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The Water Poverty Index: Development and application at the community scale

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Abstract

The article details the development and uses of the water poverty index (WPI). The index was developed as a holistic tool to measure water stress at the household and community levels, designed to aid national decision makers, at community and central government level, as well as donor agencies, to determine priority needs for interventions in the water sector. The index combines into a single number a cluster of data directly and indirectly relevant to water stress. Subcomponents of the index include measures of: access to water; water quantity, quality and variability; water uses (domestic, food, productive purposes); capacity for water management; and environmental aspects.

The WPI methodology was developed through pilot projects in South Africa, Tanzania and Sri Lanka and involved intensive participation and consultation with all stakeholders, including water users, politicians, water sector professionals, aid agency personnel and others. The article discusses approaches for the further implementation of the water poverty index, including the possibilities of acquiring the necessary data through existing national surveys or by establishing interdisciplinary water modules in school curricula. The article argues that the WPI fills the need for a simple, open and transparent tool, one that will appeal to politicians and decision makers, and at the same time can empower poor people to participate in the better targeting of water sector interventions and development budgets in general.

Keywords: Indicators; Water; Environment; Water poverty; Income poverty.

1. Introduction

The water poverty index (WPI) is a new, holistic tool, designed to contribute to more effective water management. The index has evolved out of an extensive period of consultation with people and agencies from many parts of the world, and it has come to be regarded as a useful contribution to the suite of tools available to improve the effectiveness of water management at the community level. It combines data on local water resources, access, use, social and economic capacity and water-related environmental quality to be used by local people and water development agencies to monitor progress in the provision of water at the community level. Such community indices could then be aggregated to provide countries and international agencies with a much more accurate performance indicator to guide policy.

Increasingly, water is seen as one of the most critically stressed resources, and much attention is now being paid to global water stress and the water needs of the poorest

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people. Perhaps the most notable recent international event to draw attention to these issues was the UN World Summit on Sustainable Development in Johannesburg in September 2002. One of the primary outputs of that meeting was the re-affirmation of the UN Millennium Development Goals, in particular goal number 7, to "Ensure environmental sustainability", for which one of the indicators is target 10: "Halve by 2015 the proportion of people without sustainable access to safe drinking water". Clearly, this goal is directly relevant to the water sector. However, goal number 1, to "Eradicate extreme poverty and hunger" is also significant since, as water is a fundamental basis of all life, nobody can be lifted out of extreme poverty without adequate access to water. It could be argued that the reverse is not necessarily true: that the availability of safe water does not automatically lead to poverty alleviation. This may well be so, but the fact that access to safe water is a necessary condition for an adequate quality of life, we take to be a self-evident truth.

In this context, that is, in order to assist with the global effort to tackle water problems, particularly as they relate to the poor, monitoring tools are required that enable governments and development agencies to check whether adequate progress is being achieved and to alert them to problems where it is not. Currently, monitoring access to water and sanitation is carried out at the international level by the WHO and UNICEF joint monitoring programme for water supply and sanitation. These data have national coverage and they provide information on the population with access to an improved water supply, where "improved" is defined as water available from a defined list of technologies,[1] with access to at least 20 litres of water per person per day from a source within 1 km of the user's dwelling (WHO/UNICEF, 2000). These data provide much valuable information, however they include many simplifications and have a number of shortcomings, many of which are recognized in the report. In order to move towards a truer and more comprehensive assessment of the situation, we suggest that a monitoring tool is needed that looks at water availability and access in a broader way. Some of the issues that would need to be considered in such a holistic assessment are:

- measures of access;
- water quality and variability;
- water for food and other productive purposes;
- capacity to manage water;
- environmental aspects; and
- questions of spatial scale.

[1] "Improved" water supply is defined by WHO/UNESCO (2000) as being from a household connection, public standpipe, borehole, protected dug well, protected spring or rainwater collection; "not improved" includes unprotected well, unprotected spring, vendor-provided water, bottled water and tanker truck-provided water.

1.1. Measures of access

Simple distance from the dwelling place is not a good indicator of access to water; there are several other possible constraints that may be of greater relevance. The sheer amount of time spent in collecting water can be of enormous significance. Our studies in poor urban communities in Sri Lanka illustrate some other aspects. In one inner city area, water taps are available within about 50 m of most houses, but with only two taps for a community of 460 people, queuing times are substantial. In the dry season pressure is low, and the richer or more influential people tend to get priority, leading to even longer queuing times for the poor. Because of uncertainties around land tenure for this community, the authorities are reluctant to improve the supply, even though the settlement is of long standing. In another area on the fringes of the city, water pressure is generally so low that people have to wait until after midnight before any water flows, and then they have to queue. Again, issues of land tenure tend to obstruct resolution of the problem. Another constraint relates to the ability to pay for water. The South African Minister of Water Affairs and Forestry noted when he began life as a minister, ". . . the shock of finding, in a village with a textbook community water project, a young woman with her baby on her back, digging for water in a river bed, metres from the safe supply that we had provided. She was doing this because she had to choose between buying food or buying water" (Kasrils, 2001).

1.2. Water quality and variability

Water quality requirements go beyond simply defining improved sources. For instance, high levels of fluoride found in "improved" village supplies in some areas in Tanzania have led to instances of a serious, debilitating disease (skeletal fluorosis), and there are many cases of arsenic poisoning from wells in Bangladesh. Health impacts of water are related to both the quality of water and its availability within a reasonable distance; studies indicate that clean water within a distance of not more than 1 km from the house tends to lead to improved health status, since people start to use substantially more water for cleaning and washing (Cairncross, 1988; Cairncross and Feachem, 1993). The variability of water supplies is another factor that is often overlooked. Many parts of the world suffer from high levels of seasonal variation in rainfall and river flows, which often lead to inadequate supplies in the dry season; people may then have to switch to more distant or more polluted sources. Inter-annual variations producing prolonged droughts add another level of stress. Variability can also result from unreliable water supply systems. Inadequate, under-funded or poorly maintained water infrastructure is often a critical factor leading to uncertain availability, and occurs in many urban areas in developing countries.

1.3. Water for food and other productive purposes

The WHO/UNICEF joint monitoring programme deals only with domestic water supply, however it is widely recognized that food production is also an important use of water. In many parts of the world, small-scale irrigation and livestock watering are key components of livelihood strategies. Small-scale and cottage industries (for instance, brick making, beer brewing, and textiles) can also help to lift people out of poverty, and many of these activities require an adequate water supply. Since the amounts of water required for purposes other than domestic needs are often larger, especially for irrigation, this can lead to competition between uses. Pollution of domestic water sources by agricultural and industrial use is also a possible source of conflict. Such conflicts can, of course, be greatly exacerbated by competition for water from large-scale commercial agriculture, industry and mining.

1.4. Capacity to manage water

Capacity to manage water is needed both at community level and government or administrative level. At the community level, the skills needed to manage water effectively and to lobby for improvements are relevant. These may be indicated by levels of education and income, as well as the presence and effectiveness of water users' associations or other organizations. Beyond this, adequate institutional capacities and structures are needed in local and regional administrations in order to implement government policies and respond to local needs in a constructive way.

1.5. Environmental aspects

Maintenance of environmental integrity is essential. Sustainability can only be achieved if improvements in water systems do not lead to environmental damage. The integrity of the aquatic environment is also particularly relevant because of the goods and services provided by ecosystems, which are important components of life support systems, particularly for poor people in rural areas. Wetlands are some of the most productive ecosystems, and can provide food, building materials, grazing, water quality and flood amelioration, income generation from tourism and several other functions.

1.6. Questions of spatial scale

Water situations are often extremely variable spatially. Locations just a few kilometres apart are sometimes found to be quite different in terms of social and economic characteristics as well as the physical availability of water. For example, during the data collection for this study (see below), two rural communities in Tanzania that are 20 km apart were examined: one has relatively abundant water resources, mostly within a few hundred metres of the houses; while in the other, people have to travel distances of 9–14 km, with typical daily round-trip journey times of ten hours per household. Such significant local variations require monitoring at the same local scale or they will be lost in the averaging process. In addition, since action to remedy the situation can only be taken at the local level, it make sense to use indicators that reflect local diversity.

In order to provide a monitoring tool that can move towards including this wide range of issues in a holistic manner, we have proposed a new index, the water poverty index (WPI). Monitoring is one of the functions of the WPI, but equally important is that it can be used to select the areas of greatest need, thus enabling the prioritization of action. The WPI is applicable at a range of scales, and has a number of other advantages in terms of ease of understanding for policy makers and decision makers, transparency of the process, empowerment of local communities, and adaptability to a variety of local situations, as discussed further below.

The concept of a water poverty index was introduced by Sullivan (2001, 2002), and since then has been developed further and tested at the community scale in a number of pilot locations. The objectives of this article are to describe the WPI concept, demonstrate its application at the local scale, and propose possible ways forward so that the concept can bring wider benefits. The local scale is the most important and relevant because it is at this scale that action on the ground must be taken to solve the pressing problems of water and poverty. The WPI has also been used at the national scale to make international comparisons; this is being published elsewhere (Lawrence et al., 2003).

2. The WPI concept

Given the background issues discussed above, the water poverty index was designed as a composite, inter-disciplinary tool, linking indicators of water and human welfare to indicate the degree to which water scarcity impacts on human populations. The primary focus of the index is on poor people, who suffer most from inadequate access to water. The WPI combines physical, social, economic and environmental information associated with water scarcity, access to water and ability to use water for productive purposes.

To ensure that all major relevant issues were included, the index was developed in a participatory manner, through consultation with a wide range of stakeholders, policy makers and scientists. The consultative process identified five key components:

- *Resources* Physical availability of both surface- and groundwater, taking into account variability and quality as well as the total amount of water.
- *Access* Access to water for human use, including distance to a safe source, time needed for

collection per household and other significant factors. Access also includes water for irrigating crops or industrial uses.

- *Capacity* Effectiveness of people's ability to manage water. Capacity is interpreted in the sense of income to allow purchase of improved water, and education and health, which interact with income and indicate a capacity to lobby for and manage a water supply.
- *Use* Different uses of water, including domestic, agricultural and industrial.
- *Environment* Evaluation of the environmental integrity related to water and of ecosystem goods and services from aquatic habitats in the area.

These five components represent the broad themes that need to be included in the WPI. While the components themselves are not amenable to measurement, each is made up of a number of subcomponents, or variables, that can be directly measured or evaluated in a variety of ways. The actual subcomponents used in our pilot studies and the ways in which they were evaluated are described in more detail below. First, a number of other issues relating to indices, poverty and the development of the WPI are discussed.

3. Background to indices

Indices are widely used by policy makers as a tool for the evaluation of achievement on complex issues. Their overriding advantages are that they encapsulate more than one measure of progress in a single number, and allow quantitative and qualitative elements to be combined. Thus, aspects can be shown that would not otherwise be measurable.

Some of the elements that we are most interested in are often things that are not directly measurable, but this can be overcome by using proxy variables. The resulting single index value provides a measure that is uncomplicated and can clearly set the performance of one country or location against that of others, as well as evaluate performance over time. However imperfect a particular index, especially one which reduces a measure of development to a single number, the purpose is political rather than statistical. As Streeten (1994:235) argues, ". . . such indices are useful in focusing attention and simplifying the problem. They have considerable political appeal. They have a stronger impact on the mind and draw public attention more powerfully than a long list of many indicators, combined with a qualitative discussion. They are eye-catching."

The WPI has these broad characteristics, with the distinctive difference that most indices, such as the human development index (HDI), are generally applied only nationwide, while the WPI focuses on much more local scales.

4. Structure of the WPI

The water poverty index has a similar structure to that of the HDI. The five key components are combined using the following general expression:

$$WPI = \frac{\sum_{i=1}^{N} w_i X_i}{\sum_{i=1}^{N} w_i} \quad (1)$$

where WPI is the water poverty index value for a particular location, X_i refers to component i of the WPI structure for that location, and w_i is the weight applied to that component. Each component is made up of a number of subcomponents, and these are first combined using the same technique in order to obtain the components. For the components listed above, Equation (1) can be re-written as:

$$WPI = \frac{w_r R + w_a A + w_c C + w_u U + w_e E}{w_r + w_a + w_c + w_u + w_e} \quad (2)$$

which is the weighted average of the five components Resources (R), Access (A), Capacity (C), Use (U), and Environment (E). Each of the components is first standardized so that it falls in the range 0 to 100; thus the resulting WPI value is also between 0 and 100. The highest value, 100, is taken to be the best situation (or the lowest possible level of water poverty), while 0 is the worst.

A number of other ways of combining the data to create the WPI were considered, but this approach was judged to achieve the results while retaining the virtues of simplicity and straightforwardness (Sullivan et al., 2002).

5. Concepts of poverty, sustainable livelihoods and the WPI

The conceptualization of poverty in the structure of the WPI is based on the work of Townsend (1979) and Sen (1981, 1985, 1995, 1999), extended by Desai (1995). Poverty is identified as a condition arising out of capability deprivation. Building on the basic needs approach first outlined by Pigou (1920), Sen has shown that poverty is the result of a lack of at least one of the basic conditions (or skills) that are prerequisites to an effective life. In this sense, we are interpreting a lack of water to be consistent with a lack of one of these basic prerequisites, but lack of water will have many additional repercussions. For example, low quantities of water can be shown to have a direct relation to health, as personal and food hygiene will be less effectively carried out. Furthermore, there are a number of illnesses that can result from poor water quality or contaminated water. In terms of productivity, water is usually a factor, even in subsistence households. Thus, inadequate

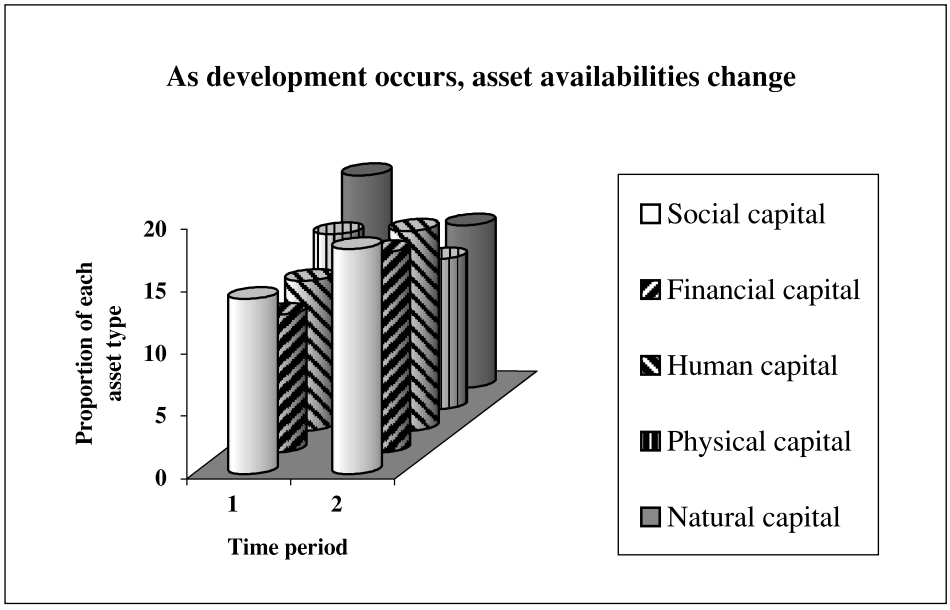

Figure 1. The impact of development and its influence on livelihood assets.

access to it will impact on economic performance, and — obvious but often forgotten — time spent collecting water will not be available for other activities. When collection times are long, as in the example from Tanzania above, negative impacts can be massive. As for the local environment, lack of water is likely to have a detrimental impact by reducing biomass growth, and/or increasing the rate of desertification and wind-induced soil erosion.

A way to understand better these diverse impacts on people's lives is provided by the *Sustainable Livelihoods Framework* (Scoones, 1998; Carney, 1998), which is becoming widely used by donor agencies to assess development effectiveness. The framework assesses development impacts in terms of a variety of attributes, referred to as livelihood assets or capitals, and identified as natural, physical, financial, social and human assets. To sustain our lives, we use a combination of some or all of these. Impoverished communities are by definition short of some or all of the livelihood assets. Their local natural, human and social capitals have not been mobilized to create adequate physical (manufactured) and financial capital. As development occurs over time, there will inevitably be changes in the extent and availability of the livelihood capitals, and such changes can be illustrated as shown in Figure 1. To redress any kind of poverty, access to these capital types must be redistributed more equitably.

The WPI concept is closely linked to these ideas; it is a way of measuring water status focusing on poverty and the livelihood assets of the poor. The five key components of the WPI are closely analogous to the livelihood capitals. There is not a one-to-one equivalence, but the WPI and sustainable livelihoods concepts fit together (Table 1).

Table 1. Comparing WPI components and sustainable livelihood capitals

WPI component	Livelihood asset
Resources	Natural capital as well as physical and financial capital, representing infrastructure
Access	Social capital; financial capital
Capacity	Human and social capital, including institutional issues, and financial capital for investment
Use	Physical capital; financial capital
Environment	Natural capital

6. Development of the WPI concept

The concept of the water poverty index evolved from work on water resource assessment at the global scale, such as that by Meigh et al. (1999). The present article summarizes the methodology selected on the basis of research into possible theoretical approaches (Sullivan, 2001, 2002). To address the complexity of water management, a composite index is preferred; and where possible, it is designed to fit in with, and draw upon, existing institutional structures and statistical procedures. For example, in identifying the access components, outputs of the WHO/UNICEF joint monitoring programme (2000) are used, as are health and education data from the *Human Development Index* (UNDP, 2002). Environmental components equivalent to those in the *Environmental Sustainability Index* (World Economic Forum, 2001) were selected as proxy indicators of ecosystem need for water.

Participatory consultation was an essential feature in the development of the WPI. The views of all stakeholders

are important, and need to be recognized if the tool is to be both meaningful and acceptable. To this end, several consultation meetings were held with a wide range of stakeholders in each of the participating countries in order to determine the essential issues for inclusion in the structure of the WPI and to test the usefulness and relevance of the approach with potential end users.

Other contributions to the literature on this subject have been made (Salameh, 2000; Feitelson and Chenoweth, 2002) and both of those articles raise the question of how to capture effectively the issues of water for food production, and highlight the importance of infrastructure. Both of these are existing components of the WPI structure, and this interest in the subject highlights the importance of taking an iterative approach to the development of such a comprehensive tool.

7. Development and application at the community scale

In order to test the WPI concept at the community scale, data were collected in four locations in each of three countries: South Africa, Tanzania and Sri Lanka. The locations were chosen to represent a range of different situations in which people are suffering water poverty in terms of both physical and social characteristics. In each country, two of the communities were in rural areas and two in urban or peri-urban areas, so that the differences in water poverty and data requirements between the two types of environment could be taken into account. The data were collected from the pilot sites specifically for the development of the WPI. Comprehensive datasets were assembled in order to investigate as many aspects of the situation as possible, and data collection was mainly limited by the tolerance of the people surveyed to a possibly extended process. Clearly, simplified surveys or other approaches to data collection would be needed for future implementation of the WPI, as discussed further below.

8. Data collection procedure

To obtain a systematic and consistent dataset for each location, data were collected by household surveys at each study site. This provided the basis on which the different WPI methodologies were tested. In addition, considerable amounts of other types of data were collected. For the resources component, information on river flows, groundwater availability and water infrastructure were obtained from local authorities and by field investigation. These data were combined with information from the household surveys, especially where this helped to throw light on water resource variability or reliability and on water quality.

Table 2. Data selected as WPI component variables for pilot sites

WPI Component	Subcomponents or variables used
Resources (R)	• Assessment of surface water and groundwater availability using hydrological and hydrogeological techniques. • Quantitative and qualitative evaluation of the variability or reliability of resources. • Quantitative and qualitative assessment of water quality.
Access (A)	• Access to clean water as a percentage of households having a piped water supply. • Reports of conflict over water use. • Access to sanitation as a percentage of population. • % of water carried by women. • Time spent in water collection, including waiting. • Access to irrigation coverage adjusted by climate characteristics.
Capacity (C)	• Wealth proxied by ownership of durable items. • Under-five mortality rate. • Educational level. • Membership of water users associations. • % households reporting illness due to water supplies. • % of households receiving a pension/remittance or wage.
Use (U)	• Domestic water consumption rate. • Agricultural water use, expressed as the proportion of irrigated land to total cultivated land. • Livestock water use, based on livestock holdings and standard water needs. • Industrial water use (purposes other than domestic and agricultural).
Environment[a] (E)	• People's use of natural resources. • Reports of crop loss during last 5 years. • % households reporting erosion on their land.

Note:
[a] In the absence of acceptable figures to represent environmental integrity or environmental water needs, these proxy data were used.

9. Subcomponents of the WPI at the community scale

The variables representing the five key components of the WPI are listed in Table 2.

10. Results for the pilot sites

Data collected during pilot studies were used to generate the WPI value for each community, as summarized in Figure 2 and Table 3. Data were collected for both the wet season and the dry season. Most of the variables are the same throughout the year, but some can exhibit differences: for instance, access can become more difficult in the dry

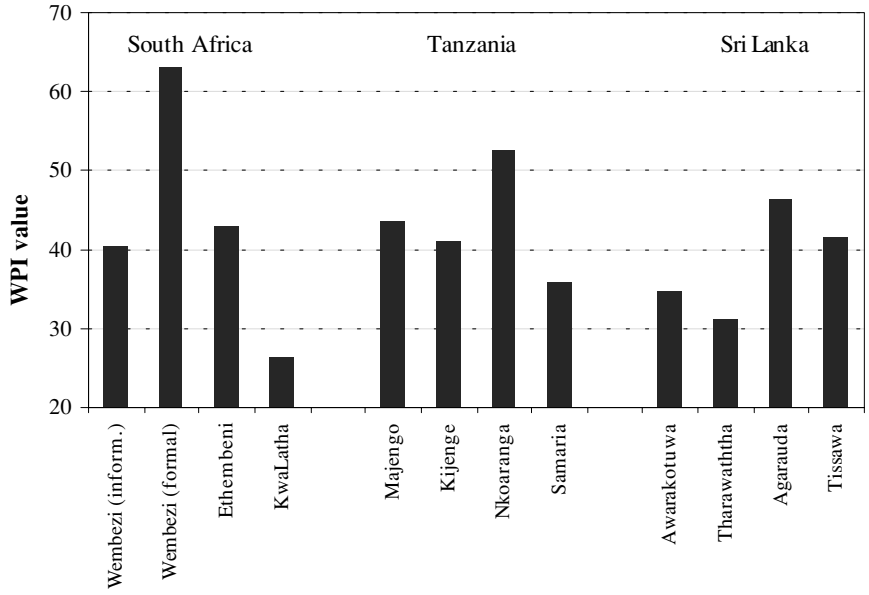

Figure 2. Water poverty index values for the pilot study sites

Table 3. Water poverty index components and values for the pilot study sites

Community		Component values					WPI
		Resources	Access	Capacity	Use	Environment	
South Africa							
Wembezi (inform.)	Urban	50.0	48.8	46.1	18.0	39.1	**40.4**
Wembezi (formal)	Urban	50.0	86.5	78.0	38.1		**63.2**
Ethembeni	Rural	50.0	36.6	59.8	41.5	27.7	**43.1**
KwaLatha	Rural	20.0	17.0	42.1	24.5	28.9	**26.5**
Tanzania							
Majengo	Urban	10.0	32.7	62.9	15.0	98.4	**43.8**
Kijenge	Urban	20.0	53.9	68.3	21.6		**41.0**
Nkoaranga	Rural	30.0	39.5	59.4	65.3	69.9	**52.8**
Samaria	Rural	20.0	20.9	44.7	37.7	56.1	**35.9**
Sri Lanka							
Awarakotuwa	Urban	10.0	35.2	79.6	21.2	28.1	**34.8**
Tharawaththa	Urban	20.0	26.5	50.6	16.2	42.2	**31.1**
Agarauda	Rural	20.0	38.3	64.7	74.9	34.2	**46.4**
Tissawa	Rural	20.0	47.3	52.0	50.0	38.5	**41.6**

Note: Formal settlements are those which have been planned by local authorities and have some degree of service provision, while informal settlements are those which have sprung up spontaneously and have little service provision.

season, increasing the time taken to collect water. Only dry season data are presented here; there were some small differences for the wet season, but it is considered that the dry season results are more representative as, generally speaking, this is when water stress is greater.

The structure of the water poverty index allows different weights to be applied to both the components and the subcomponents. In these results, equal weights are used. This means that there is some degree of implicit weighting of subcomponents, since there are different numbers of them within each main component. However, having determined that these five key components represent the significant aspects to be expressed in the WPI, this is not considered to be inappropriate. This approach also has the advantage that the index can be calculated even when some of the data are not available. There is always the possibility that this will occur, and the flexibility in the methodology allows this problem to be overcome, although there may be some loss of strict comparability between different locations. Key components were not weighted, as there seemed

to be no reason why one should be favoured over another: for instance, why should access be more important than capacity or resources? However, the methodology does allow for different weights as well as different subcomponents to be used in different situations, which enables the index to be adapted to local needs and local data availability. The weighting issue is one that could be investigated further.

An illustration of the problem of lack of data for some locations is provided by the missing values for the environment component for two of the urban areas: Wembezi (formal) and Kijenge. Since it is difficult to obtain data to measure environmental integrity or environmental water needs at the community level, proxy data were used based on people's use of natural resources, erosion, and loss of crops due to drought. However, these are mainly rural issues which were not found relevant to the households surveyed in the two urban communities. Despite this, the WPI value could still be calculated by omitting the environment component. Clearly, this is not entirely satisfactory, but it does show that approximate results can be derived even when some data are lacking. The problem of missing data is always an issue when collecting household data. Questions acceptable to some communities are not acceptable in others. For example, South African households were reluctant to provide information on livestock holdings, as this was felt to be private, relating to the financial status of the household. Identical questions posed in communities in Sri Lanka did not encounter any resistance. Similarly, in the case of Majengo in Tanzania, people were much more environmentally aware and involved in natural resource use than they were in nearby Kijenge, where households tended to depend more on urban income sources. These examples highlight the need to develop location-specific variables, and to differentiate certain components of the index for urban and rural applications.

11. Discussion and conclusions

The results shown here represent the first phase of the development and application of the WPI at the community scale. Clearly, rigorous testing of the hypothesis that the index values reveal the true degree of water poverty is not possible. Rather our approach was consultative. Representatives from a wide range of national and local government agencies participated in workshops to learn about and contribute to the index and to examine the results in relation to their extensive local knowledge. In each case, participants agreed that the WPI and its underlying components provided a true reflection of the situation in the communities. This shows that the index is an effective tool in integrating the wide variety of information relevant to water issues. It also highlights another important point, which is that the index is not intended to provide unexpected or new results, but to be a systematic and transparent indicator that allows the water situation at the community level to be expressed in a more cogent way than previous systems. These points can be summarized as follows:

- The WPI provides a means of understanding the complexities of water issues by integrating the physical, social, economic and environmental aspects, and by linking water issues to poverty.
- It is a systematic approach that is open and transparent to all.

Thus, the WPI is a powerful tool for determining priorities. It empowers decision-makers to act impartially by allowing them to justify their choices, based on a rational and transparent framework. At the same time, it gives local communities an opportunity to express their needs in a systematic way, and helps them to lobby for action.

Because of its simplicity, the WPI appeals to policy-makers — a single number can be used to represent the water situation at a particular location. At the same time, underlying complexities need not be lost. To illustrate the complexity to policy-makers and stakeholders, a 'pentagram' was developed (Figure 3). By showing the values of all five components in a visually clear way, it can help direct attention to those water sector needs that require urgent policy attention.

The pentagram for South Africa immediately identifies KwaLatha as the most needy community, and indicates that development in any of the five component areas would be beneficial; for the formal settlement at Wembezi, it shows a high value for access, while scoring much less well on use. The pentagram for Tanzania shows that the two rural communities of Samaria and Nkoaranga, geographically quite close, are actually very different in their water needs, with Samaria clearly much more in need of improved water provision. These examples highlight the need for a water assessment tool that addresses the site-specific nature of water resources, and integrates all relevant factors. The examples also demonstrate that the WPI can measure progress over time, both at community and project scale. Even individual water managers can use it to check that they are doing a good job.[2]

The WPI is directed towards communities and is especially relevant for poorer areas, but it does not neglect the issues of environmental integrity and ecosystem water needs, or that of balancing the requirements for irrigation or other productive uses versus domestic needs. If the WPI is updated at reasonable intervals — three to five years, say — it could be used to monitor progress. Another significant advantage of the WPI is that it has been constructed so as to be relevant and applicable at a range of scales. Only the community scale is discussed in this article, but work has also been done at the international scale (Lawrence et al.,

[2] A comment made by a municipal water manager at the conceptualization meeting held in Arusha in 2001.

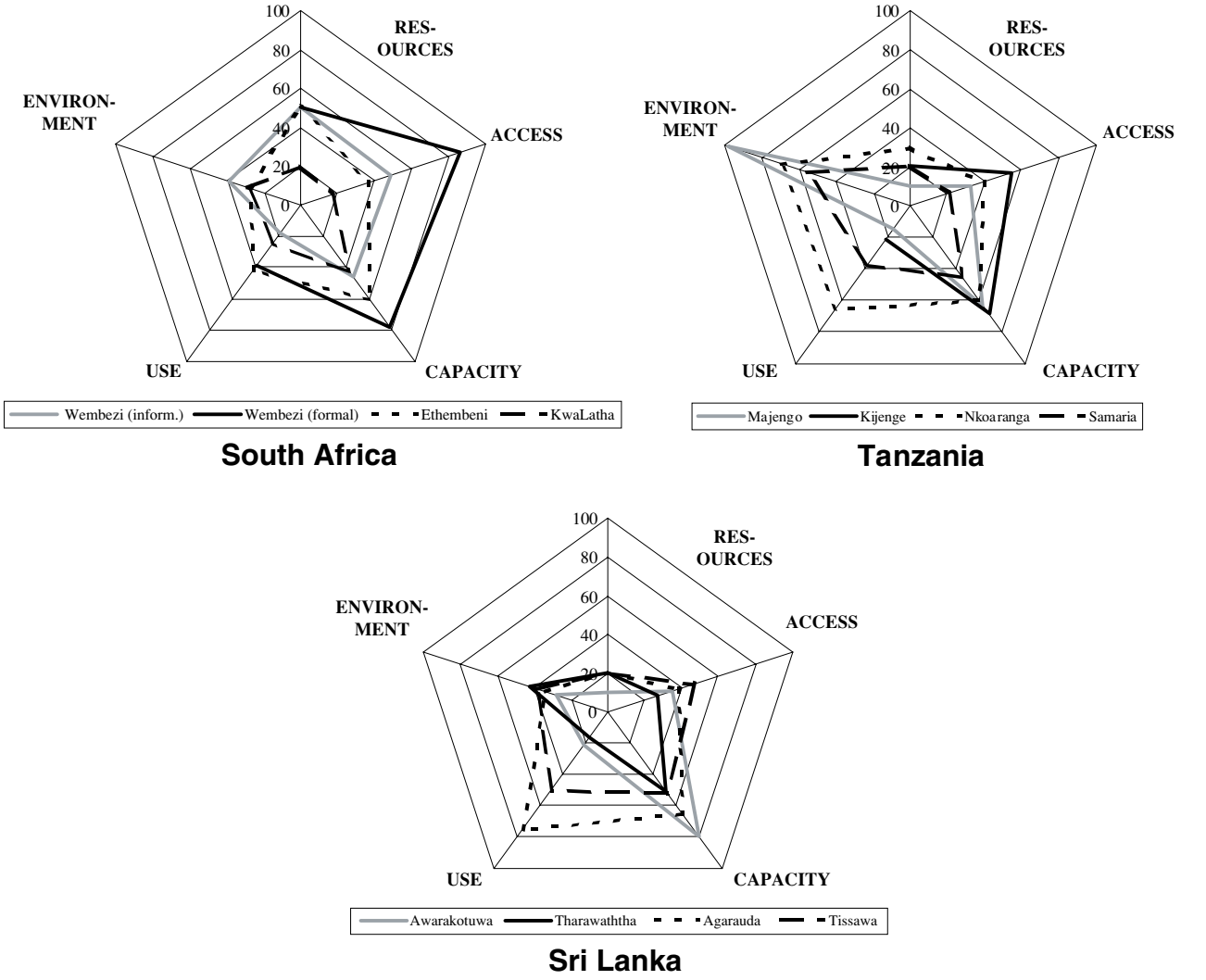

Figure 3. Pentagram presentation of the components of the WPI for the pilot study sites in South Africa, Tanzania and Sri Lanka.
Notes: For an explanation of the WPI components see Section 2, and for a comparison to the sustainable livelihood Capitals, see Table 1.
Values for the environment component for Wembezi (formal) and Kijenge are missing — see Section 10.

2003); the intermediate, basin scale, is also possible. At a wider scale, it would be possible to include large-scale agricultural and industrial water use and environmental factors in the WPI. At this point, it must be noted that the application of the WPI at different scales will require different kinds of information, and in some cases, appropriate information is not available at the required scale. A challenge for future work will be to address this problem.

The WPI provides a transparent framework on which decisions in water planning and management can be based. However, it should be clearly distinguished from other tools for integrated water resources management. The WPI can provide an assessment that helps to determine need priorities. This is an important step, but beyond this, other tools would be needed to carry out more detailed planning and study the impacts of water development projects across whole basins.

The WPI can be useful in many ways. It needs to be emphasized, however, that the implementation of any index, and its deployment, may be subject to the political circumstances and power relations that exist in the areas where it might be deployed. In addition, the data collected will be subject to local and institutional politics. These last will also determine the reliability of data and therefore the comparability of results. This highlights the need for a standardized framework as a baseline for integrated water monitoring, as well as standardized comparisons, as is the case with other macroeconomic indicators.

In the first *World Water Development Report* (UNESCO, 2003), the need for integrated indicators is discussed, and reference is made to the WPI to illustrate the theoretical basis on which indicators can be built. There is a need for such integrated indicators at the national/regional level, especially to help decision-makers (including donors)

determine where their contributions will have the greatest impact. A tool such as the water poverty index can also assist, for instance, the task force on the Millennium Development Goals, to monitor progress in a meaningful, and to some degree, comparable, way.

12. A way forward for the WPI

The data discussed in this article originated from a pilot data-collection exercise, carried out specifically to develop and test the WPI methodology. The results demonstrate that the index is a powerful tool with potential for wider implementation. Certainly, in the three countries involved so far — South Africa, Sri Lanka and Tanzania — there was clear recognition of the value of the index, and strong support for its more widespread application. To realize this, the index needs to be advanced from its preliminary application and tested in real implementation over much larger areas, covering whole provinces or substantial parts of countries. Here, two important questions need to be answered:

- What additional data need to be collected?
- How can this be done most cost-effectively, bearing in mind the wide coverage required?

Data collection should done through a process of extensive participation at national and local levels. This is necessary in order to adapt the index to individual country needs and ensure that it is responsive to specific cultural, social and economic situations. Links with the WHO/UNICEF joint monitoring programme could be explored, and source data from this programme could be a useful starting point for a number of communities in several countries. Two possible methods for collecting household data have been examined at a preliminary level, and appear promising:

- inclusion of WPI related questions in national surveys; and
- data collection and reporting through schools.

12.1. Inclusion of WPI related questions in national surveys

Some WPI related questions could be included in national censuses or other surveys. Due to the practical limits on the size of the census, only very few additional questions would normally be possible. Specific studies would be required to determine which subset of information most accurately reflects the water poverty index in each case. Preliminary investigation during the development phase of the WPI suggested that questions on time to collect water for domestic use, and on reliability of sources, would be most useful. Where data are derived from surveys that sample particular locations (rather than national censuses), other approaches would need to be examined to yield preliminary results by generalizing from the sample locations. Some work has been done to examine this possibility, and where no other data are available, educational level of head of household and data on household size could sometimes be used as proxies for some components.

12.2. Data collection and reporting through schools

Some of the data needed for the water poverty index could be collected through schools. In many countries there already exists an institutional link between schools and national statistics offices, especially for rates of enrolment, literacy, etc. Also, children are often the ones to fetch water in locations where it is not piped into homes. This raises the possibility of including an interdisciplinary water module in school curricula. This would spread awareness about water issues and also promote data collection as part of the student's learning.

Integrating the gathering of water poverty data with national surveys and educational institutions, as discussed above, could lead to its consolidation and regular use. In the long run, this could result in better targeted implementation in the water sector and more efficient use of development budgets, as poor people would be empowered to assess their own water stress, and promote the growth of human and social capital.

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