardly anything is known on how these principles of participation work out for the specificities of the resource water. In most cases it is even unknown whether and which support water professionals gave. These past experiences need to be analysed, best practices identified, lessons synthesized, and outcome and process performance indicators defined in order to render community-based MUS more robust. Issues include spending pressure, matching funds with parallel funding streams, elite capture, tools and maps, and capacity building needs.

Third, **engineering support needs to be adjusted**. The scarce information that could be found in the country studies indicates that single use mind sets continue to shape technical designs. As for the other modalities, engineers need training in designing multi-purpose infrastructure. Moreover, training in participatory design is needed even more strongly than for both +plus modalities. The structure of public technical services will be more efficient if engineers become responsible for any water sector.

Lastly, we recommend **building communities and local staff capacity** for inclusive participatory planning, budgeting, implementation and monitoring with the planning tools, maps and guidelines derived from the best practice evidence.

NETWORKING AND CONCLUSIONS

Networking

The country studies showed how MUS adds value to all water approaches and rural participatory approaches. All interventions benefit from multi-purpose infrastructure, participatory planning and resource management for sustainable services. MUS overcomes the counterproductive compartmentalization of the public sector. The negative effects of sectoral structuring are most evident for the poor. Poor people build resilience through diversified livelihoods. Water cannot be split into single uses or services separate from the issue of environmental sustainability. Institutional silos have blocked the community-driven approaches that are increasing outside the mainstream water sectors.

In the past, MUS innovation and scaling up was a process of joint learning by people who would not meet otherwise. They organized into networks with the MUS Group at global level. Their focus evolved over time depending on members' evolving pilot or scaling up initiatives. Activities were pilot testing, analysing, organizing joint field visits, reflecting, synthesizing, and disseminating lessons learnt. In this way, members leveraged their own and other institutions, in particular donors, for funding for MUS implementation and capacity building. In this process of learning, the four MUS modalities emerged.

All five country studies propose to establish such national learning alliances as an indispensable step for scaling up MUS. The names proposed include MUS champions, senior policy makers in strategic positions, implementers, NGOs, and researchers. AGRA is a proposed learning alliance partner in Ethiopia, Ghana and Tanzania. Linking the national learning alliances to the global MUS Group and gives them access to lessons about scaling MUS in other countries and vice versa.

These learning alliances take conclusions about barriers and potential for scaling MUS forward. As elaborated in the next two sections, the proposed country activities focus on the one or two modalities with the highest potential for scaling up in each country. The nature of the proposed activities depends on the modality.

Conclusions on countries' scaling potential

The one or two modalities with the highest scaling potential in each country are outlined below.

In **India**, the Mahatma Gandhi National Rural Employment Guarantee Scheme (MG-NREGS) is the world's largest laboratory for community-based MUS. In Kerala's successful implementation of the program, women are the main beneficiaries. In Gujarat, NGO support to watershed management is strong, hence districts in these two states are proposed for further scaling up.

In **Nepal,** much experience has been gained for further consolidation. Winrock/IDE innovated domestic-plus in over 200 multi-purpose piped gravity flow schemes. Other projects developed and implemented community-based MUS as the Water Use Master Plan (WUMP) in several hundred villages. WUMP has recently moved up to district scale for decentralized integrated planning in line with the country's peace process.

In **Ethiopia,** past action research on MUS informed a large-scale domestic-plus project led by UNICEF, but the MUS dimensions are not yet closely monitored. Government launched a self supply acceleration program in which multiple uses are an important dimension. Ethiopia's sustainable land management program is becoming more people-driven.

In **Ghana**'s WASH sub-sector, service levels are increased where possible using limited mechanical schemes in small towns. Research on the country's many single use small village reservoirs gave insights into how multiple uses can be retrofitted as part of rehabilitation.

In **Tanzania**, the iWASH project introduced self supply for multiple uses, for example, through rope pumps. Irrigation-plus, which includes livestock watering, is practiced but has not been formalized. Community-based MUS is explored in the country-wide Opportunities and Obstacles to Development methodology for decentralized service delivery by local government and all line agencies. Tanzania has advanced policies on IWRM. However, critique is growing that these are too top-down and too hard to implement. Country-wide decentralization of service delivery to local government is also well advanced. The question to explore is whether and how community-based MUS through local government can fill the void at local level.

In **Nepal, Ghana, and Tanzania,** large-scale community driven development programs are implemented. They target poor women and men. In all countries, communities choose water services and conservation projects.

Conclusions on next steps for scaling up MUS

More robust modalities

For all modalities in all countries, the first barrier to scaling up MUS is that past innovation experiences have not yet been consolidated into robust evidence-based modalities with clear advocacy messages, tools, guidelines and performance indicators.

In the **domestic-plus and irrigation-plus modalities**, the 'why' and 'how' of widening single use mandates have been well conceptualized. There is evidence, financial analysis (Renwick 2007), and there are guidelines. The next step in scaling is to synthesize that knowledge into country-specific advocacy messages for strategic dissemination. Such advocacy is needed to convince the WASH and irrigation sectors to formally widen their single use mandates, which is the main barrier in these modalities.

The domestic-plus concept of increasing service levels to 'climb the multiple use water ladder' is widely accepted. Country-specific advocacy of this concept can lead to pilots in Tanzania and would further support the already existing pilots or large-scale projects and their dissemination in Nepal, Ghana, and Ethiopia. In India, convergence with MG-NREGS is to be unravelled.

In the irrigation-sector, the MASSMUS methodology developed by FAO is robust. Similar principles apply for small-scale storage and irrigation. Articulating and formalizing these principles and practices is recommended for Tanzania's irrigation and livestock

infrastructure and Ghana's small reservoirs. For irrigation in Ethiopia and Ghana, scoping studies on irrigation-plus are still lacking.

The WASH and irrigation sub-sectors can also move directly to community-based MUS, certainly in new construction. Both sub-sectors would expand uses and sites of use to cover a whole hamlet, one or more communities or watersheds.

Self-supply is still ignored in the public water sector. Rope pumps, affordable drilling techniques, eco-sanitation, water filters, groundwater recharge, biogas, hydropower and drip irrigation are all vital components of people's multiple sources for multiple uses. Self supply initiatives are gaining ground in Nepal, Ethiopia and Tanzania. More evidence is needed on their success factors and impacts in general and on multiple uses in particular. The risk of exclusion of the poor, who lack capital for investment, needs to be addressed. The aim of these studies is to identify barriers and solutions for developing low-cost technologies including point-of-use treatment; establishing inclusive and gender sensitive supply chains; ensuring financing facilities for poor women and men; and creating an enabling policy environment.

For **community-based MUS**, participatory initiatives have already led to multiple use and multiple source water projects at large scale, certainly in India's MG-NREGS. Community driven development programs are also growing in Nepal, Ghana and Tanzania. However, here too, there is little documented evidence. There is even less evidence on how the opportunities of participatory planning, multi-purpose infrastructure and the efficient and sustainable management of multiple conjunctive sources for services have or have not been tapped. The Water Use Master Plan (WUMP) applications in Nepal have hardly been analysed. A next step in rendering community-based MUS more robust is assessing best practices and solutions in these water projects. Special attention is needed for the links between environmental sustainability for better services and for issues of elite-capture, the matching of integrated bottom-up demands with either earmarked or untied funding streams, and capacity building needs and tools for planning and monitoring at community, ward and district levels. Scaling community-based MUS through IWRM as its bottom-up leg is proposed in Tanzania. The shift to downward accountability requires performance indicators on inclusive planning and implementation processes of water projects.

Capacity building

The second barrier found in all modalities and countries is lack of capacity among local and intermediate level staff. Engineers continue to apply single use designs for infrastructure without much attention to multiple sources or their sustainable use. They also lack capacity for participatory design processes. Hence, an important step in scaling MUS is to build capacities. Engineers and conservation experts at all levels need to be trained in designing multi-purpose infrastructure and sustainable conjunctive management of multiple sources. Women should be included in these technical training initiatives. Other support staff also need capacity building to facilitate participatory planning, fund allocation, implementation and monitoring.

Conceptualizing holistic and sustainable people-driven development

A third set of barriers is related to the conceptual confusions that are created because the public sector persistently keeps dividing itself into silos from local to global levels. These confusions are even more pronounced for water for poverty alleviation. The country studies highlighted how water professionals contradict each other because of their upward loyalty to their sector. This reproduces an unrealistic understanding of poverty and water arrangements on the ground. In people-driven community-based public support, people's realities and priorities are the starting point. There is no 'rocket science' involved. The poor have been implementing these modalities all along. Even before implementing such approaches, water professionals (and the poor) would gain from a more holistic and realistic view across the water sector. We propose the development of such a view. We summarize:

- The poor create resilience through diversified livelihoods. Benefits from one dimension of well being are vital to make other dimensions work. Vulnerability in one dimension often causes a fallback to extreme poverty. Agriculture is the mainstay in rural areas and constitutes a significant part of food and income in peri-urban areas. Poor women and girls are least able to make the separation between domestic and productive spheres that the public sector keeps imposing in spite of decades of gender advocacy.

- Lack of water control affects more dimensions of vulnerability than any other natural resource. Poor people do not split the resource into single uses. They invest in multi-purpose water infrastructure because that is most cost-efficient, as large-scale dam builders know. People manage multiple conjunctive sources and seek to match quality and quantities as needed for each use. For the poor, there cannot be any water use without the sustainability of the resource.

The following contradictions and solutions emerged among professionals:

- Most infrastructure is designed for one use, but *de facto* used for multiple purposes. A solution is to design for multiple purposes as the norm, and for single uses as the exception.

- The WASH sector is the only sector responsible for safe drinking water. Only water from 'domestic' schemes should be safe for drinking. One solution is point-of-use treatment, as the WASH sector itself advocates. Another solution is that all professionals take responsibility for drinking water quality of all sources used for drinking.

- Equity in public funding and higher coverage for minimum services is mainly seen as a responsibility of the WASH sector. A solution is equity in all public funding for water for all uses according to poor people's priorities. This mainstreams the responsibility for implementing the legal priority for domestic water uses wherever this is women's priority. Moreover, it calls for minimum service levels for other small-scale water uses that contribute to the MDGs and broad socio-economic human rights to water, food security, and livelihoods.

- Conventionally, equity in water allocation is only operationalized in the prioritization of domestic uses without considering inequities in domestic uses. Moreover, irrigation engineers may refuse to recognize this priority use within irrigation schemes. Inequities in water allocation are hidden behind persistent allocation to monolithic sectors. In Tanzania and other African countries other small-scale productive uses that contribute to fulfilling human rights require permits. This lays the burden of proof of existing uses and complex application procedures for new uses with users. Governments lack the resources to implement permits, so the administration-proficient are even more likely to use the law for their own benefit. A solution is that national water laws become people-based, and prioritize domestic uses and all other small-scale uses for basic livelihoods with a stroke of the pen. This also reduces government's logistics burdens. International human rights law can support this process by negotiating that all existing small-scale productive uses are also seen as a human right. For future uses, issue of equity in public fund allocation needs to be addressed.

- Last but not least, the country studies confirmed the complete separation between water service providers and water resource managers and conservation and environmental professionals. Most service providers fail to see practical implications of ecosystem services for their work. They believe that ecosystems are mainly wetlands, eco-tourism reserves and environmental flows. For them, ecosystem services are primarily measures to reduce water use by everyone including the poor who hardly have any access. On the other hand, service providers feel that outsiders drive ecosystem services with hidden and top-down priorities. People opt spontaneously to allocate public funds for water conservation measures for their own interests, and implicitly for downstream users. No one called such broader practices a payment for ecosystem services. If poverty alleviation remains a goal, a solution is to unpack how society determines what ecosystem services are. The equity dimensions of ecosystem services are key, for example as environmental justice. People and water service providers would benefit from practical solutions on how to ensure the environmental sustainability of self supply and the services delivered.

All solutions imply a better understanding of how communities have managed their multiple sources for multiple uses since time immemorial. Their holistic practices and priorities are the starting point.

REFERENCES

Adank, M., B. Van Koppen and Stef Smits. 2012. Guidelines for planning and providing multiple use water services.

Bakker M., Barker R., Meinzen-Dick R., Konradsen F., (eds). 1999. Multiple Uses of Water in Irrigated Areas: A Case Study from Sri Lanka. SWIM Paper 8. International Water Management Institute, Colombo, Sri Lanka.

Boelens, Rutgerd, Rocio Bustamante and Hugo de Vos. 2007. Legal Pluralism and the Politics of Inclusion, Recognition and Contestation of Local Water Rights in the Andes. In: Van Koppen, Barbara, Mark Giordano, and John Butterworth (eds). 2007. Community-based water law and water resource management reform in developing countries. Comprehensive Assessment of Water Management in Agriculture Series 5. CABI Publishers Wallingford, UK.

Chikozo, Claudius, and Jim Latham. 2005. Shona customary law in the context of water sector reforms in Zimbabwe. In: Van Koppen, B., J.A. Butterworth, and I. Juma (eds). African Water Laws: Plural legislative frameworks for rural water management in Africa. Proceedings of a workshop held in Johannesburg, South Africa. 26-28 January 2005. Pretoria: International Water Management Institute.

Cullis, James, and Barbara van Koppen. 2007. Applying the Gini Coefficient to measure inequality of water use in the Olifants river water management area. IWMI Research Report 113. Colombo: International Water Management Institute.

Mehari, Abraham, Frank van Steenbergen and Bart Schultz. 2007. Water Rights and Rules, and Management in Spate Irrigation Systems in Eritrea, Yemen and Pakistan. In: Van Koppen, Barbara, Mark Giordano, and John Butterworth (eds). 2007. Community-based water law and water resource management reform in developing countries. Comprehensive Assessment of Water Management in Agriculture Series 5. CABI Publishers Wallingford, UK.

Meinzen-Dick R. 1997. Valuing the multiple uses of water. pp 50-58 in Kay M., Franks T., Smith L. (eds) Water: Economics, management and demand. E&FN Spon, London.

Moriarty, P., Butterworth, J. and B. van Koppen (eds.), 2004. Beyond Domestic. Case studies on poverty and productive uses of water at the household level. IRC Technical Papers Series 41. Delft, the Netherlands.

Nguyen-Khoa S., Smith L., Lorenzen K. 2005. *Impacts of irrigation on inland fisheries: appraisals in Laos and Sri Lanka.* Comprehensive Assessment Research Report 7. Colombo, Sri Lanka, Comprehensive Assessment Secretariat. 36p.

Palanisami K. and Meinzen-Dick R. 2001. Tank performance and multiple uses in Tamil Nadu, South India. *Irrigation & Drainage Systems* **15** (2): 173-195.

Palanisami, Kuppannan; Meinzen-Dick, R.; Giordano, M., van Koppen, B., Ranganathan, C. R. 2011 Tank performance and multiple uses in Tamil Nadu, South India: Comparison of 2 time periods (1996–97 and 2009–10). In: Irrigation and Drainage Systems, 25(1):121-134. http://www.springerlink.com/content/9t31218173815326/

Penning de Vries and Ruaysoongnern S. 2010. Multiple Sources of Water for Multiple Purposes in Northeast Thailand. IWMI Working paper 137. Colombo: International Water Management Institute.

Renault D. 2008 Service Oriented Management and multiple uses of water in modernizing large irrigation systems. P. 107-117 in Butterworth J., Keijzer M., Smout I., Hagos F. (eds) Multiple use Water Services. Proceedings of an international symposium held in Addis Ababa, Ethiopia, 4-6 November 2008. Multiple Use Water Services (MUS) Group.

Renault, D. 2010. Multiple Uses of Water Services in Large Irrigation Systems; Auditing and planning modernization. The MASSMUS Approach. FAO, Rome.

Renwick ME. 2001. Valuing water in a multiple use irrigation system: irrigated agriculture and reservoir fisheries. *Irrigation & Drainage Systems* 15 (2): 149-171.

Renwick, M. , 2007. Multiple Use Water Services for the Poor: Assessing the State of Knowledge. Winrock International, Arlington, VA, USA.

.http://www.winrockwater.org/docs/Final%20Report%20Multiple%20Use%20Water%20Services%20Final%20report%20feb%2008.pdf

SADC/Danida Regional Water Sector Programme. 2009a. Guidelines for Local-Level Integrated Water Resource Management. Based on experiences from Integrated Water Resource Management Demonstration Projects in Malawi, Mozambique, Namibia, Swaziland, and Zambia. Pretoria: Southern African Development Community/Danish International Development Agency, in collaboration with the International Water Management Institute. http://www.iwmi.cgiar.org/Publications/Other/PDF/Guidelines_for_community-driven_water_resource_management.pdf Accessed 6 December, 2011.

SADC/Danida Water Sector Support Programme. 2009b. Innovations in Local-Level Integrated Water Resource Management. Lessons learnt from the Integrated Water Resource Management Demonstration Projects in Malawi, Mozambique, Swaziland and Zambia. 2009. Synthesized by Barbara van Koppen, Jonathan Chisaka, and Stalin Sibande Shaba. Pretoria: SADC/DANIDA Water Sector Support Programme, in collaboration with the International Water Management Institute. http://www.iwmi.cgiar.org/Publications/Other/PDF/Lessons_learnt_from_the_IWRM_demonstration_projects.pdf Accessed 6 December, 2011.

Shah, Tushaar. 2007. Issues in Reforming Informal Water Economies of Low-Income Countries: Examples from India and Elsewhere. In: Van Koppen, Barbara, Mark Giordano, and John Butterworth (eds). 2007. Community-based water law and water resource management reform in developing countries. Comprehensive Assessment of Water Management in Agriculture Series 5. CABI Publishers Wallingford, UK.Sokile, Charles Suleiman. 2005. Towards improvement of institutional frameworks for intersectoral water management. The case of Mkoji Sub Catchment of the Great Ruaha River in the Rufiji basin, Tanzania. Ph.D. thesis. University of Dar-es-Salaam

UNICEF/WHO. 2011.Drinking Water Equity, Safety and Sustainability. Joint Monitoring Programme for Water Supply and Sanitation. http://www.unicef.org/media/media_61057.html

Van der Hoek, W., S.G. Feenstra, and F. Konradsen. 2002. Availability of irrigation water for domestic use: impact on prevalence of diarrhea and nutritional status of children. Journal of Health, Population and Nutrition 20: (1) 77-84

Verma, S. 2010. Labor market dynamics in post-NREGS rural India: Field-notes from tribal south Gujarat and southern Rajasthan, Anand: International Water Management Institute.

Van Koppen, B., Mark Giordano and John Butterworth (eds). 2007. Community-based water law and water resource management reform in developing countries. Comprehensive Assessment of Water Management in Agriculture Series 5. CABI Publishers Wallingford, UK.

Van Koppen, B.; Smits, S.; Moriarty, P.; Penning de Vries, F.; Mikhail, M. and Boelee, E. 2009. Climbing the water ladder: Multiple use water services for poverty reduction. Technical Paper Series 52. The Hague, The Netherlands, IRC International Water and Sanitation Centre and International Water Management Institute and Challenge Program on Water and Food. Downloadable at: www.irc.nl/publications; www.iwmi.org; http://www.waterandfood.org/publications/program-publications/joint-publications.html Accessed 6 December, 2011.

Venot, J.P.; Andreini, M. and Pinkstaff, C.B. 2011. Planning and corrupting water resources development: The case of small reservoirs in Ghana. In: *Water Alternatives* 4(3): 399-423

Yoder, R. 1983. *Non-agricultural uses of irrigation systems: past experience and implications for planning and design.* ODI Network paper 7, Overseas Development Institute, London.