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GENDER RELATIONS AND ACCESS TO WATER: WHAT WE WANT TO KNOW ABOUT SOCIAL RELATIONS AND WOMEN'S TIME ALLOCATION

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Abstract: Inadequate access to safe water has severe consequences for health and livelihood. More than one billion people do not have access to safe water. This paper addresses three questions: 1) How could a focus on social relations illuminate access to water? 2) Is there statistical evidence of a water-poverty connection? 3) How could time allocation studies improve our understanding of access to water? First, evidence suggests that in much of the rural global South, gender relations in particular mediate the social relations of water in numerous, interconnecting ways. Analysis of gender relations could then improve our understanding of the multiple connections among poverty, the position of women and access to water. Second, statistical evidence from the *Global Water Supply and Sanitation Assessment Report 2000* and from the *World Development Report 2000* indicates that there is a correlation between lack of access to water and material poverty. When people lack access to water and material resources, they are unable to realize their own hopes for life. Third, in order to improve our understanding of how people in the global South obtain water, future studies will need to determine precisely who collects and manages water for various uses, how much time water collection consumes, and the quality of water available to each user.

INTRODUCTION

Water is essential for life, a basic requirement for the proper functioning of the global ecosystem. Lack of access to safe water has severe consequences for people's health and livelihood. Water is necessary for people to lead lives free of destitution, deprivation, and scarcity. The development community has long understood the necessity of water for human and economic development. The United Nations Development Program uses data on access to water as one of the two variables in the 'Human Poverty Index' (HPI-1) that indicates 'deprivations in a decent standard of living'¹ (UNDP, 2003). However, currently over one billion people in the global South do not have access to safe drinking water (Pacific Institute, 2002) and this number is projected to increase (Barker et al., 2001). Approximately three million people lack access to adequate sanitation systems (Gleick, 1999; Neto and Tropp, 2000). Lack of access to safe drinking water and lack of proper sanitation systems lead to illness, suffering, and death from dehydration and water-borne illnesses. Peter Gleick² (1999: 3) asserts that if the water community focused on meeting the basic human right to water across the globe, they 'would have a

1 The HPI-1, the poverty index for developing countries, measures deprivations in longevity, in knowledge, and in a decent standard of living. A decent standard of living is measured by two variables: the percentage of people not having sustainable access to an improved water source and the percentage of children below the age of five who are underweight (UNDP 2003).

² President of the Pacific Institute for Development, Environment and Security and author of a biennial report entitled 'The World's Water.'

useful tool for addressing one of the most fundamental failures of 20th century development.'

In the global South, men's and women's divergent social positions lead to differences in water use, water rights, and access to water (e.g., Meinzen-Dick and Bakker, 1999; Zwarteveen and Meinzen-Dick, 2001; Crow and Sultana, 2002). In many societies, women have the primary responsibility for completing domestic work, including collecting water (Elson, 1995 in Crow and Sultana, 2002). Furthermore, in many societies, women's and girl's reproductive work and other unpaid labor are not considered 'real' work (e.g., Suda, 1996: 77). Across the globe, particularly in non-industrialized countries, men control land, finances, industry and government and thus men tend to control access to water (Crow and Sultana, 2002). Legal or formal water rights (rights to control water) are typically vested in farmers or household heads, typically men. Indeed, gender-based divisions of work and control of land and capital result in a gendered and unequal distribution of water. This paper is concerned with social constraints on access to safe water, specifically how gender relations mediate the social relations of access to safe water.

This paper has five sections after this introduction. In section one, we discuss some of the connections between water and different ways of thinking about poverty. In section two, we examine how a social relations approach could illuminate our understanding of how people gain access to water. In section three, we discuss some statistical evidence suggesting that lack of access to water is associated with higher levels of material poverty. Section four describes how time allocation studies could illuminate how limited access to water may constrain livelihoods. Section five concludes the paper.

1. WATER AND 'POVERTY'

In its simplest definition, poverty refers to a deprivation of basic needs. Economists usually concern themselves with 'the scarcity of the means by which the ends are realized' (Kabeer, 1994: 136). As a result, they tend to conceptualize and create measurements that reflect their focus on the scarcity of means and negligence of the achievement of ends (Kabeer, 1994). The poverty line is one example of means-focused

measurement. Amartya Sen (1982) developed the idea of entitlement in order to explain ‘the different basis of claims on resources that prevail in a society.’ As Sen explains,

The distribution of resources in any society occurs through a complex systems of claims, which are in turn embedded within the social relations and practices that govern possession, distribution and use in that society (Sen, 1982 in Kabeer 1994: 140).

In *Development as Freedom* (1999: 87), Sen argues that poverty can best be understood as a deprivation of basic capabilities and not merely as low income. Poverty should be defined as capability deprivation, according to Sen, because many deprivations that people experience are intrinsically important (unlike low income which is merely instrumentally important). Sen goes further to suggest that various types of poverty should be considered as varieties of ‘unfreedom.’ Sen believes freedom implies the representation of all, including the poor and the powerless, in the making of public policy, so that people can expand their capacity ‘to lead the kind of lives they value—and have reason to value’ (1999: 18). The expansion of freedom is, thus, simultaneously a primary end and principal means of ‘development,’ referred to as the ‘constitutive role’ and the ‘instrumental role’ of freedom (Sen, 1999: 36). Access to safe water clearly plays both a constitutive role, providing freedom from the debilitating health consequences of unsafe water, and an instrumental role, as an economic and social good, in securing people the opportunity ‘to live the kind of life they value.’

Sachs (1999) cautions against using the terms ‘poor’ or ‘poverty’ as they are Western constructed notions that are often demeaning and always reductionist. The term poverty, Sachs cautions, fails to distinguish, among other things, between frugality, destitution, and scarcity. Many cultures live frugally (according to Western standards) but would not consider themselves wanting for anything. However, even Sachs admits that frugality becomes destitution when it is deprived of its foundations, such as ‘community ties, land, forest, and water’ (11). Indeed, social cohesion, land, forest and water are necessary for communities that have scarce economic resources to lead lives free of deprivation. Water in particular is vital to all people because adequate amounts of water are a prerequisite for healthy ecosystems and for healthy humans. There can be no agriculture, no forests, and no livestock without fresh water. People who lack access to

safe water and lack financial resources are unable to realize their hopes for life. It is in this sense that destitution results from lack of water and material poverty.

There are direct and indirect connections between lack of access to water and poverty. Direct connections are those associated with control over water. A person who has control over water resources also has the capacity to irrigate, to invest in agricultural and industrial processing, and to benefit from rising land values. Indirect connections between water and poverty are those associated with access to safe water. A person who has access to adequate amounts of safe water does not suffer from illness due to water-borne disease, and thus had the capability to attend school and perform labor. When a person has secure access to a safe and nearby water source, she gains the value of the marginal time-savings of water collection. In sum, access to and control over water resources are intrinsically and instrumentally valuable for all people.

Physical and Social Realities of Water Management

In the industrialized world, government agencies or corporations provide convenient access to clean water (at a low cost to most) to nearly the entire public. In non-industrialized countries, governments rarely provide their citizens with clean, secure access to water. People in non-industrialized countries of the global South often must expend considerable amounts of time and money to gain access to water; some cannot gain access to safe water at all. How people obtain water varies significantly throughout the world. Social, technical and physical conditions determine how people gain access to or command over water. Crow (2002: 42) describes five ‘modes of access’, or the five general ways that people obtain access to water: 1. Private ownership of land endowed with a safe water source 2. Common property access (access to water via communal rights) 3. Open access (unregulated access to a common resource) 4. State-backed provision (local or national projects, such as municipal groundwater or pumped water for irrigation) and 5. Market access (purchase of water, e.g., from the owner of a pump or a company selling bottled water). Differences in how people obtain water can both be shaped by and can create inequality and poverty. As Crow (2002: 78) explains, ‘There are material and gender inequalities in each mode of access. These inequalities have

consequences for the health and livelihood of the users and may hide choices about social priorities.’

While global water resources are finite, total demand for water continues to rise. Rapidly increasing populations, deforestation, and large-scale agriculture are among many factors causing increasing numbers of people to suffer from water deprivation.³ According to the World Water Vision (2000), of the total freshwater used by people, 70 percent (closer to 80 percent in arid regions) is devoted to agriculture, 20 percent is used in industry and municipal use accounts for 10 percent. Water use varies throughout the world by class, gender, political economy, and physical environment. For example, in rural Africa, an individual uses four cubic meters of water each year while in the industrialized North, an individual consumes roughly one hundred cubic meters of water per year (Allan, 1998).

A study by the International Water Management Institute found that in the first quarter of this century 2.7 billion people⁴ will experience severe water scarcity⁵ (Barker, 2001). Figures on water scarcity must be taken with caution however as water scarcity is a relative concept. That is, it is partially socially constructed; scarcity is determined by both the availability of water and by consumption patterns which vary from one country to another. For example, two countries could have the same amount of water resources but if one has high industrial demands or demands for large-scale agriculture, this country could face water scarcity while the other would not. Thus, water scarcity results from a combination of physical factors and human activity. Though it is difficult to disentangle the innumerable forces that are creating water scarcity for an increasing number of people, the fact that many are rooted in socio-economics and politics means there is much hope for eradicating water scarcity by improving water management and distribution.

Governments in the global South, influenced by increasing levels of water scarcity within their countries and by pressure from multi-national lending institutions,

³ Water deprivation refers to ‘the inability to obtain water of adequate quantity and quality to sustain health and livelihood’ (Crow, 2002: 41).

⁴ People living in the semi-arid regions of sub-Saharan Africa and Asia will comprise the majority of this population (Seckler et al., 1998 in Becker et al., 2001).

⁵ Water scarcity is defined by water engineers as a condition in which the annual availability of renewable fresh water is 1,000 cubic meters or less per person in the population.

have increasingly 1. incorporated market principles into water management (Cleaver, 1998) 2. privatized or partially privatized water services (Allouche and Finger, 2000; Fauconnier, 1999) and 3. transferred management of water services from state agencies to local user groups (Koppen, 1998; Zwartveen, 1998). However, evidence suggests that whether the provision of water is delegated to the state, to private companies or to local user groups in the global South, poor women's and men's water needs are not given sufficient consideration (Cleaver, 1998; Regmi and Fawcett, 1999; Hans, 2001; Crow and Sultana, 2002).

The Fallacy of Sectoral Divisions

Contrary to the way people actually obtain and use water, water management policies typically compartmentalize different 'types' of water according to its different uses. Policy makers have commonly classified water into 'productive' and 'domestic' sub-sectors. In the policy arena, 'domestic' water generally refers to water that is used in households to meet basic needs. 'Productive' water is water that is used in agriculture, cattle grazing or industry- water that generates income. However, in reality, water used at the household level, typically by women, is used for a variety of activities, some of which generate income- such as small-scale agriculture, the keeping of livestock, or brick-making (Cleaver and Elson, 1995). Conversely, water allocated to irrigation can be used for a variety of purposes other than income-generating agriculture. Irrigation systems often supply water necessary for fishing, keeping livestock, growing homestead gardens, meeting household (human) needs, and maintaining micro-enterprise (Meinzen-Dick and Bakker, 1999).

Thus, the most common water sector division is false for (at least) two reasons. First, the assumption that this is a clear distinction between 'productive' and 'domestic' activities is erroneous because many activities that occur 'at the household level' generate income, and are thus productive according to any definition. Second, people, particularly in rural areas of the global South, do not themselves distinguish different 'types' of water according to its various uses. Water obtained through an irrigation system can help people to meet their 'basic water needs' while water obtained from a hand pump and carried to a household can quite easily be used to grow income-generating crops.

Government policies tend to further categorize water into agricultural, industrial, and health and sanitation sub-sectors. Perhaps because it is difficult to quantify income-generating possibilities of water used at the household level, governments and policy makers often focus on supplying water to the agriculture sector⁶ (Cleaver and Elson, 1995). State water development funds in the global South are typically appropriated to irrigation systems because governments are interested in water provision that will generate monetary revenues and food self-sufficiency (Hess and Ross, 1997). It is possible that men are more extensively involved in agricultural production than women, and thus men would more directly benefit from agricultural subsidies (e.g., irrigation systems). Though women are involved in agricultural production, and do stand to receive benefits from improved irrigation systems (Meinzen-Dick and Zwarteveen, 1998; Zwarteveen, 1998), women are also largely responsible for providing water for household uses, such as drinking, washing and cooking (Regmi and Fawcett, 1999; Crow, 2002). Thus water supply and management agencies need to consider how people actually obtain and use water when allocating resources to water management and supply and when designing and implementing country level water sector reforms.

Cleaver (1998) asserts that policy makers have recently begun to incorporate an integrated resources management approach, a more holistic approach in which sectoral divisions are not necessarily useful. However, it is possible that the rhetoric of ‘integrated resources management’ is not being translated into actual changes in water management and supply in most countries in the global South. Governments in the global South continue to discuss the need to meet food self-sufficiency as an endeavor distinct from meeting ‘basic water needs.’

Furthermore, the literature on water from a gender perspective tends to perpetuate sectoral divisions by focusing solely on irrigation (e.g., Koppen, 1998; Zwarteveen, 1998) or on drinking water projects (e.g., Regmi and Fawcett, 1999). There is also a general tendency for the literature in this area to focus on ‘water projects’ and water management. Some papers, for example, discuss the relationship between women’s water needs, social equity and women’s empowerment but only in the context of

⁶ Most countries have a national water policy that does place importance on domestic water supply, but this usually this refers only to municipal water systems (Vani et al. 1995 in Meinzen-Dick et al. 1997).

improving government-level water policy or water projects (e.g., Cleaver, 1998; Hans, 2001). Commonly, the needs of the vast majority who live outside the domain of water projects, and managed water systems, are overlooked.

To avoid the fallacies of sectoral divisions ‘integrated resource management’ must be taken seriously in studies on water management and by water management projects. Studies on water management and access to water need to investigate how people choose to allocate given quantities of water to types of activities (e.g. drinking, home gardens, agroforestry). Studies must also examine how vast numbers of people who do not benefit from ‘water projects’ and who are not affected by state water policy obtain water. The quality, quantity and social distribution of water resources for people throughout the world must be better understood. In particular, how the constraints on access to and control over water that people face according to their gender, ethnic, caste, and class identities must be considered.

2. A SOCIAL RELATIONS APPROACH TO UNDERSTANDING ACCESS TO WATER

Eva Rathgeber (1996), of the International Development Research Centre, posited that approaching water management from a gender perspective would require ‘a complete rethinking of the issues of access to water, of the differing and sometimes conflicting interests of men and women, of their relative input into and power over decision-making, and of the role and composition of the community.’ Many scholars (e.g., Cleaver and Elson, 1995; Cleaver, 1998; Meinzen-Dick and Bakker, 1999; Zwarteveen and Meinzen-Dick, 2001; Crow and Sultana, 2002) have investigated the differing constraints on access to water that women versus men face. However, there must be further examination and disaggregation of constraints on access to and control over water resources that different ‘types’ of people face, in specific ‘places.’ As Meinzen-Dick et al. (1997: 1311) note,

Class and caste; land owning vs landless; tenant and owner; life cycle stage; where there is polygyny, the marriage order; where a female head of household or part of a joint or male-headed; and household composition—all are sources of variance which may be greater than their common interest as women. Class and power relationships crosscut gender.

In order to improve access to safe water, we must first understand how a person's numerous, interrelated identities constrain her ability to obtain and control water resources. Employing a 'social relations approach' is one way to begin to improve our understanding of men's and women's divergent use of and access to water across the global South. Kabeer (1994: 54) describes a 'social relations approach' to understanding inequalities between men and women of different class, ethnic, religious backgrounds. It seeks to discern intersections and connections between different 'levels and spheres of society,' and between individuals and institutions.

Men's and women's sexually differentiated bodies are a reality for the human species. However, people's conceptions of masculinity and femininity are influenced by socially constructed normative standards and rules of masculinity and femininity more than by biological difference. Fortunately, people are also capable of resisting or of reinterpreting these norms. There is a range of possibilities for gender roles, and variable pressure to conform to particular identities across societies. Clearly, other social relations, such as class, influence how biological difference is translated into gender inequality (Kabeer, 1994: 56-57). A social relations-approach therefore, does not consider gender or class in isolation from one another, and thus does not consider either as the determining principle of an individual's identity or social position (57).

Family structures determine how assets, power and labor are allocated. The relationships within families are ascribed according to gender.

Although varying across different class and social groupings, the rules and practices governing marriage, procreation, inheritance and parenting all combine to ensure that, in much of the world, the care and nurture of the family is seen primarily as women's responsibility, while entitlement to material resources is mainly invested in men, hence the 'monotonous similarity' of women's oppression in different parts of the world (Kabeer, 1994: 58).

According to a 'social relations approach,' the apparent commonalities in gender relations across the globe must be understood as manifestations of historically specific class and gender relations.

An underlying manifestation of gender relations across societal institutions is the gender division in labor. The gender division of labor becomes a social structure when the allocation of particular tasks to particular people constrains other options for/of practice (Connell, 1987 in Kabeer, 1994: 59). The transformation of the gender division

of labor into social structure occurs in numerous, intersecting ways. In many societies, a system that might have begun simply as a way to organize labor may, over time and through practice, ‘take on a normative significance so that values become embodied in the tasks and in who does them’ (59). That is, the specific tasks that are allocated to women and to men may become inextricably tied to what it means to be a ‘woman’ or a ‘man’ in various contexts, with core gender identities.

Over time men and women acquire capabilities in ‘their’ divergent tasks (Kabeer, 1994: 59; Suda, 1996: 77). In many societies, for example, women are regarded as the ‘natural’ caregivers of the family because they know how to cook, clean, and care for the infirm. These skills are often viewed as a kind of natural aptitude or as instincts that women alone possess. While there may be a genetic component to sets of skills, genetics should not be grounds for limiting an individual’s options. Also, people generally improve skills through use. The concept of gender relations can alternatively be thought of as ‘a feminist theorization of institutions’ (Kabeer, 1994: 61).

In sum, according to the gender-relations approach, women should no longer be viewed as a discrete category of analysis. Gender is seen as one aspect of social relations. As Kabeer expounds, ‘while ‘gender is never absent’, it is never present in its pure form’ (65); it is always bound up with other social inequalities, such as class and race. This approach seeks to avoid generalizations of more structuralist approaches, such as the idea that women’s oppression is the result of ‘the capitalist mode of production’ or of ‘global patriarchy’ (65). Finally, a social relations approach is useful for explaining the bounds on decision-making that might seem irrational in a utility-maximization framework.

How Gender Relations Mediate the Social Relations of Access to Water

Gender relations influence access to and control over water resources in three ways:

1. the gender division of labor,
2. the control of productive asset ownership and
3. the intra-household allocation of resources according to gender.

Agarwal (1997b) explains that women of poor households are highly dependent upon non-privatized resources given the gender division of labor (women are typically

responsible for the collection of firewood, non-timber forest products, food and health) and, their limited ownership and access to private property resources (land, water) and the unequal distribution of basic resources within households.

First, there are gender divisions of work in all societies. In the global South, women are largely responsible for water collection for households (e.g., Regmi and Fawcett, 1999). In some areas in the ‘developing world’ women spend as much as twenty-five percent of their productive time collecting water (Sullivan, 2001). A study by Nigam et al. (1998), based in a watershed in south Asia, found that women and girls collect double the amount of water per annum as men and boys⁷ (Neto and Tropp, 2000: 233). Women make choices about the water they collect. Often they must decide between a water source that is distant but safe and one that is near but unsafe (Nyong and Kanroglou, 2001; Crow and Sultana, 2002). The amount of time women spend collecting water affects the amount of time they have for education and paid work.

Second, gendered social relations affect access to water in the sphere of productive asset ownership. To understand the extent of a gender gap in property rights over natural resources, it is useful to distinguish formal ownership of a resource from bundles of rights (Zwarteveen and Meinzen-Dick, 2001). Writing about communal irrigation systems, Schlager and Ostrom (1992) differentiate ‘use rights’ of access and withdrawal from ‘rights of control,’ which include management, exclusion and alienation (Zwarteveen and Meinzen-Dick, 2001). In irrigation systems, formal ownership rights are typically vested in men (as household head or as farmers). Often, women can only gain water in these systems through their role of wife or mother of the rights holders (ibid).

Rights to water resources are often assigned in ways that favor landowners, and/or exclude those who do not have formal rights to land. Koppen (1998) examined the links between access to water, water rights and land tenure. She used evidence from case studies conducted in Africa, Asia and Latin America to show how ‘public irrigation agencies either included or excluded women and men smallholders as rights holders to irrigated land and water’ (361). According to Koppen, new water rights must be vested in land users rather than landowners. Moreover, Koppen found that poor women and men

⁷ This study measured the amount of water that people collected from hand pumps.

must be included in the construction of irrigation systems and in community forums on water irrigation projects from their inception. As irrigation project management has been transferred from the state to the community or local user-groups, evidence suggests that intra-community power differences have been largely ignored. Moreover, the implications of these power differences on the effectiveness and equity of water management has not been considered.

Water policy and academic literature on water management has tended to not distinguish, at a conceptual level, between a 'water-using community' and a 'decision-making community' (Cleaver and Elson, 1995: 10). In practice, water-using 'communities' tend to be predominantly women, while decision-making communities tend to be mostly men (Cleaver and Elson, 1995; Zwarteveen and Meinzen-Dick, 2001). Even when water-user associations are established to give all users a role in governance, other, more powerful governance institutions may continue to dictate water use and control water supply (e.g., Cleaver and Elson, 1995).

Across the globe, the majority of land, factories and finances are owned and/or controlled by men. Since water access in the rural global South is ultimately controlled by those who control land, industry and finances, men tend to control access to water (Crow and Sultana, 2002). Those who control water resources in the global South (governments, citizens and private enterprises) allocate water in ways that indirectly favor men's interests over women's interests (e.g., Crow, 2002). Crow and Sultana posit that both global water policy and 'local norms' delineate divergent uses of water according to gender. That is, men tend to dominate so-called productive uses of water, such as irrigation used for large-scale agriculture, while women tend to manage water at the household level. Rights to water, like land, are a product of social norms and thus who has rights will relate to a person's position in her family, local community and national culture. As water becomes scarcer, local and national norms and laws relating to water are changing. The concept of water rights as 'negotiated outcomes' of shifting social norms and environmental conditions is useful when thinking about access to water in the global South (Meinzen-Dick and Pradhan, 2002: 1).

Third, gender relations inside and outside households may influence social practices. Clearly cultural or social norms, at the local and national level, affect how and

to whom water is allocated within communal water management regimes. Research must also consider how intra-household gender relations affect access to water. The two common approaches to household analysis conceptualize the household in contradictory ways. One view, that of neoclassical economics and Marxists theories, sees the household 'as a unit of altruistic decision making' (Kabeer, 1994: 96). The second view, employed by a diversity of scholars, including game theorists and feminist scholars, sees the household as 'a site of bargaining and conflict' (Kabeer, 1994: 96). According to Kabeer (1994: 97), in the economic view, the complexity of

'everyday lived reality' is compressed into a few, tightly bounded concepts which lend themselves to quantitative approximation, econometric manipulation and determinate outcomes; the rest is discarded as so much 'noise.'

However, some of this 'noise' is comprised of structural constraints, institutional processes and cultural variations that limit and shape choices within and outside of the household. According to Agarwal (1997a) there are three general determinants of women's bargaining power within a household: 1. women's independent and economic and legal status, 2. the degree of external support (economic, social and political) they receive from friends and kin, from the state, and from gender progressive groups and 3. gender ideology (gendered norms and perceptions about women's and men's rights, roles and responsibilities).

Communities, NGOs, and governments must take women's and men's differing status, constraints, and power into account when thinking about the physical and social dimensions of water management. Women and men are constrained in divergent ways according to their specific cultural norms. Thus responses to water management dilemmas must incorporate the unique social relations of the target population.

Lack of Access to Safe Water and Poverty

In water-scarce environments, such as much of Sub-Saharan Africa, the poor in particular suffer from an inability to access adequate amounts of safe water. Many poor communities throughout the world worry about water supply above all else. For example, rural communities in the Nyando basin of western Kenya reported that their chief concern is 'the availability of safe, reliable water supplies throughout the year' (Swallow, 2002: 117). Lack of water resources can be a primary cause of a person's (or household's)

poverty. Conversely, lack of financial resources can result in an individual's or household's inability to obtain an adequate quantity of safe water. Thus lack of water resources and lack of financial resources are linked together in a negative feedback loop that can keep individuals, households and communities in a 'dynamic poverty trap.' The notion of poverty traps, developed by economists observing areas in sub-Saharan Africa, refers to situations where people are caught in a cycle of financial poverty, low agricultural production and increasing environmental degradation. According to this notion, people at the household level remain in poverty because they cannot procure external finance (due to weak credit markets) and are not able to self-finance investments (Barrett et al., 2002 in Swallow, 2002: 118). This creates a cycle of increasing poverty and increasing environmental degradation.

People in 'water poverty traps' experience low incomes, face high fixed costs of water supply facilities, and lack credit for water investments. This combination of factors results in circumstances observed across East Africa where the poor pay high unit prices for water, do not participate in activities that require relatively large amounts of water and do not invest in water profitable management schemes (Swallow, 2002: 118). Under certain environmental conditions, Swallow (2002: 118) posits that entire communities are trapped in a negative feedback loop (self-perpetuating process) of 1. low levels of group investment in water and land resources 2. resource degradation 3. lack of investment in profit-generating activities (such as horticulture or dairy production) and 4. chronic poverty. Swallow describes sufficient conditions for the existence of poverty traps at the household and community level. Extensive research is needed to determine which of these conditions or factors communities facing water scarcity in various parts of the global South experience.

3. IS THERE STATISTICAL EVIDENCE FOR A CONNECTION BETWEEN WATER AND MATERIAL POVERTY?

Evidence suggests that there is a relationship between water supply coverage and poverty levels for countries in the global South and that there is also a relationship between levels of female school enrolment, access to water and poverty. We gathered data on a broad range of topics relating to human and economic development, including

gender equity, education levels, and poverty levels, from the United Nations Development Program's (2001) 'Human Development Reports'. Specifically, we created a database with 48 variables from UNDP sources. The maximum number of observations for any variable is 135 countries. We collected data on levels of water coverage, child mortality and child health from UNICEF (2001). The data on water coverage was originally gathered for a UNICEF/WHO joint project, entitled 'Global Water and Sanitation Assessment 2000.' There are 135 country-level observations for each UNICEF variable.

To investigate a water-poverty connection we employed ordinary least square regression. In Model 1, we selected 'Population living below the poverty line (2000)⁸ 'as the dependent variable (n=60) and 'Population using improved drinking water sources 2000'⁹ 'as the independent variable (n=135). In Model 2, we added the variable 'Combined primary, secondary, and tertiary enrolment ratio, female (1999)' to see if poverty levels were related to both access to water and female school enrolment.

Table 1. Unstandardized Coefficients from the Regression of '% Population Living Below the Poverty Line' on Selected Independent Variables: 60 Countries

Independent Variables	Model 1	Model 2
Intercept	120.833	120.586
Population using improved water sources (%) 2000	-.905*	-.448*
Female Enrolment Ratio 2000-01	-	-.636*
R	.599	.723
R ²	.359	.523
Number of Countries	60	60

*p≤.01

In order to examine the relationship between water coverage and poverty levels at a regional level, we first made a table (Table 2) to show the average water, poverty and female

⁸ 'Population living below the poverty line 2000' is the percent of the population living on less than \$2 PPP per day.

⁹ 'Access to improved water and sanitation is estimated using technology as an indicator. Definitions of 'improved' technologies are thus based on assumptions that certain technologies are better for health than others. These assumptions may not be true in all individual cases. For instance, in some locations an unprotected household well may provide a better supply of water, both in terms of quantity and quality of water, than a household connection which may be subject to intermittence and poor water quality' (WHO Water and Sanitation Report 2000).

enrolment levels for each of 9 UNDP world regions. We then carried out independent t-tests of water coverage and poverty level means by region.

Table 2. Mean Poverty, Water and Female Enrolment Levels, By Region

UNDP's 9 World Regions		Population living below the poverty line (%) (\$2 PPP 1993) 2000-2001	Population using improved drinking water sources (%) TOTAL	Combined primary, secondary, tertiary gross enrolment ratio (%) 1999 FEMALE
Arab States	N	7	15	15
	Mean	19.99	83.73	59.87
East Asia and the Pacific	N	5	13	12
	Mean	51.86	65.15	62.75
Latin America and the Caribbean	N	17	28	25
	Mean	32.91	87.43	70.20
South Asia	N	5	7	6
	Mean	75.30	85.43	51.67
Southern Europe	N	1	2	2
	Mean	18.00	91.00	62.50
Sub-Saharan Africa	N	24	41	41
	Mean	72.40	61.85	41.27
Central and Eastern Europe and the CIS	N		16	16
	Mean		88.31	75.44
High Income OECD	N		11	11
	Mean		100.00	101.09
Other UN member countries	N		1	1
	Mean		100.00	79.00
Total	N	59	134	129
	Mean	52.3847	78.21	61.48

While there is a significant difference between the percent of people living below the poverty line in East Asia compared to Sub-Saharan Africa ($t=-2.7, p\leq.05$), there is no significant difference between the percent of people using improved water sources in East Asia compared to Sub-Saharan Africa. Again, there is a significant difference between the percent of people living below the poverty line in Latin America and the Caribbean compared to South Asia ($t=-5.1, p\leq.01$), but there is no significant difference between the percent of people using improved water sources in Latin America and the Caribbean compared to South Asia.

Discussion

Regression 'Model 1' shows that the percent population living below the poverty line (percent below poverty line) is negatively related to the percent population using improved water sources (water coverage). Specifically, as the percent below poverty line increases by one unit, water coverage decreases by .9 units. However R^2 , the proportion of variance accounted for, indicates that only about 40 percent of the variance in poverty levels is accounted for by water coverage levels. In sum, the results of regression Model 1 suggest that water coverage is related to poverty levels but clearly factors other than water coverage influence poverty levels.

Regression 'Model 2' shows that the percent below poverty line is negatively related to both water coverage and female education enrolment levels. Specifically, as the percent below the poverty line increases by one unit, the female education enrolment ratio decreases by -.64 units and water coverage decreases by-.45 units. R^2 (the proportion of variance accounted for) for Model 2 indicates that about 50 percent of the variance in poverty levels is accounted for by female enrolment and water coverage levels. We ran more regressions of 'percent population living below the poverty line' by over 15 other independent variables relating to gender, development assistance, and other 'development indicators.' However all regression models that included more than two independent variables resulted in non-significant regression coefficients for nearly every variable. We suspect that there is a high degree of correlation between most independent variables and that this multicollinearity skewed the results.

The results of the independent t-tests indicate that the relationship between water poverty and water coverage levels vary significantly by world region. This suggests that further investigation of the relationships between poverty, water coverage and gender needs to take place at the regional level. Unfortunately data is available for an insufficient number of countries in each region to do this analysis.

Although the data collected by UNICEF and WHO on 'access to improved water sources' cannot be understood as an accurate depiction of the percentage of people with access to adequate amounts of safe water, the trends found in the data will most likely hold as data collection methods improve. Furthermore, people in different parts of the world who earn less than \$2PPP are not necessarily equally unable to obtain needed

resources. However, earning below \$2PPP does indicate a general inability to obtain access to credit and other productive assets. In sum, statistical evidence does indicate a relationship between lack of access to water, financial poverty, and female enrolment rates. Future studies will need to improve methods for measuring water coverage and will need to focus on regions and sub-regions to understand how access to water, poverty and female enrolment levels are or are not connected.

4. CAN TIME ALLOCATION STUDIES ILLUMINATE HOW ACCESS TO WATER MAY CONSTRAIN LIVELIHOOD AND HEALTH?

In order to understand how improving access to water could lead to the empowerment of women and girls, one must first understand how water access influences the decisions people make regarding the use of their time.

Across the globe, women do more unpaid work than men. Within families, women are generally responsible for tasks that benefit all members of the household, such as housecleaning and food shopping (Berthide et al., 1976). By examining how much time women spend on different household tasks (the work of reproducing the household) it is possible to value this work. Valuing unpaid work can be done by considering the cost of paying someone else to do that work, or considering opportunity costs that do have monetary values. For example, if a woman could earn a certain wage in paid labor, her time doing unpaid labor must be worth at least that wage. Recognition of the unpaid work of women may encourage, government agencies, donor agencies, and 'local' groups to consider women's needs into their policies and practices.

In 1950, the United Nations based the standard for National Accounts on a calculation of goods and services that could be traded in markets. Work that is unpaid, whether for 'reproductive' purposes or for productive purposes, is not reflected in National Accounts (UNIFEM, 1997). If state governments and donor agencies do not view women as contributors to a local (or national) economy, they may exclude women from 'development' or resource management projects. In the case of water projects in particular, if governments and/or donor agencies do not consider unpaid ('domestic') work valuable, they will most likely fail to consider domestic water provision valuable.

Time allocation studies of women's and men's time in rural Africa and Asia could increase women's agency by revealing the importance of women's work.

Cultural understandings of women's and men's roles within the household may also lead to an under-valuation of women's work (and of women in general). Suda (1996: 77) states that women's and girl's reproductive labor in Kenya is unpaid and is not considered 'real' work. Cultural norms in much of the world most likely serve to undervalue women's domestic work. As Fenstermaker (2002: 106) affirms (speaking of U.S. families),

Hardly a question of who has more time, or whose time is worth more, who has more skill, or who has more power, it is clear that a complicated relation between the structure of work imperatives and the structure of normative expectations attached to work as *gendered* determines the ultimate allocation of household members' time to work and home.

Analysis of time expenditure is particularly helpful because time (as opposed to money or products) is comparable across cultures¹⁰ (Johnson, 1978). According to Johnson (1996) 'descriptions of time allocation provide evidence concerning which activities individuals deem worthy of their time. Time is scarce in the sense that people must decide how to spend their time in ways that seem best to them.' Because every person has only 24 hours in a day, any increase in time spent in one activity must correspond to a decrease in time spent in another activity. People make choices regarding their time allocation that relate to the costs and benefits of activities. If an individual changes how she allocates her time, she might be able to increase her overall benefits from a set amount of time, generating efficiency gains. Many models of time allocation produce models of opportunity costs, the value of the next best activity (Hames, 1992).

Time allocation studies generate quantitative measures of behaviors (states or activities) of individuals or groups over time. According to Johnson (1996) the basic methodological principle in time allocation research is to make an effort to know what all members of a community are doing 24 hours a day, 365 days a year. There are a variety of possible methods for time allocation research, some of which vary according to investigators' research questions, sample sizes, ethnographic contexts (Hames, 1992) and

¹⁰ Clearly, how cultures understand time varies.

time and budget constraints. Generally, researchers collect time allocation data through informants or fieldworker's direct observations.

Applying Time Allocation to Research on Access to Water

At present, few data exist on how most people in rural areas of the global South obtain access to water. Future research will need to examine rural areas to determine precisely who collects water, how much time water collection consumes, and the quality of water available to each user. By gathering data on water collection and other work time of people in rural areas, researchers could discover the effect of water collection on how people allocate their time. Many studies show that women and girls are the predominant collectors of water for domestic use in rural areas in the Global South. However, Nyong and Kanroglou (2001) found that custom and culture of the local community dictated who collected water (based on a study of a rural village in Nigeria).

Whittington et al (1990) estimated the value of time spent collecting water for households in Ukanda, Kenya to be a value nearly equal to the wage rate for unskilled labor. Khandker (1987) studied the relationship between women's time allocation and household non-market production (child care, family health, nutrition and education) in rural Bangladesh. Khandker found that policy interventions that raise women's wages have the dual effect of increasing women's non-household market activities and decreasing fertility. Based on a case study in a poor, rural district in India, James et al. (2002) found that when improvements to water access are linked with opportunities for micro-enterprise, time once spent on water collection is converted to earned income. In areas where women and girls are responsible for water collections, these findings suggest that 1. 'improved access to water' would influence women's and girls' participation in daily activities, 2. release time from water collection lead would to increased wages for women through increased non-market production and, 3. release time from water collection for girls would translate to higher levels of education.

In sum, time allocation studies can answer questions vital to improving our understanding of the social constraints on access to water. Time allocation methods can help determine the value of time spent collecting water and place a value on women's

and girl's time in non-market production. Research that focuses on communities that face water scarcity must address two questions in particular.

1. How is water allocated within and across communities?
2. How do people choose to allocate given quantities of water to types of activities (e.g. drinking, home gardens, agroforestry)?

5. CONCLUSIONS

So, we have begun to open up three issues. On the first, the social relationships giving access to water, we suggest that there is a lot to be discovered about women, men and access to water. We want to know how much time it takes to collect water, who does that work, and how safe is the water they collect. If it is the case in most parts of the world that women collect water for use in the home, then the collection time and the opportunity cost of that collection time may illuminate the subordination of women. Social practices that dictate this division of labor may keep women and girls tied to the home and illiterate.

On the second question, the connections between poverty and access to water, we suggest that there are a series of interactions between water and poverty. Such global statistics as are available suggest that there is a connection between poverty and lack of access to water. We think the connection goes both ways. Use of unsafe water for drinking causes illness and, in the absence of guaranteed health care and unemployment provision, ill health leads to unemployment and low productivity. Both of these conditions lead to poverty. Similarly, the time devoted to water collection may reduce the time available for home garden cultivation, education and other household tasks. And, also, lack of access to water in the home may restrict the productivity and range of livelihoods available to those working in and around the home.

In the opposite direction, poverty and the lack of influence that goes with poverty, may lead to limited voice over the provision of water. And, we suspect, that the failure of most post-colonial governments to support delivery of household water to urban slums and rural households reflects the inadequate representation of women and the poor in government.

It is possible that concerted efforts to challenge the various ideologies of domesticity that support these conditions in different parts of the world, could be beneficial. Greater recognition of women's tactical needs, for assistance with childcare, cooking energy and clean water, could bring significant improvements in health and literacy. These are areas where collective action could significantly improve human flourishing.

Along with concern for the effect of ideologies of domesticity, it is desirable that concern about gender and water be directed beyond government supported projects to the effects of social change on access to water. As we have noted, state-backed provision of water supplies water to only a small proportion of the population in the global south. A range of social forces may determine the quality and quantity of water available to poor households, particularly in rural areas. The appropriation of land and water for new forms of production, such as shrimp farming in Bangladesh or horticulture in Kenya, may diminish and degrade the water available to other users, including households, farms, livestock, forests and wildlife. New forms of production may also be taking away the land required by older forms of production, and degrading the conditions that ensure the reproduction of their water sources. These conflicts among different users and forms of production sometimes straddle international boundaries and gain attention for that reason. Often such conflicts are more localized. They too are nonetheless worthy of our attention.

On the third question, we suggest that time allocation studies in selected villages and slums could illuminate the social determinants of access to water. We want to know who collects water, from what water sources, and how long that water collection takes.

Even though demand for water is increasing in the face of finite supply and reduced government spending, providing all people with adequate amounts of safe water should not be an insurmountable goal. Water for drinking and other domestic uses and for small-scale livelihoods constitutes a small proportion of overall human demand for water.

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