Generalities on Multiple Uses of Water Services

Daniel Renault FAO Water

The term multiple-use of water is increasingly used in the water sector but often referring to different levels of scale where multiple-use takes place, or originating from different sectoral backgrounds. This note aims to provide an overview of different definitions which are in use, and provide a typology. It does so by conceptualizing actual uses of water at different levels of scale. This serves as basis for defining how at these different levels of scale services are provided to meet these needs.

Different levels of scale

It is obvious to state that people use water for multiple purposes. However, it is important to recognize that multiple uses happen at different levels of scale:

The household or homestead level: this is the lowest level, where people harvest, gather several sources of water for different uses around or near the homestead, including domestic use, small-scale productive uses, such as backyard gardens, livestock, micro-enterprises, etc.

The water system level: this is the level of a certain infrastructure, such as a water distribution scheme or a water ecosystem. Often, such schemes are designed with a specific use in mind, such as irrigation of field crops, or domestic supply. Users may actually engage in multiple-uses at household level, as seen above, but there may also be other uses and functions, which are built in at scheme level. For example, an irrigation canal may also fill village reservoirs for domestic supply, or provide water for fish. In large, complex systems, such as some of the canal systems in South Asia, or paddy irrigation schemes in South East Asia, there may be a wide range of these uses and functions at scheme level.

At the **catchment or river basin level**, multiple uses of water occur from upper catchments down to estuaries and coastal wetlands, where different schemes and users take and discharge water for multiple purposes. Large dams have always typically being built to serve multiple functions such as flood protection, urban water supply, hydropower, irrigation etc.

Box 1 *Extract of the WWF5 Istanbul Water Guide (2009) Item No 52*

Acknowledge the wide-spread practice of multiple uses and functions in water systems.

Historically people, communities, and water managers have been using man-made delivery systems or natural water systems deliberately for more than a single use. In many rural and urban areas, domestic water networks are used for small-scale productive activities. Similarly, irrigation systems are often de facto providing large amounts of water within their command areas that facilitate access to water for many other uses through recharge of surface streams and groundwater. Lastly aquatic systems (wetlands including rice-based systems) provide many critical productive and ecosystem services to nearby populations. Under appropriate stakeholder management processes, the practice of multiple uses and functions can prove to be sustainable and very efficient for the community.

Multiple-uses: from practices to services

Planned and de-facto multiple-use

Although people need and use water for different purposes, often the systems or services haven't been designed or developed for these. For example, irrigation schemes may have been designed for field crop irrigation only, but are de facto used for cattle or backyard irrigation as well. We see both, the de facto and planned services as MUS. De facto MUS results of practices by users in situation where some basic services are lacking (domestic/irrigation water, sewage system, garbage facilities).

De facto MUS services, may suffer some drawbacks, e.g. users may try and access water for their different needs, which goes beyond the design capacity of a system. In fact, a key rationale for the MUS approach is that by trying to recognize the reality of multiple uses, such practices can be better accommodated. It must be said that some distorted uses which sometimes are the basis for MUS are not desirable, because the balance between advantage and disadvantages are not positive. For instance it is quite common to see the use of irrigation canal system as waste water sewage system or garbage dumping places in.
Recognizing that these multiple uses exist is a first step (often as a de facto practice). Understanding why they exist is the important second step of the process as it will help incorporating it into an efficient operation and management process. Basically they exist as externalities of the main process or as advantages taken by users to fulfil a need that would cost a fortune by any other means. The next step is to conceptualize and incorporate in the management the notion of water services, i.e. the systems (physical and non-physical) that are in place to meet these needs at different levels. In that sense, MUS, or multiple-use services, can be considered as an approach, rather than a specific type of system. Lastly it must be also recognized that some water systems are fulfilling roles and functions which are not strictly associated to any water delivery to any particular user, but more addressing community needs through specific functions and beneficial roles.

Multiple uses of water - defines the practice of using water from the same natural or manmade system or infrastructure for multiple uses and functions.

Multiple-use services (MUS) – defines the conceptual approach of providing water services provision for multiple uses, incorporates also the roles and functions of water related systems for local communities.

Multiple-use approach mainly applies at household and system levels. Although, one can of course also talk about management arrangements at catchment or basin scale to ensure water for multiple uses to different users, this is not tagged as MUS. Terms as IWRM or integrated catchments are used for that. IWRM is often understood as governance and management for dealing with competing water sectors at, the basin or catchment scale. MUS is an approach for providing multiple uses services at systems level and downwards. Further clarification of MUS *vs* IWRM are specified in Figure 1 and box 2.

To conclude, MUS is therefore very much tied to "systems" and services, i.e. infrastructure and their corresponding management and governance arrangements.

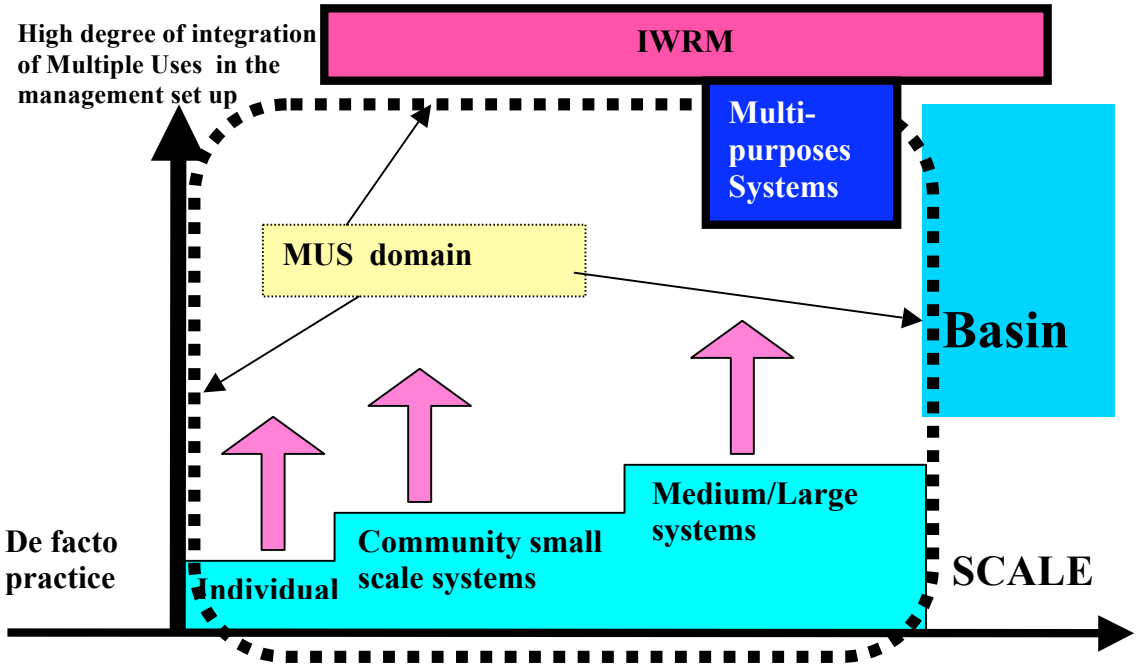

Figure 1. MUS in a scale and management integration dimensions

Different types of MUS systems

Obviously there are various types of MUS systems to be found in the water sector. The typology presented in table 1, is not exclusive and in practice MUS systems may refer to several types: For instance MPR for irrigation water and hydropower and MU + for irrigation within the CA.

Table 1 Typology of MUS systems

TYPE		Shared system	Typical situation
MPR(1)	A reservoir with separate system-networks for each use of water. Usually Large infrastructure	Reservoir	Multipurpose reservoir
MPN	A distribution system-network designed for serving multiple uses	Network	Multipurpose network
MU +	Single Use distribution network yielding opportunities and externalities for other uses.	Water resource & Network	Domestic + Irrigation +
MU Seq	Sequential system: drops cascading from one compartment to the other Successive non consumptive uses of water	Water cycle/path way	A surface groundwater hydrosystem supporting irrigation and domestic
MF	Multi dimension/functions/services Several functions/roles associated to some uses of water and/or resulting of the circulation of water and/or the set of practices associated with water management	Eco-system	Paddy Field system Wetlands

Box 2 MUS and IWRM *Extract of the WWF5 Istanbul Water Guide (2009) Item No 54*

Recognise the interrelationship between multiple uses and functions of water services and integrated water resources management.

Multiple uses practices are an inherent element of the Integrated Water Resource Management (IWRM) approach, which should be strengthened. Management agencies of large irrigation systems are often the only water services providers, notably during dry periods. Sound governance of these systems should be ensured to encompass the principles of IWRM and to recognize the needs of all stakeholders.

Definition and approach of "services" in water systems

The term "services" is used in numerous and extremely diverse meanings from employment and task, assistance, maintenance of cars to religious rite or military corpses just to give an idea of the diversity. The term "service" applied to the water sector is no exception in that respect, many actors of the water business refers to "water services" but not necessarily with the same meaning, this is why at the onset of a document presenting MUS it is critical to clarify our understanding and conceptual approach of Services in order to avoid any further ambiguity.

The services as a range of intangible economical activities (3rd sector)

The term services is often used to define the sector activity which is not the primary sector agriculture nor the industrial but the 3rd sector which has developed on the basis of production of non tangible products (banks, advise, etc...). In the field of irrigation, intangible services are advice to irrigation, choice of technical options and advise for watering scheduling, this is what is covered by the extension services.

Water Service as a branch activity or a company

The term "water service" is also used to define the activity of providing users with water deliveries as well as it can define the company itself who provide the service.

The service business approach

In this approach service is the outcome of specific task performed by a provider to produce the service that one users, beneficiaries as asked/requested. The concept of service is in that case the organic relationship between a provider and a receiver of services (also termed as customers/users/beneficiaries/etc).

The ecosystem services approach

The approach of Ecosystems services has developed significantly recently through the Millennium Assessment of Ecosystems (MEA 2003). Mankind benefits from multitude of resources and processes that are supplied by natural ecosystems, these benefits are know as ecosystem services which are grouped into four main categories:

- **provisioning,** e.g. food, fibber, fresh water, energy, wild food, spices, medicinal products.
- **regulating,** e.g. carbon sequestration, waste decomposition, purification of water and air, crop pollination, pest and disease control
- **supporting,** e.g. nutrient dispersal and cycling, seed dispersal,
- **cultural**, e.g. cultural intellectual and spiritual inspiration, recreational experiences, scientific discovery.

The concept of ecosystem services is pertinent for the irrigated command area where water is often critical for and has a strong influence on these services.

The MASSMUS conceptual approach of Services

Building upon the previous definition of services, we suggest to approach MUS in irrigation systems as follows:

First we approach irrigation system as a Bio-Physical system and for this reason we considers them as a specific ecosystem providing ecosystem services supported by a structured intervention on water management.

Second we consider the organic service relationship as the core of our business with service providers and services receivers.

Third we acknowledge the need to bound the system under consideration with clear cut physical and managerial limits.

Finally the Services Oriented Management (SOM) in irrigation system management which is the foundation of MASSCOTE and MASSMUS considers that:

Water management activity within the limits of their managerial boundaries takes place and impacts a command area considered from a bio-physical perspective as an agro-ecosystem providing ecosystem services, and centred on a dynamic organic relationship between provider and users of services.

<u>In short: A business service model intervening on a large ecosystem</u>

With this organic relationship in mind we considers that water management activities are providing services directly to users (farmers, villages, etc..) for the main provisional services or are indirectly serving beneficiaries by acting on the ecosystem processes which in turns influence the ecosystem services as described in figure 2.

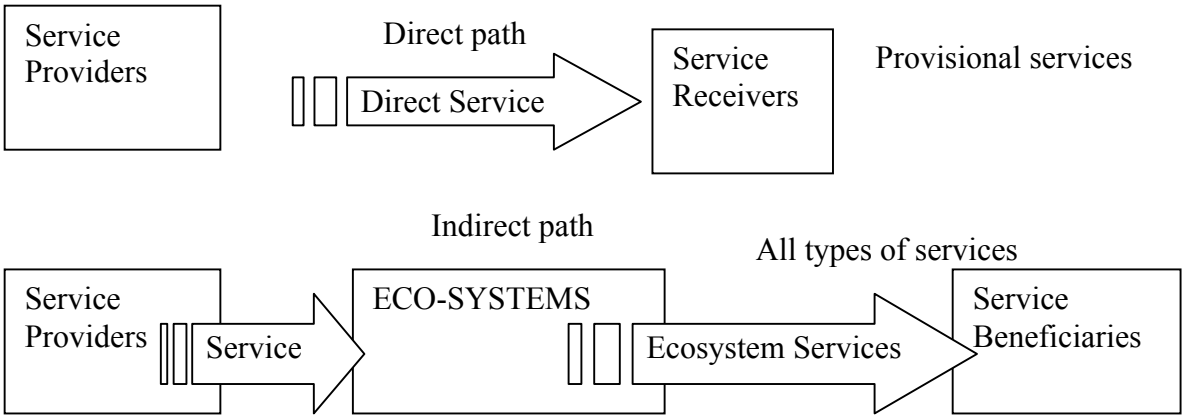

Figure 2. Direct and indirect service relationships in water systems

Multiple uses, functions, roles and purposes

When we talk about MUS, uses such as domestic water supply, irrigation supply and hydropower generation are the ones that immediately come to mind, albeit sometimes at different scales. The concept of MUS may go beyond these very tangible uses, to embrace also other functions, roles and purposes such as flood protection associated with irrigated paddy cultivation, or with multi purposes reservoir.

Some functions are rooted in the social and cultural aspects of water management; others are related to the hydrological processes, specific agriculture practices such terraces in paddy cultivation, others to the biological and ecological processes.

This is where the concepts introduced by the ecosystems services (MEA, 2003) are useful to group the various uses and functions. In table 1 below we are proposing a typology of uses and functions in irrigation systems using the MEA grid.

Table 2. Classification of water services in a command area following the MEA grid.

Provisioning services	Supporting Services
Domestic water Food and fiber (irrigation) Water for cattle Transportation Hydropower Environmental flows Fuel (natural vegetation) Biochemicals and natural medicines	Groundwater recharge Support to fishing Support to natural ecosystems and wildlife (biodiversity) Soil conservation Habitat improvements (raw materials for construction, shade,...)
Regulating Services	Cultural services
Sanitation and wastewater treatment Flood protection Cooling effect on habitats. Erosion control	Social functions linked to the infrastructure and management Recreation and Tourism Cultural heritage values and landscape (ex. terrace system)

Note that as mentioned by the authors of the Ecosystems Services in the MEA report, this partition for water is not clear cut and many services are relevant to two categories.

Box3. *Extract of the WWF5 Istanbul Water Guide (2009) item No53*
Recognize the multiple benefits of multiple uses and functions of water services including for the most vulnerable users.

Multiple use systems can provide the more vulnerable users with low cost services for domestic water, water for agriculture (irrigation, rain fed), homestead, garden, water for cattle, habitats for fish and other aquatic resources and rural enterprise water supplies. The same infrastructure may be used for these services as well as for hydroelectric power and, in some cases, to aid inland waterway navigation. Multiple use systems consider also support important cultural values and functions that are essential for local well-being and livelihoods and might provide ecological benefits which include flood control, groundwater recharge, water harvesting, water purification and biodiversity conservation. Diversification of water sources and of productive activities is instrumental in increasing local community resilience and management to global shocks and risks that may result from climate or market crisis.