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**Rural women’s rights to water for health, food, and income**

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\* The views expressed in this paper are those of the authors and do not necessarily represent those of the United Nations.

**Summary of text:**

- Rural women and girls in developing countries are the most water insecure. They are disproportionately responsible for water fetching for domestic uses but lack access to affordable and appropriate water infrastructure. Sanitation and menstrual hygiene facilities often lack as well. This greatly contributes to women's time poverty and girls' drop-out from schools. Public irrigation services often exclude women altogether. Women and girls are also the worst hit by floods, droughts and disasters, as evident in their higher mortality rates.
- Climate change is primarily manifest through the impacts of higher temperatures on the global hydrological cycle, leading to more extreme and less predictable events of droughts, floods and storms. This exacerbates women's and girls' vulnerability even more.
- These pressures are compounded by growing competition for water resources by profit-oriented private water service providers and large-scale acquisitions of fertile land with water resources ('land and water grabs'). The latter serve extractive industries with little employment, and destroy the water-dependent small-scale farming systems that are vital for women's human rights. This further widens the inequalities in the distribution of water resources.
- In line with CEDAW's General Recommendation 34, the CESCR General Comment 15 and the UN resolutions of 2010 on the human right to water for domestic and productive uses, two-pronged interventions are gaining traction to meet the intersecting rights to water for domestic uses, food, an adequate standard of living, education and procedural rights: first, women's improved and equal access and control over water infrastructure for rights to the water stored and conveyed by that infrastructure; and second, strong entitlements to water resources. Evidence of trends to achieve these two goals, lead to the following recommendations.

**Key recommendations:**

- Water infrastructure should be developed with strong participation of women; this improves performance. Starting point of planning should be the existing community-based water infrastructure investments for multiple uses and their water resource sharing arrangements as common property. Women's organizations, CSOs and governments should support these investments through appropriate technology development, for example solar powered pumps, and training. Women's organization and application of the household approach can overcome the male bias, if not male monopolization, in infrastructure development.
- The WASH sector needs to accelerate the achievement of universal coverage of affordable infrastructure services; to better involve men as care takers; and to encourage women's small-scale productive water users at homesteads.
- The irrigation sector should allocate joint or women-only titles to irrigable land and ensure equal representation in Water User Associations. Gender issues can be raised and solutions found with the 'Gender in Irrigation Learning and Improvement Tool'. Also, FAO and IFAD recognize the many other uses of 'irrigation' water that often benefit women and the landless most (domestic uses, livestock, trees, fisheries, small-scale enterprise, conjunctive groundwater for horticulture, cultural uses).
- Decentralized planning of public goods, for example in employment generation schemes, often boost collective and individual water interventions.
- There is an urgent need to decolonize current water legislation of permit systems. Foreign and administration-proficient formal large-scale users continue to get strong private administration-based entitlements, while indigenous water laws are criminalized. Instead, as for land tenure, legal pluralism and common property regimes as well as free, prior and informed consent in water tenure should be recognized. Water resources that meet human rights should be protected as absolute priority uses.

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## 1. Introduction

### Conceptualizing rural women's rights to water for health, food and income

Water is life, especially in rural areas where women, men, girls and boys depend in many ways on water for health, food and income, by drinking and using water for personal hygiene, sanitation and other domestic uses and for a range of productive uses, including livestock, cropping, horticulture, forestry, crafts, building, small-scale enterprise, energy, and cultural uses. Water also brings risks. Droughts, pollution and flooding can destroy livelihoods, especially for women who cannot afford to live in more secure sites with more protective infrastructure and with access to safer water sources. Climate change will augment these risks. Not surprisingly, rural societies continue to deeply value the power of water – interestingly, most often represented as a female or gender-neutral deity - in their mythologies and ceremonial uses (Drewal 2008; Vera Delgado 2017).

In many low- and middle-income areas, certainly in Sub-Saharan Africa, water resources are available and there is a significant untapped potential to better harvest and store water resources as driver of agricultural and broad-based economic growth, similar to the ways in which high-income areas and countries have developed their water resources and protected against floods and droughts.

Over the past decades, global consensus has grown on the strong links between water, gender equality, and human rights (Hellum et al 2015; HLPE 2016; UNEP 2016). The CEDAW Committee's General Recommendation No. 34 (UN 2016) on the rights of rural women, emphasizes in art 85: 'a) Sufficient, safe, acceptable and physically accessible and affordable water for personal and domestic uses and irrigation; (b) Adequate sanitation and hygiene, enabling women and girls to manage their menstrual hygiene and have access to sanitary pads'. It further states that 'rural women's rights to land, natural resources, including water, seeds, forestry, as well as fisheries, are fundamental human rights.' And: 'Reducing rural women's labour time and effort through infrastructure and technological innovation is particularly vital. In this regard, they are in need of agricultural, irrigation and water-harvesting technology and labour-saving agricultural equipment'.

In the water sector, many international and national declarations, policies and guidelines have highlighted the importance of gender and water in rural areas and have set broad guidelines for actions. Whereas earlier writings referred to the vaguer notion 'gender equity', current international and national water policies and declarations, including the Sustainable Development Goal 6 on Water, commit to gender equality.

The interpretation of norms and definitions of a human right to water was further clarified by the International Covenant on Economic, Social and Cultural Rights in its General Comment 15 on a human right to water (ICESCR-UN 2002). The Comment articulates both substantive and procedural aspects of a human right to water. It highlights the many ways in which a right to water is derived from and contributes to realising other socio-economic rights: 'All human rights are universal, indivisible and interdependent and interrelated'. In 2010, a milestone in rights-based water management was reached when the UN General Assembly 64/292 (2010) adopted a human right to water (meaning: water infrastructure services) for drinking, personal hygiene, other domestic uses and sanitation. This is a right to water infrastructure services at affordable prices, and concretizes a 'core minimum' as an immediate obligation or as reasonable efforts, in line with the United Nations Social Protection Floor (SPF) Initiative and UN Women 2015's Minimum Essential Levels. Human rights frameworks are

increasingly invoked in environmental degradation and water pollution as well (WGF 2012; Water Lex 2014). The UN Declaration on the Rights of Indigenous Peoples and the ILO Indigenous and Tribal Peoples Convention 1989 (no. 169) have important gender and water dimensions as well (Boelens et al 2005; Van Koppen et al 2007; RRI 2017).

This paper focuses on the indivisible rights to gender equality and non-discrimination and the rights to water, food, health, adequate standard of living and education, which combine domestic and productive spheres. The multi-faceted importance of water is described in section 2. Sections 3-7 focus on rights to water that are typically related to investments in water storage and conveyance *infrastructure* (or technology; both terms are used interchangeably). Investments in infrastructure overcome 'economic water scarcity' (section 3). Gender equality processes are discussed for four categories of investors: households' private individual or collective investments in infrastructure for self-supply (section 4); the Water, Sanitation and Hygiene (WASH) sub-sector (section 5); the irrigation sub-sector (section 6) and decentralization of various development programs by combined state agencies, and NGOs (section 7). Lastly, section 8 focuses on a second issue: the distribution of the naturally available water *resources*. It discusses the plural legal frameworks under which claims to water resources are negotiated when there is 'physical water scarcity'. Pollution issues other than drinking water quality are beyond the scope of this paper.

## 2. Water is life

### Intersecting rights to health, food and income

Water brings life, especially in agrarian economies, where a range of water uses are key to realize indivisible domestic and productive human rights to health, nutrition, dignity, food, an adequate standard of living, and education. The realization of water-dependent human rights reinforce each other in virtuous circles out of poverty towards health, food and income. Lack of water and harm caused by droughts, floods and storms, trigger a vicious circle downward.

Water in the right quantities and of the right quality, at the right site of use and at the right time, is often the limiting factor. However, other inputs and conditions can substantially improve the benefits derived from water uses. Domestic water uses require hygiene education to realize health. Productive water uses require, above all, land and labour to cultivate. High-yielding crop varieties and fertile soils further increase yields. Income from sale depends on good markets. At the same time, those with more other assets, in particular land, have more options to render more water beneficial. In that sense, water tends to exacerbate existing inequalities.

Bringing water, using water and deriving the benefits or 'fructus' (Theis et al 2017) of the use of water and related inputs, are strongly gendered. Water as vital part of both domestic chores and rural production addresses the most persistent gender inequality across age, class, race, caste, and ethnicity: women's and girls' disproportionate burdens of the unpaid and underpaid care economy in the so-called 'private' sphere. This weakens their (future) bargaining position in the public sphere of the productive economy, firstly, as a result of lesser time availability (or 'time poverty'), and, secondly, as a result of discrimination that leaves women little other choice than accepting lower wages for the same work; being the first to lose paid jobs in recessions; or being excluded from the opportunities that public investments in water for productive uses bring to men. The ideology of women being

mainly a 'housewife, only concerned about subsistence agriculture' justifies women's discrimination in states' investments in water for productive uses.

The intersections with age, class, caste, race, ethnicity and other social differences are also clear: rural women in low- and middle-income countries bear heavy burdens of water fetching. A study of time and water poverty in 25 sub-Saharan African countries estimated that women spend at least 16 million hours a day collecting drinking water; men spend 6 million hours; and children, 4 million hours (WHO 2012). This sharply contrasts to middle-class women in high-income countries who just open a house tap connected to municipal systems at often subsidized rates.

For rural women in low- and middle-income countries, the struggles are inter-related. One struggle is to alleviate and 'de-feminise' care-giving domestic chores and to create gender norms that encourage men to assume equal caring responsibilities in a joint effort to alleviate the burdens of water fetching for both women and men and boys and girls (Ferrant, Pesando and Nowacka 2014; OECD 2014). The other struggle seeks to end gender inequalities in productive water uses and control over the benefits. The combined struggle, for example through multi-purpose infrastructure, is most effective: gains in the domestic spheres open up opportunities in the productive spheres; women's empowerment in the productive sphere gives food, income and bargaining power crucial for domestic spheres. As elaborated below, multi-purpose water infrastructure for both domestic and productive uses addresses both challenges at the same time.

The many ways in which water uses bring domestic and productive livelihood benefits or harm go far beyond the sectoral organization of government and many non-government administrations, both in the water sector and even the human rights frameworks. As the water sector increasingly seeks to express in terms of 'nexus', there is no other natural resource than water that flows through so many different dimensions of women's (and men's) and the next generation's reproductive and productive wellbeing.

For example, physical health depends on water for drinking water, personal hygiene and sanitation, including women's and girls' menstrual hygiene. A small quantity of 3 – 5 litres per capita per day (lpcd) needs to be safe enough for drinking. Safe drinking water and hygiene is especially important during infants' first 1000 days and for under-fives to avoid diarrhoea, dehydration and weak food absorption, which aggravates malnutrition. Proper sanitation facilities are especially important for women; school facilities prevent girls from dropping out. Girls' schooling fosters later marriage ages and lesser dependency on many children for even a bare minimum old-age provision. Healthier babies further overcome intergenerational poverty. Washing of utensils, laundry and cleaning of homes provide hygienic shelter.

Further, clean energy depends on water, either as local level biogas or as local or distant larger-scale hydropower generation. Clean energy not only alleviates the burdens of fire wood collection (which takes girls to spend 18 hours a week on average, compared to five hours a week for households with clean fuel (UN CSW 2017). Clean fuels also prevent kitchen smoke and the respiratory illnesses that currently cause almost half a million of women's deaths each year. Half a million children under five die each year from pneumonia caused by exposure to air pollution in what should be 'safe' homes (WHO undated).

Health also depends on water for cooking and on nutritious, protein-rich and diversified diets, either grown for own consumption or bought. Water for crops and vegetables production, livestock rearing, aquaculture or fisheries and wild life provides such diets and generates income from sale. Improved access year-round buffers against dry spells; increases yields and better guarantees returns on expensive seeds, fertilizers and other inputs; and enables year-round cultivation, also in the lean season and ensures food availability in the hunger season.

Income is also gained from water-dependent crafts, small-scale enterprises like food preparation in small restaurants, butchery, or hair dressing. Income, at its turn, allows the purchase of food, other basic commodities, access to health services and payment of school fees. In addition, water enables navigation and recreation, and, as mentioned, is cherished for its cultural and ceremonial meanings.

The intersections between gender and poverty are also significant in the hazards that natural water endowments bring, which will even further increase under climate change: unpredictable, severe droughts, floods and storms. Poor women tend to have the least means to absorb shocks. Floods and cyclones affect those who cannot afford to move to safer areas, and who are less mobile and informed. For example, in 1991, the cyclone in Bangladesh killed 140,000 people. Within the age group 20-44, the female death rate was 71 per 1000, compared to 15 per 1000 for men (Mushtaque 1993, cited in UN Women 2016). Also, more than 70 percent of the fatalities from the 2004 tsunami in Sri Lanka and Indonesia were women (UN ESCAP 2013, cited in UN Women 2016). Similarly, of those killed by Cyclone Nargis in Myanmar in 2008, 61 percent were women and girls. In some severely affected villages, the death rate of those aged 18 to 60 for women was double that of men (Myanmar Government, ASEAN & UN 2008, cited in UN Women 2016).

Water borne or water transmitted poverty diseases, such as bilharzia and malaria, depend on activity patterns and may be worse for men. For example, boys suffer more bilharzia (schistosomiasis) than girls because their gender roles as herders bring them more often into contact with water supplies contaminated with the parasite (UN Women 2016). Men also risk to drown more often than women (Das 2017). Yet, responsibilities to take care of the sick and their higher water needs, fall disproportionately on women.

### [‘Housewivization’ and sustainable agricultural and economic growth in Sub-Saharan Africa and Asia](#)

Water is embedded in household-level relations governing domestic and productive labour and resource rights, which, at their turn, are shaped by, and shape community- and higher-level up to global-level events and trends. In a rapidly changing world with unprecedented communication channels, rural women’s and girls’ aspirations are highly diverse. In particular, an agrarian transition may offer better employment in manufacturing, industries and services and pull men and women to urbanization. But growth can also stagnate and lead to distress migration of men and women. Urban-rural linkages for food security and through remittances remain strong, whether seasonal or permanent rural-rural and rural-urban migration and intra- and intercontinental migration. Women whose husbands have migrated not only lack family labour power but also have less or no access to land, water and other resources that their husbands had. For women to step into these spaces and to

take up decision-making appears tall order and creates much stress, as documented in Nepal (Sugden et al 2014).

Although any generalization in such diverse contexts is problematic, some broad differences between Sub-Saharan Africa and South Asia are worth mentioning. These are the areas where the large majority of poor households live. On the one hand, Sub-Saharan Africa has an even stronger 'youth bulge', in which 60 percent of the people are below 25 years of age. In spite of urbanization, population growth is faster in rural areas than in urban areas. Landlessness is growing. Patterns of growth are capital- rather than labor intensive, extractive, and export oriented, as reflected in the recent wave of large-scale land acquisitions for agriculture (which are not about land, but about fertile and well-watered land) (Franco et al 2013). Unlike the agrarian transition elsewhere, urbanization in most of Africa has been driven by mechanized extractive exports that hardly created employment. The manufacturing and industries remain a small percentage of GDP.

At the same time, in many parts of Sub-Saharan Africa, rural women's marginalization through the 'housewivization' (or 'domestication') (Rogers 1981) is historically less deep than in South Asia – and in many high-income countries that continue to define development aid and contribute to global debates. The ancient process of gender and class differentiation around agrarian technology development, continues to have impacts, as Boserup (1970) explored and others keep confirming (Alesina et al 2013). This is the finding that, in ancient South Asia and Europe, male elite invented and monopolized the agrarian technology of the plough as power over both their female kin and poorer women and men. Gradually, their sisters', wives' and daughters' rights to land and other natural resources eroded by relegating them to 'housewives' responsible for caring for men and their offspring. A land-poor and landless class arose in which production by both women and men was necessary for mere survival. However, poorer women gradually were also denied rights to resources and technologies and became disproportionately responsible for the unpaid chores. Even today in India, strict taboos for women to touch the plough persist (Agarwal 1994), although women's organizations such as the Self-Employed Women's Association break these norms.

However, in sub-Saharan Africa, soils and crops are less fit for ploughing. Both women and men use the hoe; limited mechanization perpetuates low productivity. Even today, Palacios-Lopez et al (2015) found that, on top of domestic chores, women provide even more labor in cropping than men in Malawi, Tanzania, Uganda, and South Nigeria. Labor contributions to cropping are lower in North Nigeria (32 percent) and Niger (24 percent) where Arabic influences are strong. In Ethiopia, women perform 29 percent of the labour. Ethiopia is one of the exceptions, where the plough is suitable for soils and crops, and has been adopted. Here women can hold a land certificate or are informally acknowledged to control land. However, even then, social norms dictate that they cannot plough the land themselves (UN Women 2015). Across the continent, labor contributions were found to be higher in female-headed households and when women owned the land. This raises a historic question at the intersection of poverty and gender: can Sub-Saharan Africa follow a pattern of agricultural growth as engine for broad based economic growth that avoids the housewivization of other continents? As discussed next, rights to water are about water infrastructure. This raises another unique question: can gender equality to improve access to water for domestic and productive uses in Sub-Saharan Africa drive such inclusive rural growth?



### 3. Infrastructure channels people's rights to water

#### Hydraulic property rights creation

This section seeks to open what often remains a black box in unravelling links between society and water resources: the nature of water resources and role of infrastructure. Natural surface and groundwater resources are fugitive and highly variable over the seasons and over the years, depending on the climate variability of the global hydrological cycle of fresh water evaporation, precipitation and (de-)freezing. Increasing temperatures as a result of greenhouse gases will increasingly affect the global hydrological cycle and exacerbate extreme events of drought, floods and storms. In spite of both existing indigenous and rapidly improving modern weather predictions and early warning systems, precipitation remains unpredictable and risky. Women without access to that information are most vulnerable.

In order to use water and derive the benefits from water, people need water in the appropriate quantity, of the appropriate quality and at the appropriate site and moment. They access water either by 'moving to the water', for example through permanent settlement patterns, or long-term pastoralist transhumance, or seasonal flood recession farming. Or people 'move water to the site of use'. Carrying water comes at excessive labour costs. Only basic quantities for basic needs at home are carried; for laundry or livestock watering women move to the water sources. As soon as affordable means become available, investments are made in infrastructure, operation and maintenance to store and convey water to the site of use. Types and scales of technologies to abstract, store and convey surface water widely vary: soil moisture retention, spring development, dams, ponds, river diversions, canals, pipes, or petrol, electric or – increasingly- solar pumps. The same holds for the lifting of groundwater (which already is year-round storage). Wells are dug or boreholes installed. Manual or mechanized pumps lift water. Increasingly, wells also serve to recharge aquifers in the rainy season. Water quality is also improved by technologies, such as filters. The costs of the operation of infrastructure mainly depends on the energy costs. Gravity is for free; diesel for lifting is increasingly expensive. Rural electrification, in particular through solar power, to operate pumping opens up new opportunities to create infrastructure rights. Thus, infrastructure alleviates labour burdens and improves water control for human use and benefits.

Lack of the technical, financial and institutional means to move water to the site of use leads to 'economic water scarcity': water resources are available, but cannot be harnessed, stored and conveyed. (Entitlements to access and abstract or divert natural water resources through infrastructure are discussed in section 8. In the dry season, competition among all the infrastructure users who tapped into those resources is bound to emerge. Once all naturally available water resources have been harvested and stored by others, there is 'physical water scarcity': no 'uncommitted' water is left for development, unless existing water users give up some of their prior uses).

Importantly, claims to water stored and conveyed by infrastructure in the desired quantity and quality at the desired site of use at the desired moment (or 'infrastructure water rights') are primarily created through the labour, technical, institutional, and financial investments in the construction, operation and continuous maintenance of the infrastructure that makes water available. This process of creating infrastructure water rights is called 'hydraulic property rights creation' (Coward 1986). So 'property of water' is closely related to the ownership of the infrastructure. As for land and other resources, there

is a bundle of rights, including rights of access, withdrawal, management, exclusion, and alienation (Meinzen-Dick et al 2017). Rights to the ultimate benefits or ‘fructus rights’ (Theis et al 2017) also depend on other inputs for that benefit (such as land tenure or access to markets and control over income) and the broader gender and social relationships under which investments in infrastructure are made. For example, water for drinking is hardly ever denied to someone, even to strangers. However, it may require that specific castes take out the water to give, as found in Nepal (Leder et al 2017). When water is abundant, for example in a farmer-initiated gravity canal, the initiator may allow smallholders with land along the canal to also use water from the canal. This would enhance his social prestige.

### Land and water

Land and water are intrinsically linked (Hodgson 2004; GWP 2014). This underlines the importance of linking efforts to improve women’s land rights with improving women’s water infrastructure rights. Naturally available water resources are location-specific. Access to streams and other water sources requires a right of passage over others’ riparian strips. This can be denied to women, as reported in Kenya (Onyango et al 2007).

New infrastructure requires land both to store surface water and to channel water. This displaces existing land users. In large-scale infrastructure projects by the state or corporate sector displace, the poor and marginalized, in particular women, have least power to challenge such displacements or negotiate proper compensation. Thus, in the past an estimated 40 to 80 million people have been forcibly displaced by dam construction globally. Large-scale land acquisitions for agriculture, which are not about land, but about fertile land and water resources (and mineral resources), are often ‘land and water grabs’.

As mentioned, those with more land can use more water and increase the benefits. Land tenure also affects incentives for investments in water infrastructure. Short-term land tenure security may impede land users to invest in infrastructure, or they may prefer mobile infrastructure, such as portable pumps in areas where (land-bound) wells are cheap. On the other hand, investments in land productivity may strengthen claims.

### Categories of infrastructure investors: self-supply, service and state

Gender and poverty processes are embedded of the processes in which investments in water infrastructure are made. We distinguish three categories of investors. The first category are water users themselves, who invest in infrastructure for self-supply. Agrarian societies have made such investments since time immemorial, either at household level (for example by digging household wells) or collectively as groups (in gravity flow schemes or scattered water points by widespread pastoral communities). These investments have continued ever since. They are typically informal and often outside the ambit of the state. Investments have even become more dynamic in the last decades. The gender implications of these individual or collective investments in small-scale technologies, and the role of the state as duty bearer of human rights, are discussed in section 4.

In the corporate sector, large-scale and high-impact water users may also invest in infrastructure for self-supply for their companies: mines, industries, the food and beverage industries and other agribusiness investing in large-scale land deals with related water resources. Companies may provide

employment, but their land and water requirements, even just to bottle and sell elsewhere, is often not more than a 'land and water grab' at the expense of prior and future land and water users who risk losing their access to land and water resources forever; the gender dimensions of this competition for *resources* is discussed in section 8.

The second category consists of specialized private water service providers who invest in infrastructure to generate water supplies for clients. Service providers can be small-scale informal water vendors in low-income urban areas. A blend between investments for small-scale self-supply and service provision is the sharing of and sale of excess water not needed for self-supply. Household borehole owners allow their neighbours to abstract water from their borehole for their domestic uses for free, or for money to compensate the costs of infrastructure and operation, or to extract a rent. In irrigated areas, dynamic water markets have evolved, in which pump owners sell excess water. Or they rent their pumps out temporarily. These blends of informal small-scale investments for self-supply and sale are included in the next section.

At the other end of this second category of investors for service provision, are the large profit-oriented corporate water companies in high-income areas for well-paying clients. The latter increasingly explore business options in middle- and low-income countries. This is mainly in urban areas, where companies may even refuse to implement the human right to water for clients that cannot provide for easy profits (Lappin 2017).

Last but not least, the state, in collaboration with non-state actors such as NGOs or national and international development banks, invest in infrastructure. In this way, the state realizes its duties to achieve gender equality and human rights to water. The scale of such public investments can range from small-scale municipal projects to big multi-country transboundary hydropower projects. States can either directly provide water as public agencies and through subsidized utilities and parastatals. However, neo-liberal policies reduce state subsidies, and require higher tariffs, which are often unaffordable for the poor and violate the human right to water.

In many cases, the state finances the capital costs of new construction or major rehabilitation efforts, while expecting the 'benefitting' water users to take care of operation costs and minor maintenance. In such case, the responsibilities (and their costs) are 'handed-over' to community-based water supply groups or Farmer or Water User Associations in 'Participatory Irrigation Management' or 'Irrigation Management Transfer'. When the state invests in infrastructure that remains owned by the state, but is supposed to be operated and maintained by the future users, the users may appear unable to do that, so the scheme functions sub-optimally or is abandoned altogether. The high dysfunctionality rates of public, externally financed infrastructure, whether designed for domestic uses or irrigation, show such 'hydraulic property rights extinction'. The strong male bias of both the WASH sub-sector and irrigation –subsector are addressed in sections 5 and 6, and the gender and poverty dimensions of decentralization in section 7.

Disaster management, including insurances against climate-related crop failure, is another key state function. Further, the state supports education and research to develop engineering, hydrology and water management knowledge. Lastly, the state is the regulator. Formal water legislation typically declares states as custodians of the nation's water resources and responsible for formal water legislation and other processes of water allocation, pollution prevention and other regulation in the

public interest and as duty bearer of women's human rights to water. However, current laws violate human rights to water and food (see section 8).

Across the 'water business' of the profit-oriented service providers and the neo-liberal state that seeks to privatize public services, contractors, consultancy and engineering firms benefit from outsourcing of the planning and technical design of investments. Given the costs and specialist, if not monopolist technical knowledge required, this field is prone to corruption and collusion of interests (WIN 2015). Gender staffing issues in this water business are beyond the scope of this paper.

## 4. Self-supply: empower rural women to (co-) invest in infrastructure

### Gender in local self-supply

In today's informal rural settings, most people depend on self-developed water sources for domestic uses, irrigation and other productive uses. Areas covered by farmer-led Investments in irrigation have surpassed areas of state irrigation schemes in Sub-Saharan Africa and even in India, in spite of its mega irrigation schemes (Woodhouse et al 2016; Van Koppen et al 2017). This recent growth and need to intensify was a response to population growth, and has been enabled, among other, by improved availability of appropriate affordable technologies, cheaper energy to operate (with electrification), new market development, or cash remittances from migrants.

In local water arrangements, communities are well aware of the many interconnected ways in which water brings livelihoods. When they invest in infrastructure for self-supply, they consider their multiple domestic and productive needs. Cost-effective multi-purpose infrastructure is the rule, certainly in or adjacent to residential areas. Investments in infrastructure for one single use is the exception, for example groundwater pumping in distant fields. The use and re-use of water resources is also holistic. Depending on seasons, water is taken from ever-changing combinations of surface water sources, run-off, ponds, wetlands, or groundwater. Local geo-hydrological knowledge and infrastructure to channel water and protect against floods are the most important way to strengthen resilience to climate variability and change in rural areas where agriculture remains the mainstay of livelihoods (Van Koppen et al 2014).

A second feature is that local investments also tend to be dominated by better-off men, certainly in more specialized jobs. The contributing factors are well-documented: women's smaller plots, weaker land rights, lesser capital or loans to invest, lesser information, lesser technical skills and training, and lesser mobility and acceptability to also frequent hardware stores and mechanized repair shops. With further mechanization and technical specialization, these disadvantages risk reinforcing each other.

Women's interest in infrastructure investments for self-supply is evident wherever they manage their own intra-household production sub-units of crops or vegetables, whether on own, joint or rented land. For example women in West Africa tend to cultivate wetlands as their own plots, either inherited from their mothers or given by their husbands' kin. Women control the produce. Women's management includes the construction of bunds, soil and water management and drains. Some husbands may not even know where their plots are situated. Traditional male land authorities may be refused to enter the plains, as that would 'cause inondations' (Van Koppen 2009).

In areas in Ghana and Zambia where irrigated horticulture is rapidly increasing, a few women were found to also purchase and use mechanized pumps. However, women were over-represented among those using labour-intensive bucket irrigation (Van Koppen et al 2013). Rental markets of mechanized pumps are particularly useful for women and poorer men who cannot afford to buy their own pump. Theis et al (2017) found how men in Ghana preferred their wives to take up irrigated agriculture in the dry season, as this would prevent them from leaving the area for farm wage work elsewhere and leaving the men with the household chores.

In the matrilineal and bilateral societies in Tanzania or Malawi (Peters 2010), which are part of the matrilineal belt in Southern Africa, women also proactively engage in the digging and maintenance of small gravity canals. There is no such taboo whatsoever that 'women should refrain from construction and maintenance work'; on the contrary, women are well aware that such continuing investments in infrastructure create their hydraulic property rights (Van der Grift 1991; TIP 1993).

However, even in matrilineal areas in Malawi and Tanzania, relatively wealthier men come forward more quickly than women to initiate, design and implement a new gravity canal. It seems that men prefer making such investments on own plots, as was also found for other investments in land in Malawi (Meinzen-Dick et al 2017). Specialization into 'bare-foot engineers' is also dominated by men. This male domination is 'justified' by a norm that it would be unfit from women to go high up in the mountains to access springs in snake-infested rocky bushes, and to construct intakes and canals in underpants. Non-specialist men would not do either. Male domination in water infrastructure for self-supply is reinforced by broader developments of mechanization for transport (car, motorbikes) and appliances. Fewer women enter hardware stores and repair workshops.

Generally speaking, this gender and class differentiation is less entrenched in most parts of Sub-Saharan Africa than in, for example, Ethiopia and in many parts of South Asia. In the latter regions, landlessness is deeper; the housewivization is more entrenched; women's contributions are confined to unpaid family labour and wage work; taboos for women are stronger and male monopolisation of agrarian technologies more difficult to challenge and overcome. Female headed households are a minority. The gender discrimination in accessing land, water infrastructure, and other resources and outright taboo to plough, leaves even women land owners little other choice than leasing out their land. With lesser bargaining power and often ending up with family members, the rental conditions are more disadvantageous.

A still largely unanswered question along the whole continuum and across the world is whether and how these intra-household negotiations evolve. Who takes the initiative? Do men initiators consult their wives or sisters, and what voice women have? What monetary and labour contributions do women make both to the investment in the construction, operation and maintenance of the water infrastructure, and to the new more productive and less unreliable water-dependent enterprises, for which ultimate benefits? Common planning of both women and men household members, as enabled in household methodologies (Bishop-Sambook and Wonani 2009; Farnworth 2012; Farnworth et al 2013) should guide state and NGO interventions towards gender equality in rural households' adoption and use of water infrastructure.

## Gender equality in public support to infrastructure investments for self-supply

Governments and developmental non-state actors and equipment sellers promote small-scale water users' investments in infrastructure for self-supply in various ways, but mainly targeted at men and, at best, a small portion of women. More appropriate and more affordable technologies (and their spare parts) are made available as public services or on the markets, such as small groundwater pumps, rope-and-washer pumps, manually drilled boreholes, stronger poly-pipes, cement intakes of earth canals, purification filters, and most recently solar pumps. Informal water markets and rental markets and informal water vendors are supported. Import restrictions and duties on imported equipment are waived. Financing facilities are fine-tuned to the relatively high amounts and long period of a few years before the investment costs can be repaid from the profits. After-care and training is provided. Energy costs are minimized, for example by rural electrification.

Only very few interventions specifically targeted women's groups or mixed-sex groups. In the 1990s various NGOs in Bangladesh started providing loans and technical support to enable the adoption of irrigation pumps exclusively by women's and mixed groups. Pumps both served to irrigate own land and to sell the excess water that the pump could provide to neighbours on a vibrant water market. Many women were either landless or hardly engaged in irrigation activities of their husband's farm, so the option of becoming water sellers suited women well. A study of 35 female and mixed-sex irrigation groups supported by five different NGOs and the Grameen Bank looked at the impact on women's economic, social, familial and personal status. An empowering NGO approach, the strength of female group management and the main aim of the irrigation enterprise (sale, rather than irrigating own fields) improved women's status most. However, even then, husbands tended to control the income from the enterprise. There was little impact in groups in which women were primarily intermediaries for loan taking. However, female-headed households benefitted in both cases. In all groups, pump operation itself was done by (young) men (Van Koppen and Mahmud 1996).

The question 'what happens after the adoption of water technologies?' (irrigation pumps, including solar pumps) was addressed in Ethiopia (Nigussie et al undated) and in a comparison that also included Ghana and Tanzania (Theis et al 2017). As in Bangladesh, most pumps had specifically been targeted to women, but others had been privately bought. Even if targeted to women, men took up the operation of the pumps according to their priorities. However, for women the location of the pump appeared important: women experienced to gain most benefits from the pump of located near the homestead where it served both domestic and productive uses, as this alleviated their domestic chores. These happened to be the solar pumps.

An example of public support that specifically targets its support to the poorest landless women to improve combined land and water rights is a project in Bihar and lowland Nepal. Here, public agencies supported agricultural collectives amongst small women-led groups of tenant farmers. The women jointly lease land and share labor and capital. Having one big, contiguous plot has allowed them to jointly obtain and operate an irrigation pump and achieve economies of scale, also with other mechanization. It has also improved their bargaining power with male landlords (Sugden, 2016). This model can be upscaled (Merrey et al forthcoming).

The importance of infrastructure for self-supply is also increasingly recognized in the WASH sub-sector (Sutton et al 2012). Similar support is provided. Self-dug household wells can be better covered and

lined, and lifting devices can be improved. Other appropriate technologies and their market-led supply chain are promoted; and financing facilities provided (Butterworth et al 2011). Again, significantly, households adopting self-supply holistically consider both domestic and productive water needs. A clear example is the widespread adoption of rope-and-washer pumps in Nicaragua (Alberts and van der Zee, 2003; Sutton et al 2012).

We now turn to the state in collaboration with non-state actors as investors in infrastructure. State administrations are structured according to single-uses, either domestic uses in the WASH sub-sector (section 5), or irrigation (section 6), with quite narrowly defined related livelihood benefits. The decentralization and community-driven planning in these water sub-sectors and general development programs raise the issues of rural women's procedural rights to equal participation (section 7).

## 5. WASH sub-sector: a human right to water infrastructure to homesteads for multiple uses

### The human right to water infrastructure services for domestic uses

In 2010, the United Nations (UN) General Assembly and the UN Human Rights Council adopted two resolutions that affirmed the recognition of the right to water for drinking, personal and other domestic uses and sanitation as a justiciable and enforceable human right derived from the right to an adequate standard of living (A/64/292; A/HRC/RES/18 in UN 2010a; UN 2010b). This milestone concerns a right to *water infrastructure services*. A vibrant WASH sub-sector lobbies for its implementation, also invoking the Sustainable Development Goal 6 on water. However, the issue of the affordability of the infrastructure services provided in an environment in which tariffs for social services keep increasing, remains a major concern. If too expensive, the poorest women and girls return to unimproved resources.

In the WASH sub-sector, women and girls are well visible as end-users and main beneficiaries. Out of the one hundred indicators on gender and water that the World Water Assessment Program derived from various past sources, 52 are relevant to domestic water uses. Only 22 are for productive water uses, mainly for irrigation. The other 26 indicators are about meaningful participation in decision-making and gender issues among professionals (Seager 2014). In the WASH sub-sector, women are primarily visible as unpaid housewives. The focus is on health impacts as a result of drinking, hygiene and sanitation; other domestic tasks such as cooking, cleaning and laundry that require water, tend to be seen as secondary goals. Women's productive water needs are ignored. The defeminisation of domestic chores is hardly addressed. Women's household chores may be not alleviated at all. For example, improved access to water may lead to men's higher water demands, including for luxury uses, in which case women have merely become better servants of their husbands (Narain 2014; Van Houweling 2015). Also, yard and house connections may reinforce women's spatial confinement to the homestead in regions where norms about such confinement are strong.

Instead of ignoring men's contributions within households, the WASH sub-sector should recognize and promote this. In practice, the care economy is shared to some extent. A study in 45 developing countries found that women and girls are responsible for water fetching in 64 percent of the cases. This implies that men and boys are still responsible in a significant one-third of the cases (Fletcher 2014). Boys carry water for domestic purposes as well, and men also do, especially when they have

bicycles, donkey carts, cars, or other means of transport. Men's responsibility for digging household wells is such a contribution, as well. Some studies on women's and men's prioritization of water services to homesteads find equal priorities (Gachenga 2015). However, studies on willingness to pay for improved services in urban areas found women's stronger willingness (Gebregziabher and Tadesse 2011). Hardly any study clarifies who in the household pays for water and how this determines the affordability of improved water services.

However, women's participation is rare in the planning and technical design, construction, operation and maintenance of communal schemes. It takes considerable effort to convince the (predominantly male) engineers of the need to include women in the management of new facilities after their hand-over to communities (Van Wijk-Sijbesma 1998; 2002). Yet, siting and lay-out determine accessibility and personal security. As women and girls are vulnerable to sexual harassment and violence, routes to water points must be the safest (Water and Sanitation Program 2010). Many studies underscore how better inclusion of women improves performance (Narayan 1995). However, participation in design, planning, operation and maintenance requires time. Women's time tends to remain unpaid, while men are paid scheme operators or technicians and entitled to training. Hence, the WWAP proposes to include paid or unpaid participation in decision-making as an indicator (Fletcher 2015; Seager 2014).

The importance of in-depth participation by future users is underlined by the WASH sub-sector's high rates of dysfunctionality of public systems designed for domestic uses; this can be more than half. One remedy to better align outside interventions with people's needs and priorities is to ensure more accountability in participatory planning processes. This also ensures that any existing local infrastructure for self-supply is recognized and serves as a basis for a next incremental step in communities' water situation.

### A human right to water to homesteads for multiple uses

Professionals' exclusive focus on health in the domestic sphere reflects a middle-class urban setting, instead of rural settings where women need water for productive uses as well. In reality, even though systems are designed for domestic uses only, they are used for multiple purposes. In sampled rural areas in Colombo, Senegal, and Kenya, Hall et al. (2014) found that 50 percent of households use water supplies designed for domestic uses for small-scale productive purposes as well. Another 20 percent found other water sources for productive water uses. These productive water uses occurred even at very low volumes of overall water use of about 20 liters per capita per day (lpcd)—the threshold that the World Health Organization identifies as the bare minimum for domestic uses (Hall et al. 2014). Studies in South Africa (Pérez de Mendiguren 2004) or Kenya found the same, also in peri-urban areas. The only situations in which systems designed for domestic uses are exclusively used for domestic uses only is under extreme water scarcity (Moriarty et al 2004).

Since the early 2000s, a new approach to water services, the multiple-use water services (MUS) approach, has evolved that builds on these universal observations. MUS is a participatory approach that take people's multiple water needs as starting point of planning and providing water services ([www.musgroup.net](http://www.musgroup.net)). In a 'domestic-plus' modality, the priority for domestic uses is maintained so the focus remains on the homestead as primary site of use. Instead of providing 25-50 litres per capita per day, the targeted service level is around 100 or 200 litres per capita per day to also enable



productive uses. Water can be from several sources. At low incremental costs, many more incremental livelihood benefits can be obtained. Renwick (2007) calculated that incremental costs to enable productive uses at homesteads can be fully repaid within six months to three years. Some 5 litres per capita per day need to be safe for drinking and cooking, for example through point-of-use treatment. In fact, it may be a waste of resources to provide high-quality water for toilet flushing, irrigation, or other uses that can do with lower quality of water.

For example, the NGO iDE in Nepal has pioneered this MUS approach to homesteads since the early 2000s. By now it has implemented 334 multiple-use systems, serving 60,500 people in 29 Districts. Further support includes the marketing of the produce through collection centres and plant diseases management (Mikhail and Yoder 2008; O'Hara and Clement forthcoming). Winrock International and Catholic Relief Services are other early promoters of MUS, also supported by USAID. The MUS approach is also part of the 2013–2018 USAID Water and Development Strategy (2013).

This MUS approach fits approaches that integrate nutrition and agriculture in 'nutrition-sensitive agriculture' and that integrate nutrition and WASH from a health perspective. Unicef, for example, expands drinking water and hygiene concerns to also include: nutrition, education, the prevention of food contamination as a result of agricultural practices, safe water to avoid infant diarrhoea and nutrition, and it adopts a multiple-use water services (MUS) approach (Unicef 2017). These linkages between women's empowerment, health, hygiene, and homestead production of nutritious food are plausible, but robust evidence based on clear impact pathways is still lacking (Spring 2014; Merrey and Langan 2014).

The intersecting rights to food and infrastructure rights to water for domestic uses warrant a new human right to water infrastructure services that also includes homestead-based productive water uses for basic livelihoods (Hall et al 2014; Van Koppen et al 2017). Such right recognizes women as producers, who tend to have a stronger say over production at homesteads compared to distant fields. Moreover, for land-poor and landless households, who are among the poorest, the homestead is the main, if not the only site to use water for livestock and basic productive activities. Also, it respects the priorities that women and the poor have shown to set: they prioritize basic productive uses even at basic service levels, and certainly at the luxury domestic uses to which middle-class urban citizens are entitled. A last argument is that the incremental costs of improved services can partly be paid from income generated by homestead-based production.

FAO (Nielsen et al 2006) and various international NGOs have promoted integrated food production at homesteads since long. However, less attention was paid to water provision and to a pro-active linking up with the WASH sub-sector to jointly provide water infrastructure services. In the conventional irrigation sub-sector, the focus is on distant fields, usually in communal schemes. The relatively small-scale uses at homesteads that reach everyone tend to be ignored, with few exceptions such as Nepal. So a human right to water for multiple uses at homesteads fills this gap in the irrigation sub-sector as well. This sub-sector is discussed next.

## 6. Irrigation sub-sector: reducing gender and social discrimination

### Public irrigation schemes

The history of irrigation schemes, constructed by rulers, is a history of vesting male privilege and often of destruction of existing investments for self-supply which were more gender equal. Irrigation development was taken up with great zeal for both territorial conquest and profit by European colonizers across Latin America (Vera Delgado 2017), South Asia (Zwarteveen 2008; 2017) and Sub-Saharan Africa (Van Koppen 2017b). The consistent promotion of the 'male head of the household' with 'women as housewives' underpinned that rights to newly irrigable land and water were exclusively vested in male elite and other male land owners. Through women's housewivization, men were entitled to exploit both the domestic and productive labor of their female kin. This divide-and-rule bribed local elite men into the new 'order' at the expense of their female kin, and even more of all other women and many poorer men (Van Koppen 2017b).

Post-colonial state bureaucracies pursued similar normative frameworks of masculinity of the water engineering profession, for long entirely consisting of men (Vera Delgado 2017; Zwartveen 2017). As elaborated further below, public resource allocation continued to be justified by the male breadwinner – women housewives ideology. The division between public productive and private domestic spheres was also reproduced in the silo-ed structuring of water infrastructure investments by, on the one hand the WASH sub-sectors, and on the other hand, the irrigation sub-sectors. Irrigation also tends to widen social gaps because it targets landed farmers, and those with more land get more water. Unlike the WASH sub-sector, which seeks to reach all households, monitoring indicators in the irrigation sub-sector only focus on the state of infrastructure and yield levels. Moreover, indigenous and rapidly evolving local water infrastructure investments and water sharing arrangements remain ignored or are even over-ridden, including the local more gender-equitable arrangements.

In new schemes that were accompanied by a new allocation of plots, the option for a redistributive and gender equal land reform has rarely been used, on the contrary. Land has typically been allocated to more powerful men as the male household head, also in areas in which women had strong land rights (Van Koppen 2009). In response towards more gender equality, joint or women's land titling have been debated since the 1990s, and sometimes applied. An example of the latter is the IFAD-supported Lowlands Agricultural Development Projects (LADEP) in the Gambia. Women are traditional rice growers. The project reclaimed tidal swampland. Women and other landless farmers provided labour against land titles. About 22,216 landless women farmers, who comprised 90 per cent of the total beneficiaries, became landowners; and yields increased. (IFAD 2007).

In Burkina Faso, a wetland improvement project learnt its lessons the hard way. It only allocated land to women as prior land title holders and plot managers in later wetland improvement schemes. The earlier schemes in which plots had been allocated to men had partially or fully failed because neither women nor men were interested in the new gendered production relations (Van Koppen 2009).

A second key gender issue in irrigation schemes, both schemes in which land has been re-allocated and schemes that equipped existing plots with irrigation infrastructure, regards the membership of irrigator organizations or Water User Associations. Formal membership criteria also continue to be male heads of households. Further, the land owners, including absent landowners, are prioritized over

tenants or sharecroppers. As a result, women irrigators may only be able to negotiate night turns in spite of the risks of harassment in areas where women are not supposed to go out in the night. Most women in male-headed households do not irrigate. This was found in irrigation schemes in Gujarat and Andhra Pradesh, in which women are over-represented in the labour-intensive jobs of transplanting, weeding and harvesting, while irrigation and technological activities and decision-making activities were done by men, even in half of the female-headed households (Van Koppen 2002). The minority of female-headed households were marginalized and forced to hire men. During the past decades, quota systems and explicit support to women leaders have gradually improved women's participation in committees.

Technical operation of the infrastructure and maintenance was also male-dominated. Women tended to be discouraged to perform construction labour for maintenance, so they were obliged to pay male labourers to avoid that their rights to water weakened. It is sometimes argued that women would require specially designed and more user-friendly technology. There are cases in which, for example, women's sanitation equipment needs to be different. However, in many cases women can equally open valves, switch on electric pumps or start petrol pumps. Lighter and more user-friendly equipment would be good for men too. In such cases, the emphasis on gender differences may strengthen male monopolisation of technology.

Closing the gender gaps in irrigation requires pro-active awareness raising and change and tools to that end. The 'Gender in Irrigation Learning and Improvement' (GILIT) tool is designed to facilitate diagnostic discussions about a core set of gender issues, including the benefits of irrigation, among farmers and irrigation managers (Lefore et al 2017). These not only raised authentic concerns but also incited participations to identify solutions. A major concern identified in both Malawi and Uzbekistan was the top-down design of the schemes, without any consultation of the farmers. Further, women irrigators in Uzbekistan complained that the scheme management entirely ignored water provision to homesteads, which was the main source of livelihoods in this scheme (Lefore et al 2017).

### Including more uses and users in irrigation

As for schemes designed for single domestic uses, water in irrigation schemes also appeared to be used for many non-irrigation uses. Moreover, these non-planned uses are often the major benefits that especially women, the landless or livestock keepers without irrigated plots derive from the scheme. Calculations identified high values of these non-planned domestic water uses, fisheries, livestock watering, and horticulture (Meinzen-Dick, 1997; Bakker et al., 1999; Renwick, 2001; van der Hoek et al 2002; Nguyen-Khoa et al., 2005; Renault et al 2008; 2013). Subsequently, and as part of the move towards multiple use water services (MUS), IFAD also adopted a MUS approach (IFAD 2007). FAO developed an 'irrigation-plus' methodology for the modernization of large-scale irrigation schemes: the Mapping Systems and Services for Multiple Uses Guidelines (MASSMUS) (Renault, 2013). This methodology has been applied in India, Vietnam, and China. Other irrigation institutions adopted similar MUS approaches.

Lastly, the operation and management of public irrigation schemes appeared costly, even for partial use. In India, in spite of large amounts of funding, command areas keep shrinking. More participatory planning and users' stronger involvement in operation and maintenance in Participatory Irrigation Management or Irrigation Management Transfer have widely been adopted to improve performance,

but results are mixed. Moreover, irrigation professionals also increasingly realized the vast scale of investments in self-supply for irrigation. As discussed above, such private investments through affordable technology development are increasingly supported, but women need to be better included.

So both sub-sectors are moving towards more holistic approaches across the water, health, nutrition and agricultural sub-sectors. Global trends towards decentralization gain momentum, and would, in theory, enable such more integrated, community-driven approaches. The WASH sub-sector has collaborated with local government since long. Irrigation specialists also move beyond the well-defined schemes under direct authority of national departments. Planning and decision-making shifts to local government, line agencies' extension workers, NGOs and women's grassroots movements and, at the most decentralized levels: women and men in their households. This is addressed in the last key message on water infrastructure.

## 7. Rural women's human rights to participation in decentralized planning of water infrastructure

### Meaningful decision-making in relevant bodies bottom-up and top-down

After decades of emphasis on indispensable numbers and target quotas of women, rights to participation are increasingly seen as a matter of women's *meaningful* participation. Participation in numbers to 'sit at the table' is a first step and provides information that women can discuss after formal meetings, and to some extent they can still channel their voices into decision-making processes. However, when it is inappropriate for women (or youth) to talk in front of husbands or fathers-and-mothers-in-law other processes, participation is hardly meaningful.

In 2015, the World Water Assessment Program's gender and water indicators recommended to include the quality of participation as indicator. The depth of both participation and impacts, well beyond numbers alone, is also raised by Meinzen-Dick et al (2017) who propose to differentiate between reaching women, benefiting women and empowering women as project's gender impacts.

The well-known differences in 'participation', which range from 'not having a say' to 'final authority' are illustrated in figure 1.

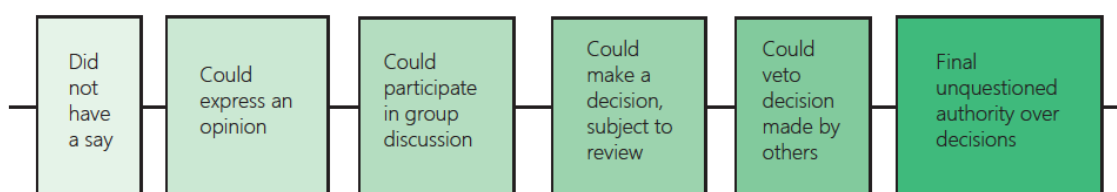


Figure: involving women in sanitation projects (UNDP 1990)

For creating rights to water through infrastructure, the most influential decisions are made in the planning and design phase of investments in infrastructure construction or rehabilitation; this creates the hydraulic property rights to the water conveyed. As indicated above, when investors are

households or groups of households, women's participation starts within the household. When users are customers of an informal or formal water service provider, as in urbanizing settings, decision-making is about choice of service provider, price or customer satisfaction. For investments by governments and NGOs who finance the infrastructure with the expectation that the future users will operate and manage, participation is about planning, technology choice, lay-out and other design issues of the scheme to be managed.

### Empowering women within households and communities

In all cases, a household approach as supported by IFAD and others is indispensable (Bishop-Sambook and Wonani 2009; Farnworth 2012; Farnworth et al 2013). This innovative bottom-up approach to joint intra-household awareness-raising, planning and decision-making mobilizes support within the family, in particular male kin, in the planning and implementation of family activities for long-term mutual benefit. Research in Nepal highlights the need to negotiate the consent of their husbands to take time away from domestic chores to progress in agriculture. The study also underlined the importance of mobilizing support by mothers-in-law (Leder et al 2017).

In the gender training that was developed with NGOs in India and Nepal, role plays were particularly insightful: by changing gender roles, men *experience* what it means to be a woman, and vice versa, (Leder et al 2017). These and other training tools help to reflect on gender norms, roles and relationships and to raise critical consciousness as basis for change (Clement and Karki 2017).

During a dialogue on Ubuntu in Gaborone 2017 both the vital role of women for survival in crises and their mutual support were highlighted. Ubuntu is reflected in grandmothers who take care of 34 children, both their own grandchildren who lost their parents because of HIV/AIDS, but also unknown children who faced the same fate. These and many other women, living in permanent crises, mention the crucial support to cope: 'then the women came'.

Women's grassroots organizations, such as SEWA, provide vital support, opening up water technologies to women, overcoming age-old gender norms.

### Community-driven planning at community-level

Water is unevenly accessed and distributed according to class, caste and other hierarchies. In India, for example, Dalits are often not allowed to use taps and wells located in non-Dalit areas. Here, Dalit women have to queue till the non-Dalits have finished. Those who can afford are the first to invest in own infrastructure.

As for many government and other public programs, a notorious risk is that the already wealthier minority reap the benefits. In projects designed and budgeted at higher levels, there are not many incentives for the factual implementers to try and reach, let alone empower women and other marginalized sections. Projects are bound to tight time frames to spend already allocated budgets, often with a strong emphasis on visible new infrastructure. Implementers avoid risks by working with known networks of earlier beneficiaries. Participation can be limited to informing communities about decisions already taken and to mobilization of labour to implement those decisions. In contrast, in genuine inclusive participatory planning, there is a planning phase first, and budgets are allocated to

the outcomes of the planning process. The poorest and women are explicitly targeted. Various participatory planning methods that seeks to overcome these constraints are developed, but those for water are still quite unique, for example, Nepal's Water Use Master Plan (WUMP) (Rautanen et al 2014; Van Koppen et al 2014).

In water infrastructure development, inclusive planning at community-level not only ensures non-discrimination and more equal access to water, but also avoids that those excluded are even negatively affected. Water abstraction by the one may directly and physically deprive downstream users or other users of the same aquifer. Intra-community norms about sharing water resources can also strengthen such exclusion. For example, Leder et al (2017) found in Nepal that Dalits could only access certain shared water points if the elite women of that area gave them the water. When these elite women got household connections in a project, they didn't come to those water points anymore, but the norm continued and Dalits lost their access to water.

Community-driven planning of water infrastructure has more advantages. It ensures that the multiple water sources, any existing infrastructure, and the multiple users and uses are holistically assessed and considered for a next incremental improvement. This taps existing assets and local knowledge (or 'water wisdom') and enables cost-efficient multi-purpose infrastructure. Obviously, perceptions and priorities differ, as confirmed in three-dimensional mapping with separate male, female and researchers' groups by Baker et al (2015). For example, in the men's maps, there was the complete absence of quarries or holy water sites. Men also mapped fewer springs and mills and focused more on grazing lands (for their livestock) and eucalyptus (for income generation). In contrast, women appeared to value soil fertility (for their farming). Interestingly, researchers were heavily focused on crops and farming systems, seeking answers to the food insecurity questions of their research (Merrey et al forthcoming).

These planning outcomes are the bottom-up inputs into decentralized planning with the range of relevant formal agencies and to hold these planners and service providers accountable (WIN 2016).

### Formalization in government structures and programmes

The challenges to align top-down financed public service delivery programs with bottom-up priorities are receiving much attention (World Bank, WIN). Without increased citizen oversight and accountability, governments may turn water provisioning over to contractors and other private service providers, while the capacity for local citizens to hold utilities accountable is weakened (World Bank 2004). Similarly, tools that have existed for long, such as the ex-ante Poverty Impact Assessment, are still hardly implemented (DAC/OECD 2007). In water infrastructure, interests of officials and politicians (who need funding for their campaigns) easily collude with those of contractors and engineering firms.

Integrating gender equality is even more challenging because of women's under-representation in formal structures. A 2010 study in 17 countries in the Asia-Pacific region found that the proportion of women elected representatives in rural councils varied between less than 1 per cent and 37 per cent, while the proportion of women chairs/heads of rural councils ranged from less than 1 per cent to 7 per cent.

Rules and monitoring of gender budgeting are acknowledged to be ‘key to enhance democracy, public participation and transparency’ (SADC 2015), and, ultimately to change budgets. SADC further defines: ‘the focus should not be on whether an equal amount is spent on women and men, but whether the spending is adequate to women’s and men’s needs’. Other definitions focus on activities that should clearly target women, such as FAO’s commitment for 30% of its funding. The CGIAR has defined that 10% of its budget should be specifically on gender issues.

The Tanzania Gender Networking Programme (TGNP), which works within a broad coalition of local NGOs (FemAct), has been a champion in this regard since 1993. It has employed strategies to influence national/sectoral policies, planning and budgetary processes for responding to practical and strategic women needs e.g. access to health services, water, reduction of violence, etc for their empowerment. Since 2005, TGNP has conducted gender-focused analyses of women’s access to safe water and water privatisation policies. They initiated a ‘bucket of women’s head’ campaign during the elections of 2005, and now expose the small budget share for water to only 4.8 percent (TGNP 2017), ([www.tgnp.org](http://www.tgnp.org); <http://www.womenforwater.org/tgnp-factsheet.html>; <http://tgnp.org/wp-content/uploads/2017/04/Why-water-budget-should-be-gender-sensitive.pdf> ).

### Water in participatory development, employment generation and social safety nets

The global move towards decentralization and participation is also reflected in a range of development programs, employment generation, social safety net, and climate adaptation programs. In such programs, improved access to water for domestic and productive uses may well come up as a priority, certainly when women have been consulted. The best example is the world’s largest rural water supply program. This is neither a WASH nor an irrigation program, but India’s National Rural Employment Guarantee Scheme. This scheme, which has been implemented nationwide through local government, provides minimum wage employment to over 50 million people each year. Significantly, women constitute 48 per cent of the beneficiaries. In Kerala, where the state government implements MGNREGS through Kudumbashree women’s organization, this percentage is 90 per cent. The scheme devolves decision-making about the choice of works to community councils, with the technical support of officers at village, block, and district levels. Assets prioritized in this manner include the digging and excavation of wells and ponds, pit-latrines digging, irrigation-canal rehabilitation, watershed management, groundwater recharge structures, forestry and plantations for soil conservation, land erosion prevention, river check dams, flood control, drainage in waterlogged areas, and gulley treatment. While most assets are communal, other investments are for individual assets of the marginalized Scheduled Castes and Tribes, such as pit latrines and irrigation, plantations, horticulture or other land development. In two-thirds of all projects, communities prioritized water and drought-proofing assets, amounting to a total value of US\$3 billion per year (Shah et al., 2010; Verma et al 2011). The more wage workers can define the assets they want to improve, the better economic development created as the long-term exit strategy to the wage’s workers’ poverty eradication.

Up to this point, this paper discussed key messages about water infrastructure. The main gender issue is to empower rural women to implement such technical solutions, either individually or jointly within households. Without such technologies, water flows by, or stays in the aquifer, and still remains inaccessible other than through direct uses of streams.



However, in certain arid and semi-arid areas, access infrastructure is not the only issue; the second issue is that other users have already taken and stored the water for themselves. Or, 'the basin is closing'. The last, but not least key message discusses the role of the state as duty bearers to concretize human rights in such situation of competition under physical scarcity of naturally available water resources. As mentioned, the issue of pollution prevention is not further discussed.

## 8. Defining a human right to water resources for livelihoods

The distribution of water resources tends to be highly unequal as water development tends to exacerbate already existing inequalities. For example, the Gini coefficient of the distribution of water use in South Africa is 0.99 (Cullis and Van Koppen 2008). Competition is strongest in the dry seasons and during droughts, and more permanently in closing basins or depleted groundwater aquifers. This means that any new water uptake implies that some prior water users have to give up their water use in a zero-sum game. In this competition for water resources, rural poor women for whom even small quantities are vital to survive, risk losing forever. Domestic water uses represent only a few percent of domestic water abstractions and are usually treated as negligible; the doubling or tripling of such volumes to also include basic productive water uses would still be only a small fraction of the total volumes of water abstracted for non-basic uses.

In more homogenous rural settings over shorter distances, conflicts over water and water sharing arrangements are often settled through the mediation of local leaders and local and district governments. Notions prevail that everyone should have a minimum for basic livelihoods and that only then some people can take more water. Games have been developed to raise awareness and find solutions. For example, the NGO Foundation for Ecological Security (FES) developed such games for groundwater overdraft in India. Upstream – downstream water conflicts were also simulated in a game and implemented in Tanzania and South Africa.

However, the rapidly growing foreign and national large-scale land acquisitions for agriculture have become a major threat. These land grabs are not about land but about fertile land and water and also entail a water grab (Franco et al 2013; Van Eeden et al 2016). If they are upstream or have the deeper pumps to access groundwater, they inevitably deprive prior users and any other future users, with women bearing the brunt (Behrman et al 2011). South Africa illustrates how the colonial, well-subsidized hydraulic mission by whites led to physical water scarcity in many parts of the country. In spite of post-1994 policy and legal intentions to redress these past inequities, in reality, the vested water users rapidly invested in infrastructure to harness the limited remaining available water resources, so even more historically disadvantaged individuals risk being deprived from opportunities to also invest in water infrastructure forever.

For mediation in such larger-scale conflicts, the top-down basin organizations that have been revitalized or established in the past decades, have stronger mandates than local and district government. However, they are easily captured by the more powerful water users, bypassing local and district governments that could defend the interests of the majority of water users.

Moreover, water legislation in most parts of Sub-Saharan Africa and Latin America and increasingly in Asia as well, violates human rights, including indigenous people's rights. This legislation of individual



permits (or licenses) was introduced by the colonial settlers. The laws were based on a massive colonial water grab in which ownership of water resources was vested in colonial rulers. Individual permits that were derived from that self-declared authority were only given to whites as superior water entitlements. Indigenous or local water arrangements were recognized but through indirect rule declared as second-class. At independence, ownership of water resources shifted to the new governments who then declared that all water users should get permits, either as individuals or – not further defined or existing – collectives. Without a permit, all water users are declared as illegal. For foreign and national administration-proficient large-scale formal water users, it is a simple submission of a form to obtain first-class entitlements. In some countries, they can even be sold once competition for water. Thus, widespread indigenous water arrangements are not only relegated to a second-class status but even criminalized (Van Koppen et al 2014). Unlike land tenure for which legal pluralism is entirely accepted, legal pluralism in water is still denied (Boelens et al 2005; Meinzen-Dick and Nkonya 2007). Moreover, as South Africa's National Water Resource Strategy – 2<sup>nd</sup> edition (DWS 2013) states: current permitting processes 'are often costly, very lengthy, bureaucratic and inaccessible to many South Africans'. Especially poor, female, remote small-scale water users with lesser access to the water bureaucracies lose out: their water uses are declared illegal but the state itself recognizes it cannot reach them. This is administrative injustice. For weaker governments with even a larger majority of small-scale informal users, this problem is worse.

In the search to decolonize water legislation, one option is to transform the legislation into a well-targeted regulatory tool for the few high-impact users to cap their water uses, raise taxes for relative over-use, and prevent their pollution in a public interest. Further, new investors in water uptake should ensure that all those potentially affected are timely informed and consent voluntarily, or negotiate compensation.

The other side of the coin is that water legislation needs to protect and encourage community-based water uses and arrangements as common property resources. Land legislation for indigenous communities that recognizes its related resources, such as forests and water, such as ILO's Indigenous and Tribal Peoples Convention 1989 (no. 169) are important commitments to invoke (RRI 2017). A human rights-based approach should both emphasize procedural rights and oblige states to guarantee water resources availability for both domestic uses and small-scale productive uses that contribute to realizing everybody's right to health, food and an adequate standard of living, or, in other words: a right to livelihoods. This is a similar commitment to 'reserve' certain volumes of water resources as for environmental flows. The human rights concept of a core minimum, or the SDG concept of a social floor, should be invoked to set such minimum of sufficient water for all. As an absolute minimum, this human right to water resources would guarantee water resource availability to implement the above-mentioned right to water infrastructure services for multiple uses to homesteads.

## 9. Conclusions

This paper's focus on gender and rural water infrastructure addresses the specific nature of water resources, also under climate change, and the role of the state as duty bearer to ensure that water development contributes to the intersecting rights to water, food, health, an adequate standard of living and procedural rights. This requires both women's access to and control over water infrastructure (for water infrastructure rights) and their entitlements to water resources (for water

resource rights). Water infrastructure development to access water and to protect against flooding is crucial in agrarian economies, especially for women who are the most water insecure. A more or less engrained gender inequality to overcome is the male monopolization of technologies in general, and water technology in particular, and, hence, over the water stored and conveyed by that water technology. In a household approach men's stronger contribution to holding states accountable for the provision of water for domestic purposes and his family's health and nutrition, defeminizes this care economy. Further, women are also producers and women's improved control over water infrastructure development enables to considerably improve women's labour and land productivity as well to realize the right to food. At the intersections between the already achieved human right to water infrastructure services for domestic uses and the right to food, water provision to homesteads for all, including the land-poor and landless, sick and disabled, should be extended to also include small-scale productive uses. The irrigation sector should finally accept rural women as farmers and allocate joint or women's land titles and membership of Water User Associations.

Last but not least, the growing competition for water resources, starting in the dry season, warrants states to protect indigenous uses of water linked to their lands and, at larger scales, the availability of water resources to meet basic human rights of all. Instead of the current trend to revive colonial permit systems that foster the privatization of water resources in favour of the few foreign and national large-scale investors under the land and water grabs, these laws need to be radically decolonized.

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