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831.459.2833 (Voice) • 831.459.3518 (Fax) global@cats.ucsc.edu

Water: gender and material inequalities in the global South

Ben Crow

Center for Global, International and Regional Studies
and
the Department of Sociology
University of California, Santa Cruz [1]

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Ben Crow, University of California Santa Cruz[1]

2.1.1 Introduction

Figure 2.1: With empty water pots on their heads, women from a downtown locality in Mumbai (Bombay) October 29, 1998 stage a road block while demanding from the government a steady supply of water and electricity. The women were complaining of having to stand in long queues at a water tap from which water seldom came. (AP Photo/Sherwin Crasto)

> 'More than one billion people are deprived of access to water of sufficient quantity and quality to meet even minimal levels of health, income, and freedom from drudgery. Poor women are particularly affected. It is primarily women who bear the daily burden of hauling heavy buckets long distances to meet the domestic water needs of their families…Meeting the multifaceted water needs of poor men and women should be a priority in water policy…' (Koppen, B. van 2000: vii).

Access to water is a prerequisite for health and livelihood. Access to clean drinking water is key to the prevention of some of the most common diseases. Access to adequate water for

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agriculture, fishing or craft production may also be necessary for people to make a living. Most of the world's people and the great majority of the world's poor live in rural areas of the global South. For the poor in the global South, access to water is routinely inadequate to sustain health and livelihood. Water borne disease is estimated to be killing one child every 8 seconds (Brandon, J 2001). Box 2.2, below, suggests this death toll could be substantially reduced with modest improvements in water supply.

Because water is pivotal for health and livelihoods, insufficient access to water may be a significant cause of poverty and conflict (Figure 2.1 above). Inadequate access to clean water for drinking causes ill health. Inadequate access to water for agriculture and other livelihoods may be a cause of material deprivation. Social scientists are beginning to talk about *water deprivation* as an aspect of poverty. Water deprivation can be defined as the inability reliably to obtain water of adequate quantity and quality to sustain health and livelihood.

How people get access to water is surprisingly complex and varied. That access involves natural conditions, human tools and social practices. This section of the course is intended to help you think about *modes of access to water* (see Box 2.1), the main social and technical conditions through which people gain command over water. Modes of access have particular characteristics. Some are free, others cost money. Some, like well-water, require work on the part of the water consumer, while other modes of access, like piped water, may entail little work. The potential for change and for sustainable use of water may also vary according to the mode of access.

Differences in access to water also create inequality and poverty. The water security of rich and poor, and women and men, varies significantly, and we can begin to understand these inequalities by exploring each mode of access to water. The focus of this paper is on inequalities in access to water in rural areas of the global South. Urban areas are referred to (as in Figure 2.1) but problems of water access in cities are not tackled here.

Box 2.1 Modes of access to water

Access to water is achieved through a range of social and technical relations falling into five main modes of access:

1 Private ownership of land and a pump providing access to water from the ground or a water course.

2 Common property access – obtaining water from a river, pond or public tank through some communal rights of access.

3 Open access: unregulated access to a common resource (this mode of access is often, confusingly, termed common propoerty).

4 State-backed provision – access to water through a government project, eg municipal tap water, or the water of an irrigation project.

5 Market access – purchase of water, eg from the owner of a pump or a water truck.

Each of these modes of access has particular social, technical and environmental characteristics. The social characteristics that may vary by mode include labour-time, monetary cost, how decisions are made and by whom, and long-term processes of change. The technical characteristics include the range of technologies and the processes of innovation associated with that mode. Natural or environmental characteristics include the sustainability of the mode.

The modes of access may be combined. So, for example, private ownership of land and a pump often supports selling of surplus water.

As we shall see in the next section, water deprivation is widespread. At the beginning of the twenty-first century it has to be tackled under unpromising conditions. Fresh water appears to be becoming more scarce in many parts of the world and governments across the globe are cutting back on their spending on water. There is plenty of salt water in the world's oceans. But it is estimated (Richards 2001: 4) that we are currently using 50% of available runoff, that is water falling as rain and snow. A recent editorial (Somerville and Briscoe 2001) in the influential journal *Science* described the severe strain on many of the world's water systems in these terms: 'Many rivers no longer flow all the way to the sea; 50% of the world's wetlands have disappeared; and many major groundwater aquifers are being mined unsustainably, with water tables in parts of Mexico, India, China and North Africa declining by as much as 1 m per year'. The desalination of sea water is still too expensive to provide a widely-useable alternative source of fresh water, and in many, perhaps most, parts of the world, ancient stores of water found underground are being depleted faster than they can be replaced by seepage from rainfall, river flows and snow melt.

At the same time that water is becoming scarce, government action on water is becoming more constrained. Governments are tending to see their roles more as promoters and facilitators, rather than providers, of water supply Cleaver and Elson (1995: 3) describe the change in these terms:

> 'The 1980s were designated the International Drinking Water Supply and Sanitation Decade. In the early years of the decade, the central role of the state in the provision of water resources was recognized and generally accepted. Water and sanitation were considered to be basic needs to be provided for through effective central government planning (Lee, 1992). However, the Water Decade coincided with a period of economic stagnation or decline in many countries and with a general reconsideration of the role of the state in the economy. This led to the widespread adoption of economic policy reform, aimed at reducing the role of the public sector and giving a greater role to the market and the private sector. The belief underpinning this move was that this kind of structural adjustment would restore economic growth through more efficient allocation of resources.'

These unpromising conditions of increasing scarcity and constrained action by government demand innovation if water deprivation is to be tackled effectively. That innovation will require us to understand the technical, social and natural characteristics of the main modes of water access.

Box 2.2: Improved water supplies could save 2 million children each year

It is estimated (World Bank 1992) that, if all people had adequate water and sanitation facilities, about 2 million fewer children would die from diarrhea each year. Great progress could be made in most developing countries just by improving the water quality from "bad" (for example, more than 1,000 fecal coliforms per 100 milliliters of water) to "moderate" (fewer than 10 fecal coliforms per 100 milliliters).(Moe et al 1991)

Effects of improved water supply and sanitation on diarrhea morbidity

Conditions	Median reduction in cases of diarrhea (percent)
Improved water quality	16
Improved water availability	25
Improved water quality and availability	22
Improved excreta disposal	22

Source: Briscoe 1993: Table 2.

Box 2.2 describes how minimal improvements in water quality might save the lives of 2 million children each year. But what about the terms in the title of this paper, material and gender inequalities? How do they relate to questions of health and wealth?

Does inequality in access to water matter?

The argument of this text is that the rich often get much better access to water than the poor. These *material inequalities* of access matter because they illuminate some causes of wealth, poverty and illness. The rich continue to be rich partly because they have access to the productive possibilities, most obviously irrigated agriculture, which water makes possible. If the poor have worse access to water, not only is their ability to gain wealth constrained, but their health is also prejudiced.

Differences in access to water of men and women, *gender inequalities*, may hide unexamined decisions about social priorities. In many societies women and children do the work of collecting water for drinking and cooking, and for productive activities occurring near the home, such as livestock raising and home garden agriculture. This text suggests that the unfavorable access of women to water may have at least two results. Firstly, lower priority may be given to work taking place in the home, than in the fields and factories. If women's access is worse than men's, provision of water for drinking, cooking and home-based production may be undermined. This may prejudice the health of the household and the livelihood activities of women. Secondly, women's poor access to water often results in many hours spent collecting water each day. This reduces the time women might otherwise have for other activities.

Questions

This text seeks to address these questions:

a) How do people get access to and command over water in rural areas of the global South?

b) How do social practices in different modes of access influence sustainability and social justice?

The next section explores global changes in water use, how water consumption grew during the twentieth century and how the importance of different end uses of water changed in an industrialized country, the USA . Section 3 examines contrasts in access to water in the industrialized and non-industrialized worlds. Sections 4 to 7 describe some of the characteristics of each of the five modes of access to water.

2.1.2 Global change in water use

From 1900 till 1980 global water use rose roughly in line with population. Since then, however, there has been more effective use of water (Gleick 2000: Figure 1). In some parts of the world people are doing more, manufacturing more, growing more, with the same amount of water. So, there is a slight tendency for water use to rise less quickly than population. This slight tendency suggests that larger possibilities exist for doing more (human activities) with less (water). In the USA, for example, the largest water uses, for cooling thermal power stations, irrigation and industrial use. were static or declining in the years after 1980.

End uses of water in the industrialized and non-industrialized worlds

Water is used for many human purposes. These end uses are generally aggregated into three categories: domestic (household use of water for cooking, washing and bathing), agricultural (irrigation) and industrial (manufacturing, mineral extraction and energy production). Water for one purpose cannot necessarily be substituted for other purposes because these end uses have particular requirements and characteristics (Box 2.3). Nevertheless, all these water uses have to be met from fresh water sources.

Box 2.3 End uses of water

Water has a wide range of human uses with particular requirements and characteristics:

Drinking and cooking – requires clean water with low levels of bacterial contamination and mineral toxicity.

Washing and bathing – requires clean water and in many societies privacy is desired.

Irrigation – the rise of water use in agriculture has allowed global food production to keep up with population growth, it is the largest use of water, and access to irrigation water has generated inequality. Small scale irrigation, such as women's irrigation of kitchen garden, may be overlooked.

Industry – use of water for energy production, manufacture and mineral extraction. Small scale or home-based industry may have different requirements than large scale.

Environmental conservation – there is wide recognition that the reproduction of ecological systems is a goal for which water should be reserved.

Agriculture accounted for the greatest use of water by far in developing countries in 1995. Agriculture also exceeded industry for developed countries in 1995. Use of water for industrial purposes is predicted to rise in both regions, and in the industrialized world, this

category of water use is expected to become the largest use by 2020 (Pinstrup-Anderson, et al, 1997).

The next section examines contrasts in water use between the industrialized, or developed, North and the non-industrialized, or developing, South of the globe.

2.1.3 Contrasts in access to water, industrial and non-industrial worlds

Figure 2.5. Villagers try digging a well in search of potable drinking water, outside Tuna village in the Kandla district of India, 280 miles (450 kilometers) north of Bombay Friday June 12, 1998. When the photo was taken, areas around Kandla were still flooded from a cyclone which hit western India a few days earlier and the water was contaminated. (AP Photo)

In urban areas of the industrialized world access to clean, plentiful water is almost universal and approximately equitable. Well-established arrangements deliver processed water through pipes and faucets to virtually every home and enterprise at costs which are small in comparison to the revenues of most enterprises and to the incomes of all but the poorest households. These arrangements involve almost no input of domestic work for households and little input of work by enterprises. Access to water has become, at the end of a historical process, a public rather than a household responsibility. The history of this transition, the conflicts and choices it involved, and the social consequences it brought, may be largely forgotten in many parts of the industrialized world.

In the global South, particularly in rural areas, access to water is generally more problematic, more differentiated, less secure, and frequently requires substantial expenditures of work-time and money (Figure 2.5).

Behind this contrast lie significant technical and social achievements. The technical projects are obvious. Reservoirs are required to store water, filtration facilities to clean it, and pump and piping systems to deliver it to the tap. These projects require mostly simple technologies but substantial investment.

Less obvious are the social practices that sustain this investment. Perhaps the most important of these is the idea that water is a collective rather than an individual or household responsibility. Early in the industrial revolution, commercial and municipal bodies undertook to provide a reliable supply of clean water of adequate quantity to the various water users, households and productive enterprises. Few utilities of comparable resources and mandate exist in the non-industrialized world, and water provision, particularly in rural areas, remains largely an individual or household responsibility.

As a result, the contrast between water supply in the two worlds is stark:

	Social form of water supply	**End user supply**
Industrialized	Socialized and homogeneous	Secure, cheap, little labor input
Non-industrialized	Individualized and multiple sources	Insecure, expensive, high labor input

In the non-industrial, or developing, world, the capacity of governments and private enterprises, and the availability of resources required for investment in water infrastructure, are insufficient to achieve the social forms and levels of supply found in the industrial world. Specific histories of water provision have been written for few countries, so that broad generalization requires further specification and exploration. I think the stark contrasts are, nevertheless, generally correct.

Socialized water (in the form of piped water provided by a public or private utility) is available in almost all of the homes in villages and towns I know in the rural areas of USA, UK and France. Some farms and isolated homesteads have their own water supplies. And, in the poorer rural areas of the southern Europe, such as Spain, Italy and Portugal, access to piped water may be less common.

Nevertheless, households getting their water from a nearby river or pond or washing under a shared handpump may be rare even in the poorer countries of the industrialized North. Such access conditions are common in the countryside of the non-industrialized South, as the following photographs indicate.

Children washing at a handpump in Bangladesh (WHO photo).

A Tuareg man draws water from a well with his camel to irrigate crops on his oasis plot north the Saharan city of Agadez, Niger, Oct. 20, 1998. (AP Photo/David Guttenfelder)

Woman washing a child's hair using water from a bucket. Chiapas, Mexico. (AP photo)

Drought in Rajasthan India. Woman carrying water on her head with tanker and camels behind. (AP photo).

Where such data are reported, governments in the industrialized world estimate 100% of their populations have adequate water supply. Governments in the South do not make that claim (World Bank 2001: Table 9, p290).

Table 2.3 describes the proportion of the population of selected countries with piped water and within 15 minutes walk from a water source for both rural and urban areas.

Table 2.3 Access to safe water

COUNTRY OR AREA	% with piped water 1990-1996		% within 15min. walk from a water source 1990-1996	
	Urban	Rural	Urban	Rural
Africa				
Egypt	97	69	96	86
Morroco	94	18	91	41
Ghana	76	13	80	36
Kenya	87	20	86	31
Nigeria	63	12	74	32
Zimbabwe	97	18	98	42
Latin America				
Brazil	84	25	95	92
Guatamala	70	61	75	78
Peru	89	29	91	41
Asia				
Bangladesh	37	1	92	87
India	70	19	89	72
Indonesia	37	6	94	64
Uzebekistan	93	66	98	75

Source: UN (2000) World's Women 2000

These data suggest that few people in rural areas of the global South have access to piped water. Less than half of the population of most of the African countries are within 15 minutes walk of a safe water source.

Contrasts in the social form (individualized access from a river, for example, versus socialized access with piped water) and end-user supply of water have far-reaching implications for health and economic activities and for inequality. The presence of socialized water removes from the global North a profound source of inequality for health and work.

In the global South, absence of socialized water adds substantially to the work of maintaining the home. Water has to be collected and carried, often long distances, for all home-based activities, from washing and cooking to bathing, sanitation and livestock care. The division of work between men and women, in most parts of the world, allocates this water-carrying work primarily to women and girls. Along with the collection of fuel wood, water collection consumes one of the largest segments of

women's work time. There is little data on how much time water collection takes. Fragmentary evidence from Africa and Asia. suggests that the time women spend collecting water can be very significant, with 17.5 hours per week recorded in Senegal, 15.3 hours in the dry season in Mozambique and 7 hours reported from the Baroda region of India. The observations from Nepal confirm the important role of female children in the collection of water, with girls of 10 and over devoting almost 5 hours per week to the task (UN 2000).

In the following sections, we examine some of the characteristics of each mode of access to water (land ownership, common property, open access state-backed, market).

2.1.4 Gaining access to water through ownership of land and a pump

In many rural parts of the global South, some households gain access to water through private ownership. They own a pump of some sort that enables them to raise water from underground water sources or from a river.

A pump is not sufficient, in itself, to achieve access to water. There are generally rules about who can pump water and where. For this mode of access to water, the principal rules are those of land ownership. Ownership of land above a groundwater aquifer, or adjacent to a river, gives rights, in most parts of the world, to those water sources.

This mode of access to water is marked by material and gender inequalities. Material differences among households are the principal determinants of who owns land and pumps. In fact, ownership of land is often used as the simplest indicator of class differences in the countryside of the South. A household with a large land holding is, generally correctly, assumed to be a relatively rich household with the capacity to accumulate wealth. A landless household, or one owning little more than the land required for a home is assumed to be a poor household. So, this mode of access gives preference to the rich and seems to exclude the poor from command over water.

A rough estimate of land ownership in Bangladesh is provided in Table 2.5. If ownership of land is required to get access to water, then about one third of the population, those households in the bottom two rows of Table 2.5, the tenants and those without land, are excluded from access to water. Almost another half of the population, the poor peasants, has access to only a little land. These households are most unlikely to be able to afford to drill a tubewell and buy a pump so that they can get access to groundwater. It is only the middle and rich peasants, perhaps a quarter of the rural population, who are likely to be able to afford a pump and their own land to give them direct access to groundwater.

Table 2.5 Class and land ownership in rural Bangladesh

Class	Percent of rural population	% of land owned
Rich peasant	8	36
Middle peasant	15	33
Poor peasant	44	31
Tenants	8	0
Landless	26	0

Source: Howes 1985, Table 3.1 (with amendments)

So, access to water via one's own pump is strongly influenced by material inequalities, that is, the wealth or class of the household.

Gender inequalities also shape land-and-pump access to water. Commonly women own neither land nor pumps. Bina Agarwal writes:

> '…despite progressive legislation, few South Asian women own land; even fewer effectively control any. Why? A complex range of factors – social, administrative, and ideological – are found to underlie the persistent gap between women's legal rights and their actual ownership of land, and between ownership and control.'
>
> (Agarwal 1994, 1455).

The exclusion of the landless from access to water through ownership of land and a pump is not as complete as it appears at first sight. The recent rise, in some regions of some countries, of markets for groundwater for irrigation has provided wider access to water commanded by private pumps. Market access to water is examined in section 7.

In the following section, I describe some recent events in Bangladesh which provide an example of the complex consequences and unforeseen natural complications that can arise with access to water through ownership of land and a pump.

These events emphasize two aspects of access to water through private ownership. Firstly, private pumping of ground gives access to a resource that was not previously owned. It involves private appropriation of a common resource. Withdrawal of groundwater is not effectively regulated by laws or accepted practice, with consequences for inequality and overuse. Secondly, events underline that our knowledge of the natural world, in this case the toxicity of groundwater, is incomplete, leading to unforseen dangers as this mode of access to water is developed.

Groundwater: unacknowledged competition and unforeseen danger

In Bangladesh, the extraction of irrigation water using privately-owned tubewells has begun to lower water tables across the country, threatening access to clean water. Between one third and one half of drinking water handpumps may be left dry for some parts of the year (Sadeque 1996).

Electric- or diesel-powered irrigation tubewells can pump from deeper levels than drinking water handpumps can reach (Figure 2.6). Operating the lever of a handpump creates a partial vacuum at the top of the pipe that the surrounding air pressure fills with water, thus creating a pump. This process is limited to a depth of 25-30 ft by the weight of water which air pressure will sustain. By contrast,

many of the larger, ‘deep’ irrigation tubewells place a mechanical pump at the bottom of the well. These pumps are not limited by air pressure and can, therefore, pump water from much greater depths. Deep tubewells can lower the groundwater below the level to which shallow wells (which constitute the majority of the homestead drinking water tubewells) can operate. Consequently, many shallow, handpump tubewells are left inoperative for several weeks or months during the dry season:

> The availability of groundwater is dependent on the properties of the groundwater storage reservoir and the annual recharge from rainfall, rivers and flooding. Seasonal lowering of the groundwater level caused by increasing groundwater development runs the risk of periodic tubewell failure due to large annual variability of rainfall distribution.
>
> (Sadeque 1996: 2)

In Bangladesh, and in other parts of South Asia, the unregulated use of private pumps has thus created inequality between the use of deep tubewells for irrigation and the use of handpumps for drinking. This is a largely unreported, conflict over water in which the dominant, and male-dominated, priority of government, economic growth, clashes with lesser priorities of government, health and domestic water supply, reflecting women’s practical interests. This is a conflict arising from the use of an open access resource. We will examine different forms of property below (Box 2.5).

There is a further setback to the achievement of access to safe drinking water. Over the last few years, there has been growing concern about arsenic in the groundwater of Bengal, both in Bangladesh and in the adjacent Indian state of West Bengal. Arsenic contamination of groundwater has been confirmed across large areas of Bengal. Many parts of Bangladesh are severely affected, with over 20 million people currently exposed to contamination and 70 million more potentially at risk.

Recent geological investigation suggests arsenic occurs naturally in the deltaic sediments that lie under much of the country (Bangladesh Government 2000: 9). The use of groundwater for drinking has turned impurity into mass poisoning.

Tubewells are contaminated in 59 out of 64 districts in Bangladesh and 1 in 3 tubewells in affected areas are producing water with arsenic at higher than acceptable levels of 0.05 mg/l in many parts of the country (National Conference 1999)

Summary

There are significant inequalities in access to water through private ownership of land and a pump. Richer households are far more likely to gain access through this means than are poor households. These material inequalities may be somewhat mitigated by the emergence of markets for water for some uses. We will see in section 7, however, that market allocation of water provides unequal access.

With access through private ownership, conflicts between users and uses may be hidden. Women may also have less control over this mode of access than men because women rarely own or control land and women rarely own pumps.

Private ownership of land and a pump used to pump groundwater has a further characteristic. It gives access to a resource that was not previously owned. It involves private appropriation of a common resource. With groundwater levels falling rapidly in many parts of the global South (Somerville and

Briscoe 2001), this is a historic *tragedy of the commons* (see Box 2.5 and next section for a discussion of this idea).

In the next section, we examine access to water through common property.

2.1.5 Common property and open access to water

Thinking about human relations to the environment has been clarified by greater understanding of the range of forms of property which provide the social framework for access to natural resources. In particular, distinctions among communal property, open access and private property (Box 2.5 Forms of property and sustainability) assist our understanding of social pressures on natural resources.

Nomadic pastoralism provides an example of a relation to nature that has come to be treated as the equivalent of open access. In many parts of Africa and Asia, there are societies with long-standing ways of making a living from the tending of livestock and the use and sale of livestock products. These societies may have sophisticated understanding of seasonal changes in nature and the availability of grazing and water resources. The Maasai of Kenya (Figure 2.8) are such a society.

The photographer who took this photo in November 2000 reported that ‘East Africa's worst drought in 40 years is causing pain throughout Kenya, but no one has suffered like the country's nomads, who have wandered through their traditional grazing lands and found only dust.’ There was a drought in Northern Kenya in the year 2000, and there was less than expected rainfall for several years prior to that. The photographer’s caption is not incorrect. But it may be telling us less than the full story.

The Maasai have been excluded by historical and contemporary changes from land and water sources to which previously they had access, and new demands have been put upon those resources. A multidimensional process of *enclosure* has been encroaching for many years upon Maasai access to land and water. In the nineteenth century, colonial rule brought European settlers who claimed private property rights on land to which the Maasai, and others, had previously had rights of access. The idea of private property is one of the organizing principles of capitalism. A key characteristic of private property under capitalism is that non-owners are excluded from the use of the resource.

In recent years, the rise of export horticulture has been making new demands on water sources upon which the Maasai could once rely. The production of flowers for export to Europe has been growing rapidly in Kenya, generating significant quantities of foreign exchange. But its use of water is so large that there are fears it will dry up one of Kenya’s lakes, Lake Naivasha. Thus a recent BBC World Service program noted: ‘…the flower industry is very profitable. In export and employment terms, it is catching up with Kenya's main foreign earners, tea and coffee. In fact, most of the roses and carnations grown on the shores of the lake end up in supermarkets in the UK.’ Horticulture is the most prominent of a number of water uses making new demands upon the water sources of Northern Kenya. These demands constitute an unacknowledged enclosure of land and water to which the Maasai and other pastoralists previously had rights.

Figure 2.8. A Maasai family with their cattle travel through a dry river bed as they move in search of water near Kajiado, about 35 miles south of Nairobi, Kenya, Sept. 18, 2000. East Africa's worst drought in 40 years is causing pain throughout Kenya, but no one has suffered like the country's nomads, who have wandered through their traditional grazing lands and found only dust. (AP Photo/Sayyid Azim)

Box 2.5 describes the 'tragedy of the commons' in which the decline of environmental common property, such as forests and water resources, is attributed to the logic of individual access to common property. This view of the tragedy has been widely taken to mean that private property will lead to efficient use and conservation of resources. The reality seems to be more complex. Common property has often been, as I describe below, effectively managed, and private ownership, as we saw in the case of groundwater in Bangladesh, is no guarantee against overexploitation of a resource. As Agarwal describes in the case of India:

> 'Current research reveals systems of water management and methods of gathering firewood and fodder that were typically not destructive of nature…responsibility for resource management was linked to resource use via local community institutions. When control rights over these resources passed into the hands of the State or of individuals, this link was effectively broken…In particular, property rights vested in individuals have proved no guarantee for environmental regeneration…' (Agarwal 1997: 25).

Box 2.5 Forms of property and sustainability

Contemporary environmental debates have begun to clarify the range of forms of property to be found in the contemporary world and their environmental implications. In 1968, a biologist, Garrett Hardin, used ideas from economics to write an influential paper 'The tragedy of the commons' (Hardin 1968). This paper argued that users of common property had little incentive to conserve or maintain that property. So the owners of livestock supported on common grazing land might allow their cattle to overgraze that land. This is a section of what Hardin wrote:

As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks, "What is the utility to me of adding one more animal to my herd?" This utility has one negative and one positive component.

1) The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly +1.

2) The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsmen, the negative utility for any particular decision-making herdsman is only a fraction of 1.

Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another; and another. . . . But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit--in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.

This line of argument seemed to provide support for private ownership of land or other natural resources. Under private ownership, it is suggested, the owner has direct incentives to conserve and maintain his or her property. Thus, a cattle owner supporting cattle on private land would be expected to keep cattle numbers below the level that would lead to land degradation.

Debate about the implications of Hardin's paper has led to a better understanding of the range of property forms. Instead of the two implied by Hardin's paper, it is clear that there are four main categories of property:

Private property – giving the right to exclude others from a resource, and regulate its use

Open access - absence of well-defined property rights

State ownership – where the state owns and regulates use and maintenance of the resource

Communal property – has an identifiable user community that can regulate and maintain the resource.

Each of these forms of property has implications for the use, maintenance and sustainability of a resource.

With hindsight, it is possible to see that Hardin's paper conflated open access and communal property and oversimplified the incentives and environmental implications of private ownership. (McGranahan 1991; Beck 1994)

Access to water through communal property

Communal property is distinguished from open access to a resource by the existence of a defined community, a particular resource and sets of practices which may regulate use of the resource. Box 2.6 describes communal management of access to water from a river bed in Zimbabwe.

Box 2.6 Communal water management in Zimbabwe

‘Local people believe that the [Shangani River] cannot be owned and therefore access is free to all. However there is a comprehensive system of rules and regulations relating to the river and ensuring the good conditon of water taken from it. The river is dry for most of the year and water obtained by digging holes in the sand. Drinking wells are dug in the middle of the river bed where the sand is cleanest and where the water underneath is flowing fastest. The drinking wells are always communal, shared between neighbouring families, to minimise the dangers of witchcraft and poisoning. Drinking wells commonly have a tin with holes punctured in the bottom sunk into them to prevent them from collapsing and are covered as a protection from animals. Water for gardens and for washing clothes is taken from wells dug at the dirty margins of the river. They may be individual but anyone can use such a well if they come across them. No one washes clothes near any well, soap always being used at some distance away and the water carried from the well to that spot. There are designated perennial pools for cattle watering and specified sites for men’s and women’s washing.

‘There is also a special place in the river reserved for the rain-making ceremonies of spirit mediums, or church services to pray for rain. No one is responsible for enforcing this system of management and there is very little non-compliance, the most serious cases reported being children leaving the lids off drinking wells. District Officers, however, believe that people use dirty water from the river and that the solution is to encourage them to use and participate in the management of wells and boreholes for which they must be mobilised and trained through formal structures.’ (Cleaver and Elson 1995: 9)

In the last few years, there has been considerable interest in the ability of users' communities to manage natural resources. Associations of women, such as the Chipko movement in the Indian Himalayas, and the Green Belt movement in Kenya, have been held up as promising examples of community management. Ideas of joint forest management, and community management of irrigation and fisheries have also gained support amongst government and aid agencies (Zwarteveen and Meinzen Dick 2001: 12).

Where there is reduced government support for water, community management of natural resources may enable government agencies to devolve responsibility and expenditure to local communities.

Nevertheless, Zwarteveen and Meinzen Dick (2001) suggest that policy makers and researchers may overlook differences in power amongst the various users in a community for the effectiveness and equity of natural resource management. They note: '…organizations often exclude women through formal or informal membership rules and practices. Women may have other ways to obtain irrigation services, but even if they are effective, these other informal ways of obtaining irrigation services are typically less secure' (Zwarteveen and Meinzen Dick 2001: 11).

Summary

Private property entails the idea of excluding others from a resource and having individual control of that resource, including the right to sell it. Communal property suggests the existence of a community or some forum for collective action. Open access describes a situation in which all have rights to a resource and there is no community to maintain and regulate it. These bundles of social practices, summarized in property rights, have distinct implications for sustainability and inequality.

Open access resources, such as a common waterhole, could be subject to a 'tragedy of the commons' in which all have incentive to exploit the resource and there are no social arrangements for its regulation. But as we see in the case of pastoralists in Kenya, the tragedy is structured by the social power of the participants. The demands on Kenyan water are not made by equal individuals but by

social groups with differing power and influence. The needs of the more powerful groups, like the export horticulturalists, are likely to be met. Those groups which are less powerful and less effectively represented in national politics, the pastoralists and the wildlife, are much less likely to have their needs met.

Community management of water resources may be highly desirable, but it would be a mistake to romanticize this mode of access. . Most rural communities are divided between rich and poor, women and men, and sometimes along lines of ethnicity too. In communal resources, those who are represented in communal discussions may get preferential access. Voice, in other words, may be crucial. For example, if women are routinely excluded from membership in communal organizations, it is likely that communal management represents their interests poorly if at all.

The next section examines state provision of water, specifically state-backed irrigation projects.

2.1.6 State provision of water

The characteristic form of state water provision in the industrialized world is piped municipal water supply providing clean water on demand at the turn of a tap. This mode of access to water is also available in the larger cities of the global South, though poor areas of these cities are frequently excluded or given a lower level of service, for example, one public tap for many households. The most common form of state-backed provision in the non-industrialized world, however, is the irrigation project.

Since World War II, many irrigation projects have brought water to the fields and homesteads of many rural areas of the global South, in larger and more dependable quantities than rainfall and often in seasons that were previously dry. These irrigation projects, often in combination with private pumping of water, have provided part of the technical preconditions for a significant increase in agricultural output termed the Green Revolution.

State supported irrigation projects may take many forms. Water may come from purpose-built reservoirs, may be pumped from the land or may be diverted from rivers. Water may be delivered by large open canals or by pipe systems. The most common form of irrigation project, however, is a canal system supplied with water from a purpose-built reservoir. This form of project has a hierarchy of canals ranging in size from huge ‘main’ system canals supplying water to a series of smaller distributary canals, then smaller ‘offtakes’ divert water into local canals, from which water is delivered to farmers for their field channels. In the case of the Tungabhadra irrigation project, in south India, which I discuss below (Box 7), the main canal is 227 km long, it serves 87 distributary canals, and thousands of outlet structures supplying water to 240,000 hectares of agricultural land (Mollinga 1998: 2).

Usually the infrastructure of canals, dams, offtakes, pumps, pipe systems and valves requires a state-employed workforce for its maintenance. State-backed irrigation projects tend to be large, serving thousands, tens, or hundreds of thousands of hectares of land. As their name suggests, irrigation projects are constructed primarily to provide water for the irrigation of agricultural crops. Other uses of water may be overlooked.

Peasant farmer drives a tractor decorated with vegetables in front of the government palace in Lima, Peru Tuesday, May 22, 2001 during a protest. The poster reads: "We demand security." Peruvian farmers started a national strike, demanding government assistance to refinance their debt and to repeal a law giving the state-controlled water company control of the Rimac River, putting irrigation at risk. (AP Photo/Silvia Izquierdo)

The contrast between state provision in industrial and in nonindustrial countries has several dimensions relating to the goals, the quality and the spatial delivery and social context of the water. The principal goal of municipal water supply in industrial countries is the provision of domestic water, for drinking, cooking, laundry and bathing, whereas the over-riding goal of state provision in non-industrialized countries is supply of water to agriculture. In the former case, the quality of the water (principally a low level of bacteria) is central to the mission of state-provision, so the processing of water through water purification plants is widespread. In the latter case, farms use a lot of water but it does not have to be highly purified. So irrigation projects focus on the distribution of large quantities of unpurified water.

Municipal water supply provides water to urban households. Irrigation projects supply water to rural fields. This elementary contrast has two far-reaching consequences. First, it means that state provision in the global South is poorly adapted for the provision of domestic water supply, because the water is delivered to the fields and not to the house which may be a long way away. Second, irrigation projects are at the leading edge of a process of taming nature, the countryside rather than the city, and taming what has sometimes been called the ‘awkward class’ of peasants or rural farmers.

In combination, the technical and social aspects of state irrigation projects establish particular characteristics for this mode of access. Irrigation projects tend to be both technically and socially

inflexible. Water in canals is not so easily turned on and off as water coming to a household tap. Large state-backed organizations tend also to be unresponsive to the variety of water needs and changing water needs. A World Bank review of state enterprises has noted that political influence and corruption commonly limit their efficacy: 'public enterprises in developing countries are key elements of patronage systems…overstaffing is often rife, and apointment to senior management positions are frequently made on the basis of political connections rather than merit.' (World Bank 1991, cited in Briscoe 1993).

Irrigation projects often reflect the capacities and limitations of state organization or bureaucracy. Bureaucracies seem to be more effective providing a simple, standard set of services with centralized decisions and to serve better those people and places that are less poor and more accessible (Chambers 1988). So irrigation projects work better in large uniform areas. Communication between the users and the water bureaucracy is often poor, and irrigation systems do not easily provide for other uses of water than irrigating crops.

Of the several forms of inequality associated with large irrigation projects, that which has gained most attention is between rich and poor users of irrigation water. This inequality is frequently associated with a pivotal social change, the making of rich and poor households. Those households which can get secure, plentiful supplies of irrigation water are able to produce and sell crops bringing high returns. These households can improve their production methods and expand their production over several years, by planting several crops each year, buying more land, planting more valuable crops (eg sugar rather than rice), using more effective machinery and hiring more workers. Irrigation water makes it possible to grow crops throughout the year, to get higher yields, and to grow crops with few harvest failures. Such households, termed big farmers or rich peasants, can accumulate wealth over time.

Households with insecure or inadequate supplies of water, may plant only one crop a year, during the rainy season. They may plant low-yielding but drought-tolerant crops and their returns from farming may be both small and unpredictable. In periods of stress, such as a year when rainfall is low and irrigation water unavailable, these households may have to sell assets including land and machinery. These households, termed marginal farmers or poor peasants, may increasingly gain their subsistence working for others rather than producing their own agriculture. This process of social change, known as *differentiation of the peasantry*, is prevalant in the countryside of the developing world. Inequality in access to water from irrigation projects plays a considerable part in it.

Box 2.7 describes the Tungabhadra Irrigation Project, a huge system of canals that has been delivering canal water to crops in Karnataka and Andhra Pradesh, South India since the early 1950s. It is one of many large canal irrigation projects built by the government of newly-independent India during the 1950s and 1960s. In a recent study of this system, Mollinga noted three important aspects of the project: access to irrigation water is unequal; the project is inflexible; and water delivery is dominated by rich peasants.Widespread inequalities in access to water are visually apparent through the coexistence of areas of luxurious green crops adjacent to scorched, dry earth.

Box 2.7 Inequality and inflexibility in the Tungabhadra Irrigation Project, India

'No visitor to the Tungabhadra Left Bank Canal can fail to notice the skewed distribution of water in the command area. Luxuriously green patches are found close to scorched yellow areas, and both may be served by the same canal. The infamous head-tail differences occur at all levels of the system: outlet, distributary and main canal…the nature of the agrarian relations in the command area, particularly credit and employment relations, structure unequal access to water.'

'For poor and small peasants access to irrigation water depends on… access to other resources, notably credit for agricultural inputs, employment and access to political representation. Rich peasants are the nodal points in these networks' (Mollinga 1998: 123 and 147)

The design of the project makes it inflexible, slow to respond to changes, and unable to cope with differences in social, agricultural and ecological conditions. Mollinga notes two technical elements of project design making it particularly inflexible:

1 the project is *supply-oriented*: 'once the canal water has been released from the dam very little can be done to regulate its availability in time…canal water level control, which can be important for reliable water supply, is very difficult, adaptation to changing water demands, resulting from rainfall in the command area for example, is very slow.'

2 the *pipe outlets* chosen to regulate discharge: 'Regulation of the discharge through this structure is very difficult particualrly when water level control in the supply canal is impossible.'

(Mollinga 1998: 84-5)

Priti Ramamurthy has shown that assessments of irrigation projects in India tend to overlook both the inequality of the results with respect to class, and also with respect to gender. She quotes one assessment, by a well-known scholar of Indian irrigation policy, as follows:

> 'Due to irrigation, India has been in a comfortable position with regard to the availability of foodgrains over the last ten years or so. *Ignoring for the moment the problem of hunger among the income deficient households of the economy*, the country's granaries are now more full and there is enough grain stored up to prevent any famine which may occur in the forseeable future.' (Dhawan, 1988: 12; italics added by Ramamurthy).

Ramamurthy criticizes this assessment, based on her own work on the Tungabhadra Irrigation Project:

> 'In contrast to the gender-blind, class-biased assessments of irrigation presented above…this article highlights the extent to which official development strategy of modernization through irrigation has increased the drudgery in the lives of poor rural women…'
>
> 'When asked whether the canal had benefited them, women agricultural laborers and marginal peasants replied "no." Although they acknowledge that the demand for labor has increased… working conditions are still intolerably tough' (Ramamurthy 1991: 18, 16).

Government projects tend to be designed and operated by men and to reflect male priorities. Virtually everywhere governments are dominated by men. Key positions from legislators and ministers down to department heads are mostly held by men, and the great majority of government employees are male. This male dominance is true in the global South as in the industrialized North.

Male domination of irrigation systems exacerbates the weaknesses already identified in this mode of water access. Domestic uses of water tend to be downplayed or overlooked. The water needs of women's livelihoods are routinely ignored. In parts of Africa women and men have separate plots of land which they cultivate. In many parts of the world, women grow crops in home gardens, small plots of land adjacent to the homestead (see Figure 2.9 of a woman irrigating a home garden in China). In some regions of Africa and Asia, women are the principle farmers. In many parts of the world women and children raise chickens and livestock. The water needs of all these activities tend to be ignored in the design and operation of state-backed irrigation systems.

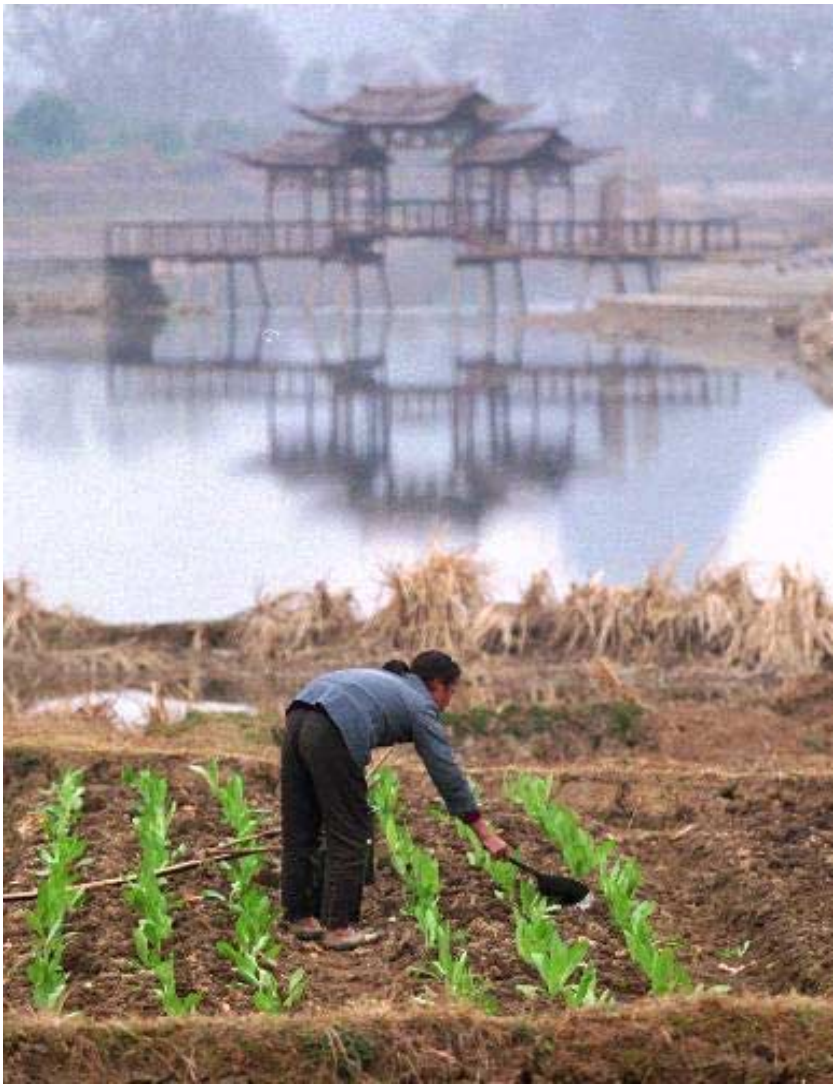

Figure 2.9. A Chinese woman waters her vegetables, from buckets carried up from the lake behind, near Guilin, in south China's Guangxi province Thursday, January 16, 1997. (AP Photo/Greg Baker)

Table 2.6 describes the first choice of water source for different uses in a large and well-established irrigation project in Sri Lanka. Irrigation water is water provided by the project, non-irrigation water is any other source of water. Even though this is a scheme which does provide for many uses through the provision of piped water supply in many places, the 156 households in this survey reported that the project was inappropriate for many of their uses. The project was rarely the preferred source of water for shifting cultivation, home gardens, and laundry, bathing and washing. For drinking, cooking, sanitation and washing utensils, and for livestock, the project was the preferred source of water for only about half the households.

Table 2.6 Choice of water source for different activities in an irrigation system in Sri Lanka

Uses	Use of different water sources %		# respondents
	Non-irrigation water	Irrigation water	
Irrigated agriculture	0	100	93
Shifting cultivation	100	0	30
Home garden	87	13	54
Livestock	45	55	20
Inland fishery	0	100	9
Home industries	41	59	17
Laundering, bathing, recreation	96	4	156
Drinking, cooking, sanitation, washing utensils	53	47	156

Source: Bakker, et al (1998: Table 8).

Table 2.6 provides support for the suggestion that state-supported irrigation projects do not provide water for the wide range of end uses of households and enterprises.

Frequently, new irrigation projects in Africa and Asia have given land and water rights to men. The designers of these projects may have assumed that men would be heads of families and would share the benefits of these new rights with other members of their household. That assumption greatly oversimplified the household and its operation (see Pearson, Chapter 15 in Allen and Thomas), to the detriment of women's concerns, rights and needs. Where irrigation projects gave men sole rights to land and water, the projects were less successful in raising agricultural production.

Occasionally, irrigation project implementers have noticed the problems raised by giving irrigated land to men. Barbara van Koppen has described how this happened in a project in Burkina Faso (Box 2.8). In this case, after a disastrous denial of women's land rights in the first phase of the project, a second phase of irrigation expansion gave land and water rights to women farmers as well as men.

Box 2.8 Women's exclusion in public irrigation: a development project in Burkina Faso

In this region of Burkina Faso, as in many parts of West Africa, men and women have separate fields. The fields of rice in the valleys are controlled by women as their personal plots. Men control the rainfed uplands. Women provide most of the labour in valley rice cultivation, have stronger land rights than men, and control rice output accordingly.

One aim of this irrigation project was to improve the incomes of women. But those who designed the project failed to recognize women's land rights. They thought valley land was controlled by male chiefs and the women's husbands. They incorrectly assumed that households operated as a single production and consumption unit, sharing all income and work.

Under pressure to get the project underway, the project management consulted the male village elite and local administrators. Once the project was complete, improved plots were allocated to the male household heads, giving men rights to land they had not had in the past. Their wives had

to provide the labor for cultivation, but men controlled the harvest. The women who had supposed they would get their lands back in their own names felt seriously betrayed by their men.

After several years, however, a new phase of the project was started. In the intervening time field staff and local people had developed their own procedures for the allocation of valley land. The women were better organized, having seen the negative events in the first phase of the scheme. Thus, all former plot owners were registered in time and got one new plot in return. Gradually this became formal project procedure.

(Van Koppen 1999: 7)

State-backed irrigation projects with their centralized, simplified and top-down design and decision processes have not responded effectively to the diversity of social and natural conditions.

Attempts to make irrigation projects more responsive to the needs of all users are ongoing. In many irrigation projects a range of water user associations have been established. Some have emerged from the bottom up, through the self-organization of users and some have been initiated by state officials and international aid agencies. Often these water user asssociations build on pre-existing systems of water rationing or sharing. In Sri Lanka and parts of India a system of *warabandi* or rotation is widely used. The needs of crops for water are so large that sharing or rationing of water is necessary if all farmers are to get water.

Water user associations frequently represent the needs of the largest users, the male farmers. In some countries, there have been experiments to make water use, and the employment it generates, more widely available to poor people without access to land, and to women (Wood and Palmer Jones 1991).

Summary

State provision of water in the countryside of the global South is predominantly through large scale irrigation projects. These projects are subject to the virtues and limits of states. They provide irrigation water to more affluent and connected farmers and tend to overlook other uses of water. Domestic uses of water, home gardens, livestock and non-standard forms of agriculture are poorly served by this mode of access.

Women's roles and women's use of water have frequently been overlooked in the design of irrigation projects. Where rights to land and water have been distributed they have routinely been allocated to men. Women's cultivation and women's uses of water have suffered.

2.1.7 Market access to water

> 'The striking features of these 'market-based' reallocation methods are that they are voluntary, that they benefit both the buyers and the sellers economically, they reduce the environmental problems resulting from profligate water use in irrigation, and they reduce the need for more dams'. (Briscoe 1993).
>
> '…it is argued that water pricing...can induce much needed water efficiency. The general point is simple "If people have to pay for something, they will be less ready to waste it".' (Richards 2001: 44-5).

Markets allocate scarce resources effectively. They can provide incentives for efficient use of resources and disincentives for profligate uses. They provide a way in which collective action can be mobilized and funded. The two statements quoted at the head of this section indicate that there are strong arguments for the use of markets in the allocation of water.

In fact, much has been written recently about the role of markets in the distribution and conservation of water. This advocacy of markets has gained impetus from two factors mentioned earlier. Firstly, I quoted Cleaver and Elson (1995), in Section 1, describing a 'general reconsideration of the role of the state in the economy' leading to the adoption of reforms reducing the role of the public (government-controlled) sector and giving a greater role to the market and private sector. So, governments and policy makers are favorably disposed toward private, market-based water supply, and wary of state provision. Secondly, the poor performance of state water provision, both municipal water supply and irrigation projects, in many parts of the global south, has encouraged interest in the distribution of services through water markets.

In practice, existing water markets are confined to rather limited contexts. There are reasons to be sceptical that water markets can easily be extended to other contexts. If they are, they will introduce new inequalities or heighten those already existing.

Existing water markets

At least three distinct types of existing water market can be identified.

1. Markets for the sale of irrigation water pumped from the ground by tubewells.
2. Urban markets for the distribution of domestic water.
3. Markets in water rights, for example, between farms and urban uses.

(In this paper, I am not going to explore a fourth market for water with which many students may be familiar, the market for bottled drinking water. This is a very expensive commodity, probably costing more than a days wages per litre bottle if it were to be available in the countryside of the global south)

A market of the first type, for the sale of irrigation water from privately-owned tubewells has been described in Pakistan (Meinzen-Dick 2000: 257-8) as follows:

> '…[tube]well-owners tend to be bigger farmers, and they have more of a stake in ensuring production on their own land than in selling water to others. Prices paid for water seem close to costs for pump owners, suggesting tubewell owners are not gaining large rents from selling water. Access to tubewell water through groundwater markets can be precarious, since tubewell owners irrigate their own fields first. Water buyers benefit from groundwater, but not as much as tubewell owners…the benefits are substantially higher for tubewell owners than for the generally smaller and poorer farmers who depend on buying water.'

This sort of market for irrigation water mitigates the gross inequalities of access to water through owning a tubewell or other pump, but buyers can be denied access to water when water or energy is scarce.

Figure 2.10. Kenyans wait in line to collect clean water from a water dealer in Nairobi, Friday, Jan. 5, 2001, to take home for domestic use. Along with power, water is rationed in Nairobi. The government has introduced power rationing of six to eight hours daily. A three yearlong drought has left hydroelectric dams, the main sources of electric power in Kenya, at an all time low. (AP Photo/Sayyid Azim)

Urban markets for the distribution of domestic water (Figure 2.10), the second type of water market, tend to be costly. In many large cities, municipal water connections provide cheap access for richer families and markets provide water for people living in poorer parts of the city. A study of the cost of water for the poor in sixteen large cities generated the data in Table 2.7. What this study showed is that the poor routinely pay much more, at least 4 times more and sometimes 100 times more, for water than richer families with municipal supplies.

Table 2.7: How much do the urban poor pay for water?

Country	City	Ratio of prices charged by vendors to those of public utilities
Bangladesh	Dhaka	12-25
Ecuador	Guayaquil	20
Honduras	Tegucigalpa	16-34
Kenya	Nairobi	7-11
Mauretania	Nouakchott	100
Nigeria	Lagos	4-10
Turkey	Istanbul	10

Source: Selected from Bathia, R and M. Falkenmark (1993) cited in Bosch, et al, 2001.

The third type of existing water market, the sale of water rights, has emerged in some industrialized and non-industrialized countries. This type of market differs from the first in that what is sold is not a unit of water, but the right to exclusive use of water from a particular source. In a few countries, notably Chile, a trade in water rights among farmers is reported. More commonly, the expansion of urban demand for water, and the higher prices urban consumers are willing to pay than farmers, has led to the suggestion that markets would allocate water more efficiently among farmers and cities. In China, some reallocation of water between high value urban uses and low value irrigation has been reported:

> 'In the North China Plain, the State Science and Technology Commission determined that the economic rate of return on a cubic meter of water used for agriculture was less than 10 percent of the return for municipal and industrial uses.(Hufschmidt et al 1987) Once agricultural and urban users accepted that they had to talk to each other and had to look at water as an economic commodity with a price, progress - including reallocation - was made. (Briscoe 1993).

In the United States, it is more common for cities in desert regions, such as Phoenix, Arizona, to buy not the water rights but both the land and the water rights of farms with water.

Two points can be made about these existing water markets. First, they are not generalized markets for water, but specific arrangements arising in certain contexts, such as private ownership of groundwater tubewells, and for specific end uses of water. This suggests that water markets may be hard to transfer from one context to another. I will note below that there are theoretical reasons which lend support to this suggestion that different markets arise in different contexts.

Second, to the extent that these markets provide water for the poor, that is the first two types of market, there are clear indications of persistent inequality between rich and poor.

In Box 2.9, an extract from a paper by John Briscoe, Chief of the Water and Sanitation Division of the World Bank, seems to provide an argument in favor of market provision of water even in rural areas of the global South.

Box 2.9 A case for market provision of water?

'It is widely assumed that the demand situation in rural areas is quite different [from that in urban areas] in that people there have only a "basic need," which can be met via a public tap or handpump. However, a recent multicountry World Bank study of rural water demand found that most rural people want and are willing to pay for a relatively high level of service, such as yard taps (World Bank Water Demand Research Team 1993). Furthermore, people will pay substantially more for reliable service, and more people will make use of improved water supplies if innovative financing mechanisms are employed. It is also possible to break out of a "low-level" equilibrium trap" - in which a low level of services is provided, for which willingness to pay and thus revenues are low and operation consequently deteriorates - to a "high-level equilibrium" in which users get a high level of service, pay for it, and maintain the desired system.(Singh et al)' (Briscoe 1993)

Briscoe is certainly sympathetic to the idea of market provision of water, as the quote at the beginning of this section makes evident, but the extract in Box 9 stops short of saying that water markets are a panacea for water deprivation. The study Briscoe reports is saying that even people with limited financial resources give high priority to a good water supply and are willing to pay for that service. Briscoe's idea of a low-level equilibrium trap describes a self-limiting situation in which the water supply is so bad that people will not even pay the low costs of that supply. This, he argues, does not mean that they would not be willing to pay the higher costs of a much more satisfactory service. The study he reports suggests that in many rural communities people would be willing to pay for a good water supply.

Difficulties in expanding market modes of access

There are several difficulties in the expansion of water markets as a solution to the problem of water deprivation. Here I will deal with two categories of difficulty: A) the difficulty of establishing water markets, B) the association of market forms of provision with inequality, most notably in access for women.

In category A, Richards (2001: 45-55) identifies three main difficulties hindering the more general establishment of water markets:

1 Markets require property rights. For a market to function, someone has to own the water. Open access, communal access conditions, and even state-supported irrigation schemes, which make up a large proportion of the water sources currently used by rural consumers, do not confer clear ownership rights. Privately owned tubewells have provided a foundation for one type of water market because this technology is associated with socially-accepted property rights. In the absence of clear ownership of other modes of access to water, markets may be hard to make.

2 Water is a peculiar good. The fact that drinking water 'is essential for life makes many people feel that access to water is better treated as a right than as a commodity'.

3 Water access requires investment and involves uncertain returns. Water use requires substantial infrastructure, including pipes, canals and processing. In the absence of predictable and secure revenue, private enterprises are unlikely to make those investments. Few situations in the global south offer the prospect of secure, predictable revenue. Problems in this category may well be a major part of the reason why markets for domestic water supply are rare in rural parts of the global south.

What these three points amount to is this: while markets in the abstract may have the properties of benefiting both buyer and seller and promoting conservation of a scarce resource, real water markets are going to be difficult to construct because clear property rights to water exist relatively rarely and because water distribution infrastructure is expensive compared to probable secure returns.

I turn now to some difficulties in category B, the association of market forms with inequality. Most obviously, markets tend to disadvantage the poor, who lack the purchasing power to make their demand for water effective.

Less obviously, markets and property rights often marginalize women and those issues, such as health, for which women have particular responsibility. Thus, Cleaver and Elson (1995: 4) write:

> 'The move towards viewing water primarily as an economic resource shifts the emphasis away from the area of health in which women have recognized interests and a strong professional presence…Much current thought is devoted to devising ways of valuing the economic rather than the health and social benefits of water…It is believed that investment in the sector is more likely to be forthcoming if it can be justified in terms of economic returns…'

Cleaver and Elson (1995) go on to argue that the new emphasis of water management policy, reducing the role of the public sector and giving a greater role to markets and the private sector, disadvantages women in a number of ways:

Markets and meetings: 'Emerging sectoral programmes focus on …the price of water and the…formal structures [of] markets and meetings. Through markets of various types users pay for water. Through meetings of various types users and providers take decisions…Both cash and committees might be thought to be gender-neutral instruments. But closer examination reveals that both tend to be marked by gender bias of various forms.'

Ability to pay: 'The centrepiece of the new approach is the idea of paying for water. From the point of view of those responsible for public expenditure on water resources this is described as 'cost recovery', where costs refers to those resources for which the public sector has had to pay…Women in Zimbabwe are willing to pay 40 percent more than men. This is probably related to the fact that much of the burden of fetching water falls on women. Improved water supply would save women's time and effort. However, women's willingness to pay may not be matched by ability to pay, because of lack of access to cash.'

Property rights and ownership: 'The desirability of 'ownership' is a much repeated and rarely challenged theme in recent statements about water; with ownership of water supply facilities being associated with responsible water use and improved operation and maintenance.' [Note how this echoes the policy implication of Hardin's tragedy of the commons described in Box 2.5]. 'The creation of property rights over any resource inevitably involves the power to exercise these rights to exclude non-owners. We know that women are in a disadvantageous position in relation to property rights, particularly over productive resources such as land, livestock and even their own labour. It is optimistic to assume that vesting 'ownership' of a water source in the community will give women equal rights over the resource; and far more likely that the creation of ownership rights will confer opportunities for the rich and powerful to appropriate preferential access to the resource.'

(Cleaver and Elson 1995: 5-8).

In sum, there are a series of reasons why increased reliance on the distribution of water through some form of water market would marginalize women's access to and control over water with serious consequences for women's activities and the health and maintenance of their families.

Summary

In principle, market forms of water allocation offer desirable attributes – efficiency, equity, conservation. In practice, market distribution of water is confined to certain specific contexts – notably providing water for the urban poor, and redistributing the surplus irrigation water of tubewell owners. Water markets are unlikely to be extended easily to rural areas of the global south because property rights are uncertain and infrastructure costs exceeds probable secure returns. Where market forms of provision are promoted it is likely that the interests of women and the poor will be marginalized and non-economic concerns, such as health, will be given reduced emphasis.

2.1.8 Conclusion

This discussion has tried to make three points. First, there is a broad contrast in access to water between the industrialized North and non-industrialized South of the globe. In the former, water is generally provided as a public service and is mostly cheap and reliable, and requires little work by the user. In the South, access to water tends to be diverse, organized by each individual, enterprise or household and the supplies obtained tend to be expensive and insecure and to require significant work on the part of the user.

Second, the diverse ways in which people gain access to water in the countryside of the global South can be grouped into five main categories, or modes of access: ownership of land and a pump; open access; common property; state-backed provision; market allocation. Grouping access into these modes is a useful step to take because it enables us to explore the characteristic features of each mode.

Third, there are material and gender inequalities in each mode of access to water. These inequalities have consequences for the health and livelihood of the users and may hide choices about social priorities.

In this conclusion, I will discuss each of these points in turn and then make some additional comments about new possibilities.

The contrast between socialized water supplies in the North and individualized water supplies in the South may be useful because it highlights several areas for investigation. Histories of the change from individualized to socialized water supply in the industrialized North could assist in our understanding of the investment costs and technical changes involved in building the infrastructure of water supply, the environmental costs in terms of changes to natural conditions, and the institution building processes. These histories might also shed light on the choices facing communities and governments in the non-industrialized world. These choices include those of institutional structure (community provision, state provision, market provision), costs in building different technologies of provision (reservoirs, pipe supply systems, pumping technologies), and the social and environmental consequences of different modes of access.

The grouping of diverse ways of gaining command over water into the main modes of access sheds light on the tragedy of the commons (Box 2.5) and emphasizes that human modes of interaction with nature need careful examination if complex goals like sustainable development are to be realized.

The notion of a tragedy of the commons seeks to generalize and sensationalize the degradation of natural resources associated with particular modes of resource use. It is usually applied to the question of overgrazing. Hardin's use of ideas from economics allowed him to make the influential generalization that common property would tend to be overgrazed while privately owned property would lead to conservation of grazing lands. In this discussion, I have extended the range of modes from two (common property, private ownership) to five by recognizing that common property can be divided into open access and communally regulated property, and by recognizing that state-backed provision and market-regulated access are separate modes. The identification of five modes of access to water frees the idea of a tragedy of the commons from the oversimple conclusion that common property is bad for the environment and private property good.

In fact the evidence we have is more complex. The most obvious tragedy of common water is the case of groundwater. In this case, there are private property rights to the land and pumps which give access to the water, but the groundwater aquifer itself is an open access resource. So, the rich (and many municipalities) are appropriating and mining a finite resource. In the case of Bangladesh, powered pumping for irrigation has lowered water tables beyond the reach of handpumps used to get drinking water, and unforseen contamination of the groundwater has underlined the uncertainties of our knowledge of the natural world.

What of the third point, gender and material inequalities? It is clear that the rich tend to gain better command over water in each mode of access. With pump and land ownership they gain first use of water, even if they also sell some to poorer farmers. In communal property and state-backed provision, the rich tend to dominate in decisions made about the resource. In markets, the rich have the greatest purchasing power. These material inequalities have consequences for livelihoods, constraining the range of possible livelihoods available to the poor. Material inequalities may also prejudice the health of the poor by limiting their options for water.

Differences in the access of men and women, gender inequalities, matter for the two reasons noted in the introduction. Firstly, if women's access to water is more tenuous or laborious than men's this may result in water supplies for women's activities being curtailed. Those activities often include maintaining the home, bringing up children and productive activities around the home. So these activities may be jeapordized by inadequate water. It is reported from Tanzania that one woman keeps her children in the house during the hottest hours of the day so that they will not be be active and drink less water. Secondly, the many hours that women are required to spend collecting water for domestic uses crowd out other activities. All women's other activities may be curtailed for the long work of water collection to be done.

This text suggests that new possibilities for gaining access to water will be most clearly discerned by those aware of the existing diversity of modes of access to water and the range of uses of water.

Some possibilities include:

Making irrigation projects more flexible: Recognizing that irrigation projects are the major form of state-backed provision in rural areas of the global south and introducing the social and technical flexibility to meet a wider range of end uses for water, including domestic water and home production (livestock, home gardens).

New forms of collective action: women's demonstrations of the sort recorded by the Associated Press photo on the cover page, the successful witholding of sex in a Turkish village, reported in Box 2.10, and the new water legislation in South Africa, reported in Box 2.11.

New technologies: In parts of Africa, bucket sprinkler systems seem to be providing effective, cheap irrigation, and are being promoted by women's organizations for use by women. In India, great success is being reported from the use of rainwater harvesting, the construction of very small, generally earthen dams, by communal labor, for the short-term storage of rainwater runoff for irrigation. (Center for Science and Environment, Delhi – http://www.oneworld.org/cse/).

The mobilization of community resources, the ability to work as well as the ability to pay, in support of water management schemes has sometimes been a hallmark of successful local schemes (such as those described in Briscoe 1993).

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