Women, Water, and Development

Isha Ray

Energy and Resources Group, University of California, Berkeley, California 94720; email: isharay@berkeley.edu

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Abstract

That women play a central role in the provision, management, and safeguarding of water is one of the four internationally accepted principles of water management. This principle is especially important for the developing world where millions of women lack access to water for their basic needs. The objectives of this chapter are to summarize what is known about women with respect to water and about water with respect to women as well as to provide a sense of the current debates around these themes. A review of the literature suggests that the lack of gender-disaggregated data on the impacts of water policies, and underlying disagreements on how gender and development should be theorized, makes it difficult to reach robust conclusions on which policies can best assure poor women reliable access to water for their lives and livelihoods.

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1. INTRODUCTION

The urgency of extending reliable and affordable access to drinking water to the 1.2 billion who lack such access, mostly in the developing world, is by now accepted and understood well beyond the world of water professionals. Less well understood is the need to extend irrigation services to the millions who practice subsistence farming on small plots of land, often 2 hectares or less, in semiarid conditions (1, 2). And even less is understood about the complex relationship of women's lives and access to water, even though the burden of providing households, and frequently family farms, with water falls disproportionately on women (3, 4). This review brings together the literatures on the dominant theoretical frameworks in which gender and development can broadly be understood; on what is known about women's access to and use of freshwater in the developing world; and on policies aimed at ensuring that low-income women have access to, and a measure of control over, sources of water for their domestic and livelihood needs. The objectives of this chapter are to summarize what is known about women with respect to water and water with respect to women as well as to give the reader a sense of the current debates and unanswered questions around these themes.

1.1. Why Study Women, Water, and Development?

By the mid-1970s it had become clear to scholars, practitioners, and advocates engaged in the field of economic development that development and modernization were affecting men and women in different ways. Rather than acting as a rising tide for all boats, the intended and unintended consequences of modernization were bypassing many women and even adversely affecting others (5). Overall the process of economic development was radically changing women's roles in the home and in society at large (6). At the same time, it was also seen that especially rural women spent long working days on diverse activities such as farming; agroprocessing; marketing; handicrafts; animal husbandry; collecting water, fuel, and fodder; and childcare, all of which contributed to the local economy and to development more broadly (3, 7). Women came to be recognized as key participants in efforts to alleviate poverty and achieve social transformation. The field of women and

development thus grew out of the recognition that international assistance to low-income countries, and national policies in these countries, had to be better directed toward "improving (women's) status and assisting the development effort" (8). Literally thousands of articles, policy documents, books, and dissertations have now been written on this topic. Water use and water management have been recognized in these literatures as central to sustainable development efforts as well as to women's domestic and economic activities.

In 1992 the International Conference on Water and the Environment held in Dublin, Ireland, produced four key principles to guide policies for water and sustainable development (**http://www.gwpforum.org/servlet/PSP?iNodeID=1345[0]N**). Known as the Dublin Principles, they represent the international consensus, albeit one that was reached after contentious discussions, on best practices in the water sector. They are as follows:

I. Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
II. Water development and management should be based on a participatory approach, involving users, planners, and policy makers at all levels.
III. Women play a central part in the provision, management and safeguarding of water.
IV. Water has an economic value in all its competing uses and should be recognized as an economic good.

In 2000, at the United Nations Millennium Summit, world leaders committed to a collaborative program of sustainable development, greater gender equality, and increased access to health and education through the Millennium Development Goals (MDGs). Greater access for women and men to water and sanitation is key to achieving each of the eight goals (4, p. 22–24), but of especial interest to this review are the following two:

Goal 3: Promote gender equality and empower women.

Goal 7: Ensure environmental sustainability, with a specific target to halve by 2015 the proportion of people without sustainable access to water and sanitation.

International agencies have thus made water for women a cornerstone of their development and humanitarian efforts (9), but much debate surrounds the nature and consequences of their policies. It may be worth noting that Dublin Principle III, unlike, for instance, Principles II and IV, simply states the centrality of women to water and of water to women. No specific actions or recommendations are embedded in its language. Influential gender-equity advocates argue that there is a positive synergy between women's interests and the management and conservation of natural resources (10, 11). However, critics counter that naively designed "women-centered" projects can merely add to the responsibilities of already overburdened women, without transforming the power imbalances that constrain their lives at home or in society (12, 13). So are water projects in which women play a central part likely to increase their workloads rather than their well-being? Is the participation of women in these projects either necessary or sufficient for project success or for higher levels of access for women? Can more secure access to water spill over into greater economic and decision-making power? This review concludes that we can answer these questions in a tentative manner at best. This is so in part because of the general disconnect between scholarship on water policy and scholarship on gender and also in part because the water sector is weak on the kinds of data we would need to get more definite answers.

1.2. Outline of the Chapter

The primary purpose of this chapter is to review and organize the diverse and somewhat uneven literature on women's access to and use of freshwater as well as to present some case studies on projects in the water sector that are

women centered or otherwise relevant to gender and access.[1] The women-and-water literature is largely made up of policy documents produced by international agencies that are rarely peer reviewed in the academic sense, and small-n case studies that are often, but not always, published in peer-reviewed journals. These documents are valuable on their own terms, but also need to be understood in light of the dominant framings of gender, environment, and development that (often implicitly) inform their assumptions, data collection, and conclusions. Specifically, these framings inform the evaluation of interventions aimed at increasing women's access and participation. Because the field of women and water integrates the broad fields of gender, environment, and development, Section 2 summarizes these frameworks with attention to their relevance to the water literature. In Section 3, we turn to models of the household, the primary locus of gendered decision making with respect to water use and priorities. This chapter will show that how the household is conceptualized determines both data collection and subsequent analyses of water sector interventions.

Moving on from these theoretical discussions, Section 4 reviews the empirical literature on women in the domestic water sector, and Section 5 reviews that on women and water use in the agricultural sector. The first part of each reviews the state of knowledge on women's access and the consequences of access or the lack thereof, and the terms and processes of access. The second part discusses selected case studies of gender and water with respect to participation, since participation in water management is both a major thrust of international policy as well as a topic of intense debate. The cases and their possible implications are presented with some caution, because it is sometimes hard to distinguish the features of a case from its "lessons" and because examples of "success" are often written up with a robust optimism that prevents detailed examination of failures along the way. The highlighted cases are from South Asia and sub-Saharan Africa, homes to the largest numbers in absolute poverty and lacking access to the most basic amenities (14, table 5). For reasons of space and scope, Sections 4 and 5 do not include sanitation, fisheries, or aquatic ecosystems, although these are also important sites of the gender-water interface. Section 6 reviews the literature on the potentially gendered consequences of two global trends in the water sector—cost recovery and multiple use. Finally, Section 7 concludes with a brief discussion of recurrent tensions in the water and gender literature and with suggestions for future data collection and collaborative research.

2. WOMEN, GENDER, AND DEVELOPMENT

In order to integrate the gendered nature of social, economic, and political processes into development theories, three broad frameworks were proposed over the 1970s and the 1980s. Although the third, gender and development, has become the mainstream position of most academics as well as donors concerned with development, all three versions can be found in research and policy documents on women and development. The way in which the role of women within development is conceptualized determines, often implicitly rather than explicitly, why access to water is considered important and in which ways access should be sought. The rest of this section is drawn from several peer-reviewed papers (7, 13, 15–17) and the gender policy position papers of the World Bank and the Food and Agricultural Organization (3, 18, 19).

In the 1970s, the term "women in development" (WID) came to stand for the argument that economic development was leaving women out because they lacked the access, or

[1] It may be useful to distinguish scholarship related to gender from feminist scholarship. Feminist theories are not necessarily reflected in empirically based research on gender and environment or development.

were not allowed access, to the very resources that made development possible. These resources included healthcare, education, voting rights, employment opportunities, credit, and also basic services such as water and sanitation. Women, it was argued, had to be integrated into the development process (20). WID was subsequently critiqued because its focus on access to the tools of development ignored the complexities of gender relations in different societies, and because emphasizing the importance of women's access for development emphasized the instrumental over the intrinsic value of such access. Over the next two decades, the mainstream position on this issue moved from "women" to "gender" and from "in" to "and," i.e., gender and development. Nevertheless WID-style arguments appear frequently in the water literature, for example, arguing for easier access to water because women can use their freed up time to generate more income for their families.

In the early 1980s, an influential group of feminist scholars attacked the WID approach for assuming that being left out of development was the problem when it was the very process of development that marginalized women. The women, environment, and development (WED) proponents' core premise was that there was a special relationship between women and natural resources because they use them most and know them best. This "ecofeminist" perspective saw analogies between the marginalization of women and the marginalization of the environment, arguing that the dominant and male forces of development were responsible for both (e.g., 10, 21). The WED position had two related strands. The first argued that women, especially poor women, were victims of a development process that was destroying the environmental resource base. The second argued that women were the natural defenders of land, trees, and water and could use these efficiently and sustainably if given the chance to do so. WED was, and continues to be, heavily criticized for universalizing women's natures. Soft versions of WED, however, continue to inform gender and resource positions at both multilateral organizations and more local nongovernmental organizations (NGOs).

Starting from the mid-1980s, gender has been mainstreamed[2] into the literature on resources and on development as well as into the policy documents of international agencies, through the framework of gender and development (GAD). GAD challenges general assumptions about what women need, and emphasizes the importance of understanding gender relations, which are dynamic, in order to understand, for example, how women use water. Gender equality is understood to be contextual rather than rigidly defined. Furthermore, GAD argues that women and men have interests in addition to their gendered interests, such as those associated with ethnic or class identities. Rather than assume that women are naturally sustainable users of resources, GAD asks why women have historically developed these relationships. Rather than assume that access to credit will enable women to irrigate their land, GAD asks what are the common and conflicting interests that men and women have over that land. As Jackson (13) says, that which WID assumes, GAD problematizes. GAD is explicitly the gender position of the World Bank, the Asian Development Bank, and the United Nations Organization members. However, donor policies on the ground often seem to reflect the other two frameworks because the refusal of GAD to make simplifying assumptions makes policy prescriptions problematic.

3. MODELING THE HOUSEHOLD

The most basic social unit in which resources are allocated and decisions about water use

[2] Gender "mainstreaming" refers to the understanding that gender is not its own topic of interest within, e.g., water management or development, but is "an integral component of every aspect of the economic, social, daily and private lives of individuals and societies" (19) and should thus be integrated into every part of a research or intervention project.

are made is the household. It is sometimes surprising to scholars unfamiliar with developing countries that enumerating households is not a straightforward task. Rural as well as urban households in Asia and Africa may consist of one nuclear family or several, with a common kitchen or not. Thus if a municipality defines the lifeline volume of water by household, as many do for South Africa's Free Basic Water Policy, low-income households could easily use up more than the allocated 6 kiloliters a month (22). Moreover, even in a nuclear household, the household as such makes no decisions—individuals do. These realizations have led to a rich literature in anthropology, economics, and gender studies on the nature and structure of household allocations with respect to food, money, and time (23, 24). The way in which research or practice constructs the household determines the data collected, the level of disaggregation of those data, and the interpretation of gender equality in water projects.

3.1. Unitary and Collective Household Models

The traditional model of the household is unitary—a single decision-making unit that is led by a benevolent dictator, or that takes account of the needs and wants of each member either as part of an explicit calculation or "as if" so (e.g., 25). In these frameworks, there is frequently (though not always) an assumption that household well-being is maximized within the constraints of a single household budget—thus equating individual well-being with that of the household to which the individual belongs. In the unitary model, there is no need to disaggregate the household's utility function into its gender-specific components.

The conceptualization of the household as a single decision-making unit has been criticized on theoretical and on empirical grounds. Researchers have started modeling the household as a negotiated unit, often as a bargaining game, in which the adult members have separate utility functions but also common interests (26, 27). Household allocation approaches that are not based on specific bargaining frameworks have also been developed (28, 29). These analyses are in the process of being extended and refined, for example, to take account of extrafamilial factors that influence the intrafamilial balance of power, and the role of social norms and perceptions (30). Overall, collective approaches to the household start from the premise that male and female members may not have joint utility functions because they may have different ideas of what constitutes personal as well as household well-being.

3.2. Unitary versus Collective Models

The unitary model has the advantage of parsimony, but much evidence points to the collectively negotiated approach as the more realistic framework. In 1995, five economists (all men) argued in an influential paper that, in the face of overwhelming field evidence, the collective rather than the unitary framework should be the default one for analysis of the household (31). For water supply or management policies, the working assumption of what constitutes the household is central to our understanding of the gender impacts of these policies. Several international agencies, without explicitly engaging competing frameworks of the household, recognize the need for gender-sensitive policies (9, 19) and no longer assume that poverty reduction or better access to water at the household level automatically ensures the greater well-being of women.

In practice, however, the household is still the dominant unit of intervention and analysis in the water sector. Research on household water demand or willingness to pay for water, for example, rarely disaggregates demand or willingness by gender (e.g., 32–34). Community- and participation-based studies in both water and sanitation are usually inclusive of women's perspectives (e.g., 35). But this can sometimes amount to equating women's well-being with household well-being and

gender with women (17)—a position that the collective approach to the household, and the GAD framework discussed above, explicitly reject. Many irrigation management studies, even now, treat the farm household as unitary. Large water sector studies such as global-scale assessments or models are also largely silent on gender (e.g., 36). With few exceptions, therefore, researchers on irrigation interventions or cross-country comparisons do not collect, or perhaps do not report, gender-specific data, and so the reader cannot infer gender-specific information.

The tension between the unitary and the collective constructs of the household has many reasons. Even if the collective version has become the norm for academic research, national and even international policy is often implemented in line with conventional wisdom rather than research insights (37). The work of Amartya Sen (38) on what he calls "cooperative conflicts" within the household points out that it is a delicate matter to deconstruct the household when pressures, perceptions, and norms could all work together to make male-female asymmetries appear entirely natural. Hart (39) finds that the negotiated model is inherently more politicized and therefore can be resisted both at the research and the implementation levels. The point here is that the empirical and especially policy-oriented literatures on women and water have models of the household embedded in them, and it is necessary to uncover these embedded models in reading the literature on access to water.

4. WOMEN AND WATER FOR DOMESTIC USE

About 1.2 billion people lack access to the minimum quantity of water needed for basic health and hygiene, and this number is almost certainly an underestimate. Throughout the developing world, the task of providing domestic water is a female one. Thus the health consequences of lack of access to water and of transporting water on a daily basis, and the policy frameworks in which access can be improved, are of particular relevance to women and development.

4.1. Access

Access to the minimum quantity of water necessary for domestic use, usually meaning that for drinking, cooking, washing utensils, and basic hygiene, can be defined in many ways. The UNICEF/World Health Organization Joint Monitoring Program (JMP), the main source of national level data on access, defines reasonable access as 20 liters per person per day from an improved source, no more than 1 km distant from the dwelling (36). *Improved sources* are household taps, public standpipes, boreholes, protected dug wells, protected springs, and collected rainwater. *Unimproved water sources* according to the JMP are unprotected wells; unprotected springs, rivers, or ponds; vendor-provided water; and bottled water.[3] The data are compiled primarily from reports received from participating countries, but since 2000, these have been supplemented where possible by household-level surveys and calibrated using other regional studies. The unit of analysis for data collection is the household, although the data are reported as per person. Gleick cautions that these data should be used for cross-country comparisons with a degree of skepticism because there are major disparities in data collection capacity and accuracy across regions (40).

Current JMP estimates are that 85% of the population has access in Latin America and the Caribbean, 81% in Asia, and 62% in Africa (**Table 1**). Globally, approximately 65% of the population without access to safe water lives in Asia and 28% in Africa. Even though these access numbers do not directly translate to those of access for women, they are reasonable proxies because it is almost always women and children who are responsible

[3] Bottled water is explicitly recognized as an "unimproved" source because it is considered too expensive to be the primary source of drinking water for most people.

Table 1 Access to drinking water by region[a]

Region	Area within region	Percent of population with access
Latin America and Caribbean	Overall	85
	Urban	93
	Rural	62
Asia	Overall	81
	Urban	93
	Rural	75
Africa	Overall	62
	Urban	85
	Rural	47

[a]Adapted from Reference 36.

for the daily provision of domestic water. The Gender and Water Alliance further claims that gender development indices can be used as indicators of overall water supply development because of the positive correlation between low achievement along the Gender Development Index (GDI) and low water coverage (41). For example, putting together data collected by the JMP and the Human Development Report, it can be seen that eight of the ten countries in Africa with less than 50% of overall population served (Burkina Faso, Chad, Democratic Republic of Congo, Eritrea, Ethiopia, Madagascar, Mauritania, and Rwanda) all scored higher than 120 on the GDI out of 146 countries ranked.[4] However it is not clear what can be inferred from this particular correlation given that these countries suffer from a host of problems such as low per capita incomes, low literacy levels, and internal conflicts.

Lack of access to an improved water source, or even difficult or unreliable conditions of access, translates to what the 2006 UN Human Development Report (4) has called "time poverty" for women and children. The report cites studies that found households in rural Uganda that spent almost 2 h/day collecting water (4) and parts of rural Benin where young girls spent 1 h/day on this task (42). Overall, it is estimated that some 40 billion mostly woman-hours per year are spent fetching water in sub-Saharan Africa (43, p. 19). An estimate of the value of the time spent collecting water from wells versus more accessible kiosks in rural Kenya suggested that women placed high values on the opportunity cost of their time (44).

Estimates from South Asia are quite similar. NGOs working in rural India report that women in many villages find themselves walking 2 km or more to their drinking water source (45). Time-allocation studies have found that women in the Konkan region of Maharashtra spent nearly 2 h/day fetching and storing water (46) and that, in the dry season, women in the state of Gujarat had to walk 3–4 h/day in order to secure the daily domestic supply (47). The same study from Gujarat also presented evidence that when access to water improved, the women devoted more time to income-generating microenterprises. Similarly, an econometric study of time allocation in rural Pakistan found that 15% of an average woman's monthly work effort went to collecting water and that more accessible water infrastructure would allow some substitution of income-generating activities for water collection (48). It has, however, been argued that the implication in many time-allocation studies, which is that women would necessarily use time freed up from collecting water in income-generating activities, is based more on WID-like assumptions than on broad-based evidence. Freed up time is used for income generation if such opportunities exist and if women are able and willing to use them. Some researchers have made the case that easier access to water is desirable not just for economic reasons but for overall quality of life, regardless of how the extra time is spent (42, 49).

Urban and periurban areas in the developing world may have household connections or standpipe water within a short distance of the home. In such cases, women and children would not have to walk long distances,

[4]A high GDI rank indicates low levels of gender development.

but waiting in line takes time. In survey data from across India, 21% of urban households reported spending 20 min or more to get to the water source to which waiting time and the return journey have to be added (50). In densely populated slums such as Kibera, Kenya, waiting times at water kiosks of 1–2 h have been reported, and slums in Dhaka, Bangladesh, could have a standpipe-to-person ratio of 1:500 (51). As in rural areas, most of the fetching and waiting in urban areas fall upon women and girls.

Although the disproportionate burden that water provision imposes on women is well documented in the water and development literature, the opportunity cost of girls' time is less studied. The 2006 Human Development Report concludes, mostly on the basis of African case studies and interviews in the course of producing the report, that there is a "straight trade-off between time spent in school and time spent collecting water" and that this is much less true for boys than it is for girls (4, p. 47). This is an area where more research must be conducted. If confirmed by further research, the lack of reliable access to water and sanitation could be a major contributor to continuing gender inequality in education and the opportunities that education can provide.

4.2. Health

Even households with access to what the JMP calls an improved source might not actually be getting water that is safe to drink. Sources of surface as well as ground water are increasingly contaminated from human and animal waste, agricultural runoff, chemicals such as fluorine or arsenic, and industrial effluents (52). Few municipalities in the developing world provide potable quality water in their pipelines, and few rural water supply agencies systematically test wells for water quality or treat poor-quality water even to a secondary level (53). The most deadly health cost of waterborne diseases is the 1.8 million lives of children under age five that diarrhea claims every year (36). In addition, the suffering caused by sickness and disability from waterborne, water-washed and water-related diseases, such as intestinal helminths, periodic episodes of cholera, blinding trachoma, and schistosomiasis is amply documented in the public health and epidemiological literatures (e.g., 54, 55). The benefits to health and well-being from better-quality drinking water for the urban and rural poor (e.g., 56) and the potential for low-cost technologies to alleviate water quality problems (e.g., 57) are also well known—at least to the broader water and health community. But much less attention has been paid to the health risks that women face as water carriers.

Women and (usually) girl children fetch water in pots, buckets, or ideally more modern narrow-necked containers, which are carried either on the head or on the hips. A family of five within 1 km of an improved water source would need 100 liters of water a day to meet its minimum needs. The weight of that water is 100 kg (220 pounds) without the container. Plastic is the lightest material for carrying the water; traditional clay pots are much heavier. In these circumstances, women and children may need to walk to the water source two or three times daily, with the first of these trips taking place at around 5 A.M. (45). Globally, more than 50% of poor women suffer malnutrition and iron deficiency (23), and thus it should not be surprising that, especially during the dry season in rural India and Africa, 30% or more of a woman's daily energy intake is spent just in fetching water (58, 59). When several trips are not possible, rural and periurban families make do with 10 liters or less per person per day, even if they live within 1 km of an improved source, and thus have "access." Carrying heavy loads over long periods of time causes cumulative damage to the spine, the neck muscles, and the lower back, leading to the early ageing of the vertebral column (60). Symptoms in the form of constant pain in the neck and the knees may also occur (46). The burden of daily carrying is rarely covered in leading public health and

epidemiological journals, as it falls outside of the conventional categories of water-borne, water-washed, and water-related ailments.

4.3. Gender, Water, and Participation

In the years leading up to and immediately following the Dublin Principles, water researchers as well as practitioners at the community, national, and international levels have become more gender sensitive than was previously the case. There was broad agreement on the need to include women in water planning and decision making but perhaps less of a consensus on what such inclusion meant in a concrete sense, in different contexts, and at different scales (61). During the 1990s, however, researchers and practitioners alike gradually converged on the desirability of local-level or community participation in water management, especially that involving women.

The voices in favor of women participating in decision making over the use and management of local water resources can be (*a*) WID leaning, arguing that women's involvement is central not only to their empowerment but also to greater efficiency and sustainable development (3, 18, 62); (*b*) mixed WID and WED leaning, arguing that women use and know local resources best and therefore represent the natural loci of decision making (23); and (*c*) GAD leaning, arguing that attention to how both women and men use and negotiate over water resources is important (13), as is the potential for women to increase their self-confidence and status through control over water (63). The failure of many community-based water resource management projects has been attributed to the exclusion of women at all levels of the project and to the inability of project planners to take their (often hidden) knowledge and priorities into account (61, 64). Numerous reports from Asia and Africa suggest that the inclusion of women as participants and decision makers increased their access to, and control over, local water resources. Most of these reports are case studies, and some of them may seem more advocacy oriented rather than analysis driven. Cases for these analyses are purposively rather than randomly chosen; therefore it is important to recognize potential selection biases in the case study literature on women, water, and participation. Nevertheless, these studies provide insights into the ways in which women-centered policies have affected women's control over water resources, and the consequences of that control.

Early studies from Zimbabwe, Ethiopia, and Kenya came to mixed conclusions about the role of women in participation and decision making with respect to the maintenance of village handpumps.[5] A study by Cleaver (65) reported that the national policy of Zimbabwe was to have women take prominent roles in their local Waterpoint Committees but that few women actually were in such leadership positions. Nevertheless, traditional authority figures in many villages were quite effective in managing their local waterpoints. The Ethiopia study, however, argued that the development of successive generations of the Afridev Pump had, with World Bank and UNDP support, evolved to the point where it was simple enough that rural women readily undertook the installation and maintenance of the pumps. Installing and taking care of the pumps gave women much-appreciated control over both water and technology (66). The Kenya study describes the frequent breakdowns and lack of maintenance of handpumps in a cluster of Kenyan villages until a FINNIDA grant trained women to repair the pumps. The maintenance improved, as did the self-esteem and authority of the women mechanics. However, the women were expected to install, operate, and care for the pumps without compensation, whereas the previously lax and male mechanics had been paid (67). A more recent study of the Mvula Trust, a South African NGO devoted to community capacity building for

[5]Handpumps are the primary water withdrawal mechanisms for millions of South Asians and Africans.

sustainable water and sanitation, highlights an example of women-led community participation in KwaZulu Natal. Community standpipes and their diesel pump were maintained and paid for by community members, and all the standpipe "wardens" were women. The sustained success of this arrangement was partly attributed to the prominence of women, drawn from a long-standing women's community organization, in the Village Water Committee (68).

More recently, an ambitious report from UNICEF and the Water and Supply and Sanitation Collaborative Council (69) provides case-based evidence on women-centered participation in water and sanitation efforts from around the world. This study is squarely in the WID tradition; its opening paragraph argues for improvements in women's capacity to make water and sanitation decisions and states, "ultimately, what is good for women is good for the family and the whole community, who share the benefit from all these improvements." Citing a wide variety of experiences from Pakistan, Nepal, India, South Africa, Kenya, Tanzania, and several other nations, the report finds that "placing women at the center" of water and sanitation decisions can lead to more households with access to water, more cost-effective service delivery, better placement and maintenance of water infrastructure, better community health and hygiene, and less corruption in financial matters. The report concludes that when women are enabled to make decisions and act on their priorities the overall impacts are always a safer and more sustainable water system and greater empowerment of women.

By contrast, a statistical study of World Bank water projects in rural India is more circumspect about the consequences of women's participation. The analysis of participatory water projects in 45 villages found that women's involvement was often of a token kind; although in the few cases of substantive decision-making power, participation was found to lead to greater self-confidence and status. Overall, though the correlation between community participation and project success was positive and significant, there was no effect of women's participation in project success (70). Similarly, a comprehensive review of 121 rural water supply projects from around the world found that women were not critical to participation and that it was a myth that involving the community in the project would automatically involve the women (71).

For almost three decades, it has been understood in the water management community that a project plan with no mention of a role for women cannot improve the status quo with respect to empowerment or access to water. However, a review of the case-based literature on women and water in the domestic sphere reveals that it is not clear when and on what terms participation in community projects improves their access to and control over water, or their empowerment overall. Three broad points emerge from a review of gender and participatory drinking water projects. First, although the roles that women play in planning and management can be very important to water projects, effective community participation does not always require women to play a central part. Firmer conclusions from the empirical evidence cannot be reached because there are few projects for which comprehensive gender-disaggregated data are collected. Many well-cited studies of participation in the water sector do not even mention women and instead use the household or the community as the smallest units of analysis (e.g., 72, 73).

Second, participation takes many forms (70). At low levels of power, although not necessarily of time, it can mean donating labor or perhaps attending meetings without speaking up. At higher levels of power, it can mean active involvement in decisions about water-related technologies and priorities as well as the ability to ensure action on these priorities. The original champions of participatory development argued that the priorities, aspirations, and constraints of marginalized groups were to shape the entire process of participation (74). It seems plausible that the level and

nature of participation could make a difference both to the success of the water project and to any spillover effects on women's lives. However, many case studies omit the details on what levels of participation were actually achieved and on the mix of project design, social structure, and women's preferences that constrained or enabled particular forms of participation.

Third, it may be necessary to read between the lines of a case study to understand whether the central role of women in managing and safeguarding water resources was considered of instrumental or intrinsic value. Embedded in most case studies, often only implicitly, is a WID-, WED-, or GAD-sympathetic worldview. Projects that enable women to supplement their agricultural incomes on account of access to water (75) or that require women to work extra hours to manage their water sources (67) may be successful in WID terms but may contribute less to empowerment (76). Participatory projects in which women take on water-related responsibilities for which they are not paid have been critiqued for their WED-like assumptions that women are natural protectors of water and thus do not need payment (e.g., 13, 77). However, the more complex GAD-based perspective, which arguably represents the mainstream academic and donor position, is more commonly used as a critique of existing interventions than as the guiding principle for new interventions (78).

5. WOMEN AND WATER FOR IRRIGATION

Irrigation has transformed thousands of once dry-farmed hectares of cereal crops into productive, double-cropped diversified plots of land. Yields with irrigation of cereals, pulses, and vegetables in developing countries are from 100% to 400% higher than they are without irrigation (79). Yet 800 million people are estimated to suffer from chronic hunger, and the majority of them live on small farms, of less than 2 hectares, in South Asia and sub-Saharan Africa (52). Increasing the access to irrigation for these tiny farms, which are usually overlooked by large-scale water infrastructure and which are too small to benefit from conventional groundwater withdrawal technologies, would be a major step toward food security and poverty alleviation (52, 80).

5.1. Access

In a paper on integrating women into water policies in Sri Lanka, Athukorala (81) suggests that women's priorities have proven easier to integrate into the domestic water sector than in the irrigation sector because domestic water has always been considered in the women's sphere and because conflicts over irrigation water challenge traditional ideas about the division of rural labor. But Zwarteveen (82) argues that a near-exclusive focus on gender in the domestic water sector overlooks the potentially gendered impacts of irrigation technologies and institutions, especially with the increasing number of woman-headed farm households. She also suggests that it risks cementing gender inequalities by emphasizing the role of women as homemakers and mothers, rather than as producers as well.

The literature on irrigation reviewed here brings to the fore three gender-specific concerns. First, it suggests that women are often denied direct (that is, not mediated by male relatives) access to irrigation water. From the productivity as well as equity perspectives, there is considerable evidence to suggest that allocating water to men and to women would increase household incomes. However, the literature indicates that formally allocating irrigation rights to women is not sufficient and, in a few cases, may not even be necessary for women to benefit from the water. Second, new participatory irrigation management policies may not improve women's access to water unless the policies take account of gender-specific roles in agriculture. Unlike drinking water, which is accepted as being in the women's domain, women and men in a community or even household may need

and use irrigation water in different ways. Third, the transformation in agriculture that irrigation brings about increases women's well-being through increases in household incomes but could also increase women's workloads without increasing control over the additional income.

The default image of the farmer and of the farm head of household in the majority of research and policy documents is male. Yet almost 10 years ago, an FAO (Food and Agriculture Organization of the United Nations) bulletin reported that in sub-Saharan Africa and the Caribbean 80% of staple foods was grown by women and that almost 90% of the labor in Asian rice fields was female (62). More recent FAO fact sheets continue to show that women do approximately 70% of the agricultural work in low-income food-deficit countries (3). Field surveys from India, Nepal, and South Africa confirm that, although agriculture is organized by gender-specific activities, both men and women participate in irrigation, especially in female-headed households (83). Another field survey from Kenya found that the de facto head in 35% of the households was a woman and that 44% of the irrigation labor was carried out by women (84). Similar research in South Africa found that the smallest plots tended to be farmed exclusively by women because adult males had migrated (85).

For access to irrigation water, there is no equivalent of a JMP that keeps consistent lists of percentages of farm households with and without irrigation. Region-based research on access to irrigation takes the unitary household to be the unit of analysis, and so gender differences in access cannot be inferred. The primary sources of information on women and irrigation are case studies from agricultural communities around the world. These illustrate the structural and household-level constraints to women's access to irrigation as well as the multiple ways in which access can be mediated. As with the literature on drinking water, existing case studies of gender and access to irrigation may exhibit selection bias. They are thus sources of understanding the processes and terms of access and of possible entry points for policy interventions, rather than of generalizable data on the extent of access.

The most common constraint identified by a number of studies from around the world is that women typically lack formal or enforceable rights to irrigation water. In a pioneering study of land rights in India, Agarwal (86) showed that women were denied access to a range of social and economic opportunities because these were available primarily to the formal holders of land. The author used her findings to challenge the unitary model of the household because access to land mediated through husbands and fathers versus direct access to land had very different consequences for women's poverty and physical well-being (86, p. 30). Zwarteveen (82) suggests that direct access to water is similarly important for women's well-being and for greater productivity in agriculture. Her research in Burkina Faso concluded that when both men's and women's plots were separately titled and irrigated the overall productivity of agriculture rose (87). Several field-based studies in anthropology as well as economics have confirmed that women are efficient irrigators as well and productive farmers (88–90). However, in most canal irrigation systems, water is allocated to the official landowner, usually a male (82, 91). Women who have become de facto heads of households are not necessarily entitled to reliable water rights. Well ownership is also often a function of land ownership (91), and although water rights are more fluid than land rights, rights to water, land, and trees generally go together (92). Thus land ownership patterns directly preclude many women from water rights.

Of course these patterns also exclude the poor from access to water. From a number of canal irrigation studies in Asia and Africa, van Koppen (93) concludes that the poor in general and poor women in particular can be given access to irrigation if water rights are vested in land users rather than just land

owners, and to both men and women rather than to the assumed male head of household. In a major policy report on women and development, the World Bank has identified the combination of (enforceable) formal rights and social norms as one of the key barriers to development and gender equity (18). However, Jackson (13) suggests that the danger of too much emphasis on land rights and titles is that one might assume that a changed property rights regime will automatically ensure access and opportunity for hitherto deprived women. She and other GAD-sympathetic scholars argue that these WID-like policy prescriptions are "only the beginning" and that water policies must also take into account the multiple ways in which gender relations influence access to resources (13, 94).

Ribot & Peluso (95) conceptualize access as the ability to benefit from a resource—whether through de jure rights, de facto rights, theft, purchase, or access to social networks. This framework is useful in considering the many ways in which women either have, or are denied, access to irrigation. For example, norms and social custom may deny women a place or a voice in the collective management of irrigation water, whether or not they hold land (e.g., 96). But Zwarteveen & Neupane (97) challenge the assumption that public exclusion always leads to deprivation. They find that, in a Nepali irrigation scheme, female heads of household were able to use their allegedly vulnerable status to get access to water and to reduce their contribution to the required maintenance labor (97). Other cases confirm that women without formal rights attempt to get water through social networks or through access to paid labor, or through helpful or influential men (e.g., 98). One such way is to send their sons or sons-in-law to the formal water users' association meetings, so they can get their needs and complaints expressed without participating themselves (99). Another way might be to ask a brother or male relative to irrigate fields owned by women because neighboring farmers may be less likely to interfere with a fellow male neighbor, especially in times of scarcity (A. Kome, unpublished report). However, these authors conclude that such informal channels are generally not available to a majority of women, and access through them can be haphazard. Such channels of access also need continual maintenance with social visits and small gifts. They are thus likely to be less conducive to women's access than more formal or even customary rights.

Several studies show that gender-specific roles are the norm in agriculture, which creates opportunities for both conflict and cooperation when it comes to water use. Field observations indicate that South Asian patterns of irrigation needs and uses may be less gender differentiated than those of sub-Saharan Africa (91). Carney's work (100) in The Gambia showed that with the arrival of pump irrigation, rice went from being a traditional women's crop to a new men's crop, after which men started to control both the farming and the revenues (100). Research using a large dataset from Ghana showed that the common distinction between cash crops for men and food crops for women was not a clear-cut one but that gender differences in agricultural responsibilities did exist (101). The agrarian household in sub-Saharan Africa is increasingly modeled as a "separate spheres" household, although separate responsibilities coexist with interdependence in production (102). These separate responsibilities may call for trade-offs in irrigation delivery and its timing. In Sri Lanka, for example, rice is largely a male responsibility and millet largely a female one, but the delivery schedule for canal water usually favors rice as it is the "main" crop (103). Irrigating homestead crops, which contribute to family health and nutrition but not to revenues, may be discounted when making up the seasonal canal water delivery schedule (104). Irrigated agriculture constantly brings up cases of Sen's (38) cooperative conflict, and Meinzen-Dick et al. (92) conclude that "hard choices" have to be made when there are many uses of a resource and many desirable policy goals.

Given that there are no indicators of access to irrigation comparable to the flawed but universally accepted indicators of access to drinking water, it is worth discussing in some detail van Koppen's comprehensive attempt to design a gender performance indicator for irrigation (GPII). The GPII is rooted in a WID approach and in a negotiated model of the household. It first categorizes (mostly canal-irrigated) farming systems into male dominated, female dominated, and mixed (90). Gender performance is then indicated by the presence or absence of gender-based differences along three axes: equal access to water for both genders at the farm level, equal participation in fora for water management arrangements, and equality at the community leadership level that reflects the gender composition of the farm community. After field tests of this indicator in Burkina Faso, South Africa, India, Nepal and Sri Lanka, the author finds that the main source of exclusion in female and mixed systems is usually the official irrigation department itself; whereas where the farming system is male dominated, many social-structural factors limit women's access to water and to power. In these cases, the author suggests mandating inclusion, such as requiring that women serve on the water committee, is unlikely to improve women's access, rights, or participation.

5.2. Gender, Irrigation, and Participation

Even more than for the drinking water sector, decentralized management, devolution of rights and responsibilities to water users' associations (WUAs), and financial accountability in the public irrigation sector have taken hold throughout Asia, Africa, and Latin America (105). This devolution is known as participatory irrigation management (PIM) or irrigation management transfer (IMT). The primary reasons for the rapid acceptance of PIM were (*a*) the heavy financial burden of major canal systems on governments and (*b*) the growing belief that if water systems are owned by their users they will be better able to use, allocate, and manage them (106). As such, the spirit of PIM seemed to reflect both the second and the fourth Dublin Principles—that water management decisions should be made in a participatory manner by farmers and users and that water is an economic good and thus should be used efficiently (105). The evidence on the irrigation and economic performance of PIM has been both positive and negative, and the introduction of PIM has certainly impacted both women and men farmers (85, 91). However, the treatment of gender issues in the PIM literature is quite different from that in the domestic water literature.

As discussed above, despite theoretical and policy differences in the domestic water sector, there has been an explicit consensus that the inclusion of women is necessary, preferably at all levels. Because irrigation bureaucracies rarely consider women as farmers in their own right, and because the usual assumption is that women will automatically benefit from water allocated to their households, PIM policies were not formulated or implemented with gender equity in mind (e.g., 104). The literature to date remains gender neutral in academic research as well as policy documents, with the words *women* or *gender* rarely appearing in them. The few research papers there are on women and PIM are generally skeptical of the value of PIM to women and of the ability of women to participate meaningfully in PIM-created WUAs.

Management transfers from the official irrigation agency to officially recognized associations of water users changes old systems of allocation based on usufruct rights to new systems of allocation based on formal membership. As Agarwal puts it, "membership is replacing citizenship" in joint government-user management programs for several resources, including water and forests (16, p. 1). All residents may be eligible for membership, or just one member per household, or just heads of households. Each of these membership criteria has gender impacts, sometimes excluding women from the ability to participate. Van

Koppen finds that throughout Asia and Africa, irrigation agencies vary greatly in whether they include or exclude women and smallholders and that, where labor participation entitles a person to water rights, women are sometimes excluded from the right to that collective labor (93). Meinzen-Dick & Zwarteveen (99), on the basis of several case studies in South Asia, also conclude that irrigation agencies have considerable influence in organizing WUAs but that women are rarely recognized as irrigators and therefore as potential members. They note that women participate informally by, for example, assisting their husbands (as shown in Reference 107) but argue that access to formal participation in WUAs would increase women's bargaining power in the home as well as better secure their access to water. By contrast, Cleaver (108) suggests that there is little evidence that the participation of a few women in WUAs can raise access to water or opportunities for the majority of women. Finally, Zwarteveen (104) points out that as long as PIM studies are conducted at the aggregate scheme level and neglect to collect and analyze data on gender and women, we cannot know the gender impacts of PIM. This neglect, she avers, not only leaves the irrigation community uninformed about gender, but it also reinforces the view that gender is not an important aspect of PIM (104).

Formal PIM has been a part of national water policies for about two decades and mostly for publicly managed canal irrigation systems. There are, however, many less formal forms of farmers' organizations and irrigation groups, some of which have been working for several years and others that have recently been revived through NGO mediation. The source of irrigation water for such users' groups may be canals, tanks, wells, or harvested rainwater. Effective and indigenous water users' groups have been the inspiration for several models of successful commons management (e.g., 109). However, there are only a handful of studies on women's participation in decision making, technology use, and maintenance in these contexts. Depending on the goal of participation—household well-being, women's empowerment, or both—each study attempts to evaluate the level of participation and its impact on productivity, equity, and (in rare cases) sustainability.

Two small studies from the state of Gujarat, India, show the enabling role that established NGOs can play in encouraging women to participate in irrigation operations and decisions. Three years into an intervention promoting women's irrigation cooperatives, the first project appears to have succeeded in raising crop revenues, in changing the pattern of irrigation and equipment management in the community, and in raising the confidence of the women committee members (110). The second case assesses an NGO-organized lift irrigation effort, which raised household revenues and gave women easier access to water and fodder. Four years after the initial intervention, the women in the case study village organized a milk producers' cooperative and gradually started to participate in irrigation committees themselves (111, 112). In both cases, the authors acknowledge the continued community-level awareness raising and capacity building that the NGOs in question had to undertake.

Several technologies have been discussed in the literature on irrigation development as affordable, sustainable, and gender equity friendly. Rainwater harvesting, for example, is enjoying a revival in many arid parts of Asia and Africa, with widespread NGO and international donor support. Its proponents emphasize its ability to recharge groundwater and its potential for gender equality through access to water, higher attendance for girls in school, women's participation in community decisions, and increased employment for women in construction and maintenance activities (113). Although several studies confirm that rainwater harvesting increases community (and thus women's) well-being through the availability of year-round water for drinking and irrigation (e.g., 114, 115),

there is hardly any research on the hoped-for gender equality effects.

Another promising candidate for poverty alleviation with women's participation is the human-powered treadle pump, which has gained popularity in the shallow aquifer zones of India, Bangladesh, and Nepal. Actively promoted as a sustainable development and business model by NGOs such as International Development Enterprises, research has shown that the treadle pump can increase the incomes of extremely small farms by up to $100 a year (116, 117). Field observations indicate that both men and women can and do use the pump (80, 117). Promotional images of the treadle pump are usually shown with a woman at the helm. But as with rainwater harvesting, there is no reliable information on gender-specific impacts with respect to the treadle pump. On the contrary, Palmer-Jones & Jackson's fieldwork (118) in Bangladesh concluded that women plot owners could treadle for short periods of time for their vegetable crops, whereas many very poor women suffered pain and fatigue when they treadled for wages for long hours. In such cases affordable and sustainable technologies, the authors argue, are not conducive to gender (and class) equity. The role of low-cost irrigation technologies in poverty alleviation for men as well as women, and for greater gender equity, needs much more detailed research.

This chapter so far has shown that women's participation at all levels is widely considered necessary for productivity, equity, and sustainability and is central to donor policies in the rural water sector (4, 18, 19, 53). However, that women should play prominent (if not equal) roles with men in irrigation management, or even that efficient irrigation is unambiguously good for women, has been questioned on several counts. The productivity of irrigated agriculture, or the substitution of labor for water in order to use water efficiently, could lead to higher levels of women's labor (12, 118). This is particularly possible if the terms of trade within households are biased against women (104). Carney's research (100) on the introduction of pump irrigation in rice production in The Gambia found the intensification of agriculture was accompanied by the intensification of, and seasonal disruptions to, women's labor. The Gambia study explicitly confronted the unitary model of the household, arguing that any technology transfer that occurred under the assumption of a joint utility framework would fail to see the gendered effects of such a transfer. Collective institutions that emphasize formal membership are often based on pooling time and cash resources, thus tending to exclude poor women and women with young children who are typically pressed for both (76, 119). In particular, the implicit ideal woman in current discussions of mainstreaming women has been sharply challenged. In addition to providing drinking water, food and care for the family, as well as for domestic animals, a woman should also participate in collective water management decisions, raise funds for and help to maintain water facilities, be empowered to demand good service, and improve her family's health and income through access to these water facilities (39, 108).

By contrast, the Gender and Water Alliance calls for more women's participation in irrigation precisely on the grounds of higher productivity in women's hands because of "their more conscientious labor inputs and attention to detailed management" (41, p. 39). They argue that drinking water interventions that do not have livelihood-improving potential may not be considered a priority by women in rural communities. Corroborating this point, an early study of handpumps in rural Indonesia found that most women used the water not primarily for drinking, which was the original intent of the project, but for irrigating tomatoes, which they then could sell for a profit (75). Agarwal (16) has argued that, unless women fully participate in community-based natural resource management, both productivity and equity are likely to suffer. Such proponents of participation conclude that irrigation policies should include not only rights

allocations and enforcement, but also gender-inclusive approaches to specific agricultural, household structure, and social-economic contexts.

It is difficult to come to robust conclusions about women's participation in the domestic water or irrigation sectors with the studies that the literature currently provides. Even research that links community participation to positive project performance is unclear on how women participated (71, 120). Mansuri & Rao (73), in an extensive review of community-based development projects, conclude that without honest and unbiased impact evaluations, we cannot say much to guide policy about the impact of participation on development goals. Although few studies in their review focused on women, their conclusion is highly pertinent to water and gender. Given that women's inclusion and active participation are goals of water sector policy and funding almost everywhere, credible impact studies are critical to understand in what circumstances participation in water and irrigation can benefit women, in which ways, and—because women are not a homogeneous category—which women. They are in fact critical to our understanding of the circumstances in which the second and the third Dublin Principles are compatible.

6. GENDER ASPECTS OF TRENDS IN THE WATER SECTOR

Water sector reforms are under way in many countries in order to cope with the increasing and competing demands on freshwater as well as to raise simultaneously the productivity, efficiency, sustainability, and equity of water resource use. Two emerging trends and their potential gender impacts are highlighted here. The first is the increasing emphasis on cost recovery in the water sector and on market-based access; the second is a new trend away from a sectoral approach to water toward designing for multiple uses.

6.1. Cost Recovery and Market-Based Access

Paying for domestic as well as irrigation water is seen by many as efficient for the user and for the state, especially since the fourth Dublin Principle became internationally accepted. The literature on cost recovery in urban water utilities of developing countries includes urban pricing reform, efficient system management, and, increasingly, privatization. Both price reform (with or without private sector participation) and privatization have led to polarized debates on efficiency, sustainability, and equity. Advocates of price reform argue that current subsidies do not help the poor and that not recovering costs leads to poor maintenance and inadequate system expansion (121, 122). Privatization is a more radical step than merely raising water tariffs, and it encompasses a range of options from simply contracting out repairs and bill collection all the way to full divestiture of the water utility. Advocates of privatization argue that the public water sector has failed to reform itself in most cases and that the provision of water services is better left to the more efficient private sector (see Reference 123 for a comprehensive review). Higher water prices in the irrigation sector have been proposed for similar reasons, i.e., cost recovery, the inefficiency of public sector water schemes, and the relative efficiency of private groundwater irrigation (124).

Although these issues have given rise to a voluminous literature, hardly any of it explicitly addresses the impacts of cost recovery on women. Willingness-to-pay studies that estimate household demand for water, for example, routinely use the household as the unit of analysis (32, 33). This is unfortunate because this review has shown that it is women who are usually responsible for securing the family, and sometimes the on-farm, water supplies. It has been argued that women pay the coping costs of distant and unreliable water supplies and so would benefit from more expensive but better access (125), and it has been argued

that if women do not control the household cash income they may not be willing or able to pay more for water (e.g., 12, 23). Gender-disaggregated data on willingness to pay, ability to pay, and the potential impacts of water pricing reform on differently situated women are thus key to our understanding of the circumstances in which the third and the fourth Dublin Principles are compatible.

Market-based access to irrigation water is usually through groundwater purchases from well owners who have surplus water to sell. Groundwater markets are common throughout Asia, spurred by the boom in groundwater exploitation made possible by low drilling costs and cheap pump sets (126). As with drinking water, the commodification of irrigation water could exclude not only the poor, but also women. However, some studies indicate that even the poorer buyers benefit from reliable irrigation, available on demand (126, 127). Again, there are few systematic studies on the impacts of local water markets on women farmers. On the one hand, it has been argued that women may be willing but not able to pay for water, and if irrigation water has to be purchased, then women's uses will be shortchanged because they may be less quantifiable in terms of market value (77). As a counterargument, Zwarteveen (104) asks if access through the market is really much worse than unreliable access through informal networks, political connections, and socially conforming behaviors. She argues that better questions to ask (given the huge variations in women's participation in agriculture, women's participation in irrigation, and intrahousehold bargaining power) are: Which mechanisms of access to water benefit women? And in what circumstances? As before, we want to know in what circumstances the third and the fourth Dublin Principles are compatible.

6.2. Designing for Multiple Use

Several of the papers cited thus far have commented on the unrealistic assumptions of separate needs and separate sources embedded in the traditional sectoral approach to water resources planning and development. Instead, in rural areas, multiple uses and users of water are more the norm. Women use drinking water for irrigating tomatoes and for other daily water needs (75, 127); they use irrigation water for a range of uses such as washing, laundry, bathing, and washing livestock (119); and men use women's handpumps to wash and bathe (17). A study of irrigation systems in Kenya concluded that, in reality, formal and informal rules of rural water use blended into "the reciprocities and interactions of social life" (98, p. 727). It is thus being argued, especially by researchers in the irrigation management sector, that designing for multiple use from the start will more optimally allocate the water among all the stakeholders and users, and such designs will increase the chances for gender equity and negotiated cooperation at both household and community levels.

As an example, Renwick's model (128) of irrigated paddy and fisheries in the Kirindi Oya system of Sri Lanka shows that the relative values of rice and fish, and their interdependence in production, argued for a combined approach to irrigation planning and design. A recent report on multiple use makes the case that designing for multiple use would make it more feasible to use water policy to achieve the MDGs (129). It found that it is often the poor who use water designated for irrigation for nonirrigation purposes and that often women find irrigation canals a handy source of water for a range of productive and domestic needs. Thus accommodating these uses in the volumes and timings of canal water delivery could promote poverty alleviation, sustainable development, and gender equity—all MDG items. The authors advocate a thorough understanding of all the livelihood-enhancing ways in which water is used and coordinated action between sectors and agencies as two basic principles for multiple-use design. They conclude that the primary reason that design for multiple use is not the norm is because the separate

jurisdictions of water agencies do not match people's integrated uses of water. They therefore suggest that a shift toward designing for multiple use could hold promise for total productivity, gender equity, and cooperation in the use of water.

7. CONCLUDING THOUGHTS

The published literature on women and water, although acknowledging the gravity of millions of women's lack of, or highly circumscribed, access to basic water supplies, is nevertheless a contentious one. There are debates over whether access to water should be sought primarily for its value to general well-being and development or for its intrinsic value for quality of life; over whether participation is necessary, or even desirable, to ensure action on women's priorities for water in addition to men's priorities; and over whether emphasizing the cooperation or the conflict aspect of Sen's cooperative conflict is the better strategy and in what circumstances. Some of the assumptions and observations driving these debates are consequences of the complexity and variety that Dublin Principle III encounters in its implementation. Other debates are driven by implicit or explicit divisions on the framework that best integrates women and development.

Some of the tensions in the literature reflect the gaps between theory and policy and between policy and practice. Although gender has been mainstreamed into the policy frameworks of many international agencies, there is almost no documented evidence of donor agencies refusing to fund a project on the grounds that the gender policies of the donor were not being followed (61). And even when gender-sensitive policies are implemented, the actual implementation may be in the hands of water and sanitation engineers who are trained to deliver water, not empowerment. It is certain, however, that progress toward resolving some of the debates could be made by a concerted effort by researchers, agencies, and NGOs in the water sector to collect gender-disaggregated data as their default practice and to work more collaboratively with the broader community of gender and development scholars.

7.1. The Need for Gender-Specific Data Collection

Writing 25 years ago, the economist Benería (130) noted that survey data systematically underestimated women's contributions to the economy because the production of use value, such as in food processing and water carrying, as opposed to of exchange value, was invisible. This invisibility is still a feature of water policy research, although much less so than in the past. In 1999, the Global Water Partnership published a major review (131) of the legal and institutional aspects of the Dublin Principles, which completely bypassed the third Principle. In 2003, the Annual Report of the Gender and Water Alliance lamented that "the authors were handicapped by a lack of reliable disaggregated data on outputs and impacts" (41, p. 9). A subsequent report in the UN-published journal *Natural Resources Forum* concluded that, despite the adoption of the third Dublin Principle, the focus on women in water management had been "somewhat lost" (132). Overall, few comprehensive assessments of the international water situation emphasize the third Dublin Principle (e.g., 14, 133, 134).

Similarly, few water-related indicators have anything to say on the role of women in fetching, purifying, or irrigating. To give but one example, the first World Water Development Report of the United Nations compiled 176 indicators for cross-regional comparisons in different contexts and at different scales, and although several access or health indicators were clearly relevant to women's lives, none was gender specific (135). A notable exception is the extension of the Water Poverty Index to the community level, which explicitly includes data on water carried by women and the time spent in this work (136). Leading indicators of women's status, such

as the Gender Empowerment Measure, are composed of conventional measures such as literacy, formal economic earnings, and participation in national politics (4, table 25). Indicators of status do not include measures specific to water access, such as "average walking distance to improved water source."

Impact evaluation, process documentation, and success or failure analysis are all ultimately dependent on disaggregated data. Gender-disaggregated data collection does not necessarily commit the researcher to a particular model either of women and development or of the household. It does not require the researcher to espouse aspects of current feminist scholarship. A recurrent theme in the literature discussed in this review, from many different political and disciplinary positions, was the lack of the kind of data that would allow critical questions to be asked and answered. It should be admitted, however, that collecting and compiling data separately for men and women are inherently political acts, and some of the reviewed literature claimed that research that appeared to be "too" women focused could be seen as inappropriate.

7.2. The Need for Collaborative Research

Evaluating the success of women's participation is dependent not only on data availability but also on what constitutes success. From the researcher's perspective, the policy-oriented literature on gender and water is sometimes unclear on the goal of a participatory project: Is it women's empowerment, sustainable development, simply easier access to a water source, or some combination of these? What Sen has called the *well-being aspect* and the *agency aspect* (137, p. 190, emphasis in original)[6] of gender analysis inevitably intersect and yet they are conceptually quite different. To include women in water planning might mean to consider their interests (for greater well-being) or it might mean to bring them into the active planning and decision-making process (for greater agency). At present, the women-and-water literature sometimes appears caught between the goals of well-being and agency and, at other times, appears to conflate the two.

A parallel tension in the water-and-women literature is that between structure and agency. Almost all the examples of women's participation in water projects for drinking or for irrigation in this chapter focus on increasing women's involvement and/or agency at the local and community levels. These same studies are clearly aware of the structural constraints to greater involvement and agency, such as long-standing asymmetries in the roles and expectations of men and women; unequal property rights in land and water; the gendered impacts of the policy agenda of dominant multilaterals (e.g., 138, 139); and the larger ecological-environmental changes within which women's local participation must take place. Social structures also divide women from other women by class, community identity, age, and marital status, and thus deconstructing the category of "women" could be central to studies of gender and natural resources (16, 17). Yet structures are not static and do change in response to changes in the broader economy and also to bottom-up pressures. Gender and development analysis in academia has struggled for some time to balance the roles of structure and agency as well as to understand what shapes the conditions of and opportunities for choice for women and men within specific structures (13, 140). Water policies, however, are generally prescriptive and do not reflect the diversity of how men and women live and work with water. Thus much of the empirical literature on gender and water—especially the policy-oriented literature—has yet to confront explicitly the tensions between structure and agency.

[6] Agency is used in the sense of autonomy or empowerment; it is the individual's ability to act in accordance with his or her preferences or interests.

There is an urgent need for more collaborative research between gender scholars and water policy analysts, a collaboration that may have to overcome field-specific theoretical, philosophical, and practical differences. The challenge ahead for an integrative understanding of women, water, and development is to address the general lack of a gendered analysis, or even focus, in large parts of the water management literature as well as the general lack of a water focus in large parts of the gender and development literature.

SUMMARY POINTS

1. Despite the adoption of the Dublin Principles and the MDGs, many millions of women lack access to water for even basic domestic and livelihood needs. Most of the deprivation is concentrated in sub-Saharan Africa and South Asia.
2. It is estimated that 40 billion hours are spent each year in Africa, mostly by women, in carrying water. The economic and health costs of this burden are enormous.
3. Many women are excluded from formal usufruct rights to water, especially to irrigation water, although the evidence confirms that women are productive and efficient farmers. However, some women are able to access water in informal though unreliable ways.
4. International and many national agencies have adopted the view that participation in water investments and decisions would enable women to bring their water needs to the table, empower them in other ways, and contribute to more productive and efficient uses of water. However the role of participation is being debated because its contribution to women's well-being and to their workloads is unclear.
5. There is considerable debate on whether policies should be geared toward women's access to water resources or also to women's agency through such access.

FUTURE ISSUES

1. Gender-disaggregated data are vital for the resolution of many unresolved debates in the gender, water, and development arena.
2. More collaborative work is needed between water managers, policy researchers, and gender and development scholars to balance the roles of cooperation and conflict, of well-being and agency, and of structure and agency, which arise from access to water for women.

DISCLOSURE STATEMENT

The author is not aware of any biases that might be perceived as affecting the objectivity of this review.

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