Rapid appraisal of poverty, gender and health: Application to the NeWater Case studies

(NeWater Deliverable D2.4.1)

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A head of household from the Nile basin (Source NBI)

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Executive Summary

This document provides an introductory summary of the activities of WP2.4, addressing poverty, health and gender in the NeWater project. It provides a brief account of work that has been done in specific cases where these issues have been identified by stakeholders as issues that need to be addressed in the context of water management. These particular cases are the Orange, Nile and Amudarya basins, all of which have serious poverty problems, with gender inequalities and health problems associated with that. It is also anticipated that some work will also be done in the Guadiana basin at a later date.

In Section 2 we present an explanation of what the issues of poverty, gender and health are in the context of water management, and in Section 3, we outline ways in which these three issues can be assessed. Section 4 discusses a new analytical approach being developed within WP2.4 of the NeWater project, namely the . LASER framework , an approach to support the analysis of poverty, health and gender

Section 5 illustrates these various approaches through an evaluation of what these methods tell us about poverty, health and gender in three NeWater case study basins: the Nile, the Orange, and the Amudarya. In addition we report some information on poverty, health and gender issues which have been elicited by the BRAVA approach carried out as part of WP2.1. In section 6, we outline the work to be done in the next phase of the Newater project. This includes:

- developing and applying the LASER framework,
- further development of the integrated indicator known as the Water Poverty Index (WPI), and
- an examination of the degree to which poverty health and gender are integrated into IWRM, and how they are reflected in indicators used for the Millennium Development Goals (MDGs).

Finally, we provide more details of the various approaches in a number of appendices.

It is our intension that this report will be of use to project partners, and will provide some insights into the current state of poverty health and gender in some of the Newater Case studies. We have selected the cases included here as these issues are most pressing there, but we would be happy to extend this analysis to other regions if that were considered to be of interest to case study partners. Hopefully, the analytical approaches developed within WP 2.4 will contribute new ways of addressing the social dimensions of water management, and this will help to demonstrate how processes of Adaptive Water Management will be able to more explicitly incorporate poverty, health and gender in the future of water decision making processes.

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1 Introduction

Work Package 2.4 is contributing to the NeWater objectives 1, 2**,** and 3, *'by contributing to development of a conceptual framework for research and adaptive management of river basins that integrates natural science, engineering and social science concepts and methodologies' (*NeWater DOW 2005). This report represents deliverable D2.4.1, a report: on the rapid appraisal of poverty, gender and health issues in case studies.

The work done in this work package so far has involved a review of the literature and examination of the outputs of the BRAVA process carried out during the first year of the project. In addition, a number of key indicators appropriate to the Millennium Development Goals have been identified, and evaluated for three of the NeWater case studies. The three case studies included here are the Nile, the Orange and the Amudarya. Work on the other cases has been limited due to lack of resources, but it is anticipated that some more detailed work will be carried out in some other case studies (particularly the Guadiana) if resources are available. It is also felt that in some cases, (eg the Rhine and Elbe), problems other than poverty gender and health need more attention (eg. Flood control, pollution etc).

As part of the milestone of month 12, '*mechanisms for dialogues on poverty, gender and health in river basin planning'* are to be developed. In this respect, two specific tasks have been carried out in this period. The first of these is the development of a new conceptual framework, the LASER framework (*Learning from and Adapting to Social-Environmental Realities*). The second activity is the further development of the *Water Poverty Index* (The WPI), an existing integrated index which links poverty, health, gender and water. (Sullivan, 2001,2002, 2003, Sullivan et al., 2002, 2003, Sullivan and Meigh, 2003, 2006),

Indicators are widely used for policy purposes, and have been applied to water management in many ways. Major policy instruments such as the EU Water Framework Directive use several indicators, not only as tools to evaluate and compare situations, but also as means of ensuring compliance with various requirements. One area of water management which the Water Framework Directive fails to address explicitly is how water management may impact on human health, poverty and gender. This report attempts to consider specifically how these aspects of our *Quality of Life* can be represented in the form of indicators as a contribution to more effective and equitable water management regimes.

As a starting point to that process, we state our position on our understanding of the relative importance of these three attributes, in the context of influences on human wellbeing:

a. **Poverty:** The importance of poverty as a factor in reducing human wellbeing is well known, and international commitment to its reduction through the Millenium Development Goals (MDGs) has been made. We believe that water has a major impact on both household and community poverty, and on micro and macroeconomic development . It is with this in mind that indicators of poverty with respect to water will be identified within the indicator structure to be developed and tested in the NeWater cases.

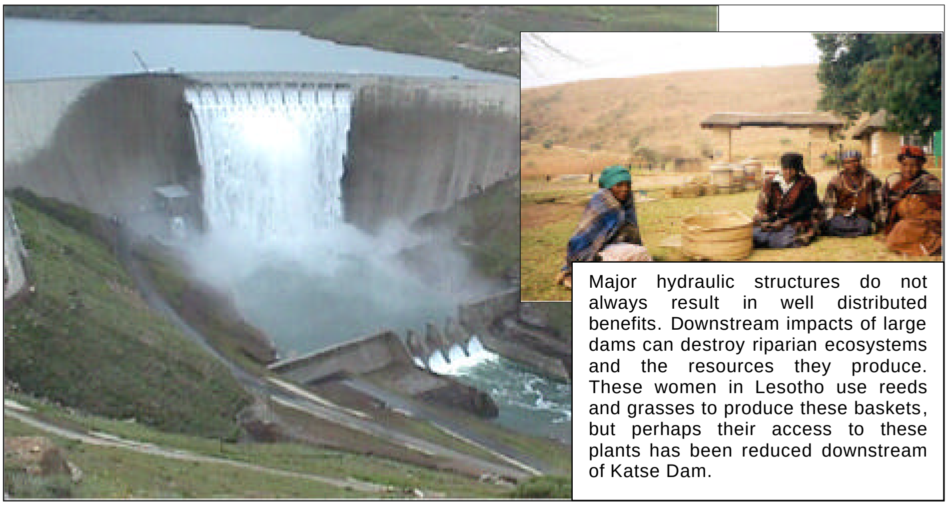
b. **Health:** Deaths from water- related sources range from 2 million to 12 million deaths per year – depending on source of

information (Gleick 2002). Poor water supply, sanitation and personal and domestic hygiene account for 6.8% of the total DALYs (Prüss & Havelaar 1996). These illnesses incur significant treatment costs, and their economic impact in terms of the *opportunity cost of lost productivity* is significant. At the industrial scale, health related reductions in productivity could be measured by levels of illness-related absenteeism. At the household level, this can manifest itself for example in frequent bouts of diahorrea or recurrent malaria preventing subsistence farmers from optimizing crop outputs.
Note: *these latter examples of health impact are almost exclusively ignored due to the fact household-related production values are not included in most national statistics databases.*

c. **Gender:** Gender relations are an important factors in influencing access to water and its use by members of the society. The deeply entrenched nature of gender inequalities and their relationships to water make it important that water managers are aware of the impacts of their interventions on gender roles and responsibilities. To ensure that water is managed equitably, it is important that gender specific needs are addressed in water policies and a truly inclusive gendered approach is undertaken in its implementation.

On the basis of this interpretation, this report provides an outline of the approaches being developed to provide a rapid appraisal technique for the assessment of poverty, gender and health in the NeWater case studies. Both of these approaches will provide mechanisms by which poverty, gender and health can be evaluated and analysed in the context of IWRM. This information will help to support decision-making which mainstreams gender and related wellbeing issues into the process of adaptive water management. This will allow consideration of these issues when assessing not only the costs and benefits of water development options, but also the distribution of their impacts. This is illustrated in Fig 1.

Figure 1 How water developments may not always help poor women



Major hydraulic structures do not always result in well distributed benefits. Downstream impacts of large dams can destroy riparian ecosystems and the resources they produce. These women in Lesotho use reeds and grasses to produce these baskets, but perhaps their access to these plants has been reduced downstream of Katse Dam.

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2 Poverty, gender and health in water management

2.1. Assessing the gender impacts of water management

Gender can be said to be adequately addressed in the context of IWRM if:

- both genders participate equally in water management and decision-making,
- both genders have equal access to the benefits of water allocation, and
- policies address existing gender inequalities and are genuinely inclusive. (equity issues)

In the NeWater project, we hope that appropriate indicators will be developed to capture these issues for IWRM. One important method to do this is participatory gender analysis to understand the complex gender issues that is rooted in the historical and the geographical contexts of the river basins. This will help generate gender specific data on the control and use of water and will provide a basis for addressing these issues in adaptive water management.

2.2. Assessing water related poverty

Because poverty is so all pervading and because the poverty cycle includes all elements and sectors, it is not possible to either achieve success in isolated sectors or to break the cycle through a single sector intervention. It is therefore necessary to approach development - and water sector development in particular - holistically and to integrate activities as much as possible. An integration first requires an assessment of water-related poverty. Poverty is often linked to deprivation from water in sufficient quantity and quality for normal domestic and farming uses. Deprivation from access to water for productive uses is a real obstacle that prevents poor people from fulfilling their basic income needs and escaping income poverty. Poor women are particularly affected. But being poor also exposes people to water-related risks as e.g. floods because they cannot afford housing at locations being less exposed to such a risk. The different ways how poverty and water are linked need careful investigation before drawing up plans and programmes. Only having complete and well researched information it is possible to take an integrated, multiple-use approach to water development and management. Then it even becomes an opportunity to advance progress on five of the eight Millennium Development Goals: Goal 1 to eradicate extreme poverty and hunger; Goal 2 to achieve universal primary education; Goal 3 to promote gender equality and empower women; Goal 4 to reduce child mortality, and Goal 7 to ensure environmental sustainability (IWMI, 2006). The kinds of indicators which can be used to represent health, poverty and gender are discussed in the following sections.

2.3 The assessment of health impacts associated with water and sanitation

Indicators used to represent health impacts usually reflect life expectancy, death rates, infant mortality rates or child death rates. In a rapid appraisal, indicators depend - besides other factors - on scale and scope. The type of indicators applied on a local or even household level differs considerably from indicators applied at a national scale. E.g. indicators used to represent health impacts at national scale usually reflect life expectancy, death rates, infant mortality rates or child death rates. More recently, the use of the Disability Adjusted Life Year (DALY) as a health indicator has become more widespread, and this is thought to be more accurate as a representation as it also captures the morbidity impact of poor health conditions.

The Disability Adjusted Life Year *or DALY* is defined as following:

> ***'The time lived with disability and the time lost due to premature mortality'*** (WHO,2004)

This is a health gap measure that extends the concept of potential years of life lost due to premature death (PYLL) to include equivalent years of 'healthy' life lost by virtue of being in states of poor health or disability.

- **One DALY** can be thought of as: **one lost year of 'healthy' life** and
- **The burden of disease** as a measurement of **the gap between current health status and an ideal situation** where everyone lives into old age free of disease and disability.

The DALY presents therefore one comprehensive indicator depicting the health status of a larger population. It comprises the issue of water and sanitation but also reflects issues like waste, food safety, air. Calculation of the DALY requires a good statistical database, and due the lack of specific linkages between health and water in the DALY, this measure does not represent an ideal measure to represent poverty, health and gender in IWRM in the evolving NeWater assessment methodology.

In the context of NeWater it is also important to check on a national scale for those indicators that are used for monitoring the achievement of the Millennium Development Goals (to be achieved by 2015). Safe water and sanitation impacts directly on both the poor in general and women in particular, and this in turn has an impact on health. In this way, the following Millennium Development Goals (MDGs) and corresponding targets and indicators have been selected for the research topic of integrating PGH issues into IWRM (www.unmillenniumproject.org). The selection of the indicators to be examined has been done mainly based on the criteria of availability and comparability between countries but also on their relation with water issues. As a result, a health indicator on diarrhoea or malaria for example, would be preferred compared to a health indicator on the prevalence of HIV.

2.4 Identification of existing indicators to address the Millennium Development Goals

A number of indicators have been identified from the literature which can be used to monitor progress towards the Millennium Development Goals. A number of these are used here to illustrate the variations in these national measures across the countries of selected NeWater basins, based on easily accessible indicators at national scale.

Table 1 MDG Goal 1 Eradicate extreme poverty and hunger

	Target 1: Halve, between 1990 and 2015, the proportion of people whose income is less than $1 a day	**Target 2:** Halve, between 1990 and 2015, the proportion of people who suffer from hunger
Indicator 1	Proportion of population below $1 (PPP) a day a (Indicator 1a: For monitoring country poverty trends, indicators based on national poverty lines should be used, where available e.g. Poverty headcount ratio (percentage of population below national poverty line)	
Indicator 2	Poverty gap ratio *(incidence x depth of poverty)*	
Indicator 3	Share of poorest quintile in national consumption	
Indicator 4		Prevalence of underweight in children (under five years of age)
Indicator 5		Proportion of population below minimum level of dietary energy consumption

Table 2 MDG Goal 3: Promote Gender Equality and Empower Women

	Target 4: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015
Indicator 9	Ratio of girls to boys in primary, secondary and tertiary education (UNESCO)
Indicator 10	Ratio of literate women to men, 15-24 years old (UNESCO)
Indicator 11	Share of women in wage employment in the non-agricultural sector (ILO)
Indicator 12	Proportion of seats held by women in national parliament (IPU)

Table 3 MDG Goal 4: Reduce Child Mortality

	Target 5. Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate
Indicator 13	Under-five mortality rate (UNICEF-WHO)

Table 4 MDG Goal 6: Combat HIV/AIDS, Malaria and other diseases

	Target 8. Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases
Indicator 21	Prevalence and death rates associated with malaria (WHO) (Plus indicator on diarrhoea if possible)

Table 5 MDG Goal 7: Ensure Environmental Sustainability

	Target 9. Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources	**Target 10.** Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation
Indicator 26	Ratio of area protected to maintain biological diversity to surface area (UNEP-WCMC)	
Indicator 30		Proportion of population with sustainable access to an improved water source, urban and rural (UNICEF-WHO)
Indicator 31		Proportion of population with access to improved sanitation, urban and rural (UNICEF-WHO)

It is useful for international comparison of countries to apply these selected indicators of MDGs, but in many cases, different countries have further interpreted and adapted these indicators to their specific needs for measuring progress in attaining the MDGs in their own countries. In such cases, individual country data should preferably be used.

Whereas the world development indicators follow an approach of the World Bank, a different indicator approach is followed by the WHO. This involves use of the cause-effect framework **DPSEEA** (**D**riving forces-**P**ressures-**S**tate-**E**xposure-**E**ffects-**A**ctions) (WHO 2002) is one option that often serves as the model for describing the relationship between causes and effects and their corresponding indicators. The focus is on exposures, related health effects and actions and integrates existing indicators on driving forces, pressures and state-of-the-environment. The WHO adopted the DPSEEA approach for its indicator development, and accordingly the WHO defines for Europe the "issue" water and sanitation in Table 6.

Table 6 An illustration of the DPSEEA approach

Issue	Driving Force	Pressure	State	Exposure	Effect	Action
Water (Recreation al and Drinking) and Sanitation		Wastewater treatment coverage	• Exceedance of limit values recreational: microbiological • Exceedance of WHO guideline values for drinking water: microbiological • Exceedance of WHO guideline values for drinking water: chemical	• % of the population with access to safe drinking water • % of the population with access to adequate sanitation	• Outbreaks of water-borne diseases: number of outbreaks and total number of cases involved • Diarrhoea morbidity in children under 5 years of age as reported to the national PH surveillance	Effective monitoring of recreational water

Source: Environmental Health Indicators for the WHO European Region *1.* Update of methodology. Geneva, May 2002.

For more detailed analysis on the impact of water and sanitation on the health status of a population different, less aggregated indicators on a lower geographical and administrative scale are necessary. For the community level in a developing country often proxy-indicators are applied. These indicators are not necessarily of quantitative nature but qualitative. Typical examples on community level are: availability of latrine in compound, conditions of facilities, time to fetch water, toilet sharing among x No. of people, time to get access to facilities, type of water source, kind of disposal of liquid waste, etc.

The water management problem is highly complex, requiring as it does an understanding of hydrology, meteorology, ecology, geology, demography, economics, social psychology and engineering. Any attempt to develop more effective water management strategies will need to incorporate a range of disciplines, in order to be able to generate appropriate solutions to the kinds of problems illustrated in Figure 2.

Figure 2 Typical domestic water access in most parts of rural Africa.

Capturing the essence of water poverty
Why people anywhere in the 21st century have to live in conditions like this is difficult to understand. The lack of water access seen in such rural communities is the result of a multifaceted context in which many variables play a part. This situation illustrates a clear policy failure on the part of national and international institutions, to mobilise the relatively small amount of financial and human resources needed to provide for conditions of basic human dignity and health. Providing a meaningful explanation of this to policy makers is a challenging task, and so an easy-to-understand framework is needed for this purpose. The provision of such a framework has been one of the drivers in the process to develop a Water Poverty Index.

3 Developing rapid appraisal tools for assessing poverty, gender and health for use in water management

One of the problems faced by water managers is the lack of adequate tools which can assist in decision making. Tools which are available are not always appropriate, and water allocation decisions are often made on an ad hoc basis. The development of rapid appraisal tools is therefore timely. This section addresses the use of an integrated index approach, (through the further development of the *Water Poverty Index* (WPI), and we also include some discussion on a new, more qualitative approach referred to here as the BRAVA (*Baseline Rapid Vulnerability Assessment*)

The structural framework for the index approach being developed here is that on which the Human Development Index (HDI) has been based. The structure to be used is that of a composite index, which involves the combination of a selection of relevant variables into one formulation, in such a way as to provide an integrated assessment of the issues in question. Examples of such an integrative formula are shown in Box 1.

Box 1 Calculating the Human Development Index

The formula used to calculate is as following:
Human Development Index (HDI) = 1/3 (life expectancy index) + 1/3 (education index) + 1/3 (GDP index)
Source: UNDP, Technical Note 1 of the Human Development Report 2003

3.1 Illustrating an integrated index approach: the Water Poverty Index

Introduction

An innovative approach to the assessment of poverty in relation to water has been generated by the work on the rapid appraisal technique known as the *Water Poverty Index* (WPI) (Sullivan, 2001, Sullivan and Meigh, 2003). This is designed to provide a holistic and transparent method of water resource assessment and monitoring which has been developed in a CEH led international research project funded by DFID (Sullivan et al., 2002; Sullivan et al., 2003). In the design of the WPI, health and gender issues are included, but only as components of an overall composite structure. The Water Poverty Index (WPI) is considered as useful for Integrated Water Resource Management (IWRM) as it incorporates the ecological, hydrological, economic, institutional and social issues which relate to truly *integrated* water management. It is particularly of use for adaptive water management, since it can be applied simply, without complex statistical techniques or software, and can be implemented by local water managers after simple training. Another advantage of this approach is that it can be applied at a variety of scales, and can serve to empower decision-makers in the water sector.

This section is provided to enable potential users in case studies to understand the approach more thoroughly[4], and more information is provided in Appendix 3. The need for this type of tool has been widely recognized, not least by participants at the NeWater general assembly in Mallorca (Nov 2005), as summarized in the WB4 report to the NeWater steering group (Paris 2005). In this report, the responses made to a 'tools and training' survey carried out at that meeting have been summarized:

> *'Integrative tools are needed to support the move towards Adaptive Water Management'*
> (Source Jens Jorgens; NeWater PICP meeting, Paris, Feb. 2006)

The development and application of the Water Poverty Index to date has managed to meet some of these characteristics, and the approach has now been piloted in some 20 countries around the world. The original development of this tool was funded by DFID of the UK, and its objective was for use as a rapid assessment tool to provide a means by which progress in the water sector could be both prioritized and assessed (Sullivan, Meigh and Fediw, 2002). This is particularly relevant in the context of measuring progress in terms of the Millennium Development Goals (MDGs).

3.1.2. The selection of appropriate variables to represent poverty, health and gender

For inclusion in any integrated index, the selection of variables to represent any attribute of a situation depends largely on two things:

- our ability to identify key characteristics of that attribute, and
- the selection of appropriate variables which can capture some defining aspect of it.

To date, in the NeWater project, we have introduced the concept of the Water Poverty Index to stakeholders at the NeWater General Assembly in Mallorca in November 2005, and we have applied the approach to national level data from the Orange and Nile and Amudarya basins. In the next phase of the project, we will be applying this approach in selected sites within some NeWater case study sites, and one specific challenge we will address will be the determination of basin data components from existing locally and internationally generated datasets. More information on the WPI approach is provided in Appendix 1.

3.2 The NeWater Baseline Assessment process BRAVA

As a way of providing some insight into vulnerability in the NeWater case studies, possibly including that related to poverty, health and gender, a new approach has

[4] If any NeWater Case study wishes to implement the WPI approach, CEH will be happy to provide support in application and analysis. For more information contact csu@ceh.ac.uk

been developed. This is referred to as the BRAVA[5] approach *(Baseline Rapid Vulnerability Assessment.* Using this approach, it was hoped to identify priorities and gaps in existing knowledge, but in practice, while some generic vulnerabilities may have been identified through this process, very little information was elicited on the topic of poverty and gender.

The Brava results provide inventories, frequencies and trends of threats and stresses in the river basins. They also indicate impacts of threats on exposure units; i.e., socio-economic or demographic classes, environmental components of the catchments (groundwater, wetlands or endangered habitats) and public infrastructure. Given the wide variation in the composing elements of the exposure units allowed in the definition, the results are also varied. This can make it difficult to compare elements across the basins. More details on this methodology are outlined in Appendix 2, and some general findings from a variety of cases are included here.

3.3.1 Some generic findings from BRAVA

The BRAVA results from Amudarya, Nile, Orange and Tisza indicate that the whole population is affected by water related hazards like drought, floods, water pollution and salinization. In the Orange and Amudarya basin, women and children are affected particularly by drought and water shortages. In the Elbe basin, drought mostly affects the old through causing psychological stress. In Tisza basin children were particularly noted along with the whole population to be affected by drought, floods and pollution.

Hazard impacts based on poverty are not specifically noted. Only in Elbe, the low income group is mentioned to be affected by the water policy. In Orange, livelihoods are impacted by floods while in Tisza they are impacted by erosion. Adverse impacts of floods, drought and water pollution on human health are noted in Rhine and Tisza.

Given the scope of the rapid appraisal, the nature of information generated was of a general nature. The exercise largely failed to capture the differential nature of the impacts of threats and stresses on the basin population based on their gender, poverty and health based roles, responsibilities and relations. This may primarily be due to the lack of existing data. Lack of poverty and gender disaggregated data seems to be a general problem and not only limited to the NeWater case study basins. Reviews have typically noted that such 'data is still rare, and, often not routinely collected, analysed or used in practice.[6] Future research activities in the basins must address these gaps and inadequacies and use poverty and gender sensitive research approaches.

The RAPs in the Amudarya, Nile and Orange provide some information on the poverty and health aspects in the basins, but the results from the BRAVA process do not provide enough robust information to provide a baseline on the status of poverty, health and gender in the NeWater case studies. This will however be incorporated here with other information, to provide some insights into these issues in selected basins.

[5]This section is based on NeWater Rapid baseline vulnerability assessment 1-order and 2-order draft 2005.(Downing et al., 2005)

[6] Division for the Advancement of Women (2005) *Women and Water*. United Nations, Department of Economic and Social Affairs

4 Developing a new analytical tool: LASER (Learning from and Adapting to Social-Environmental Realities) framework

The LASER framework for water management is a conceptual framework developed to analyse the social dimensions, particularly the poverty, gender and health issues for water management. It presents ideas and concepts for understanding these issues in an integrated manner to capture the dynamic nature of vulnerability and understand the pathways for transition towards adaptive management at the local levels, i.e., starting from the individual, household and community up to the local and higher level institutions. This will provide a valuable insight for national and basin authorities in their efforts to achieve social and environmentally sensitive adaptive management strategies and policies.

4.1 Social Dimensions of IWRM: the key questions

The LASER framework is designed to provide an in-depth analysis of the existing and dynamic nature of adaptation from a social dimension perspective. The framework is based on the premise that the aim of an adaptive water management system is to *enhance human well-being* from adequate access to water and *reduce human ill-being* resulting from water related hazards. Given the importance of water in alleviating poverty, redressing gender inequalities and improving health conditions, it can be argued that a net gain in human well-being will be achieved by enhancing the capabilities of individuals and communities for water management. On the other hand, capability to adapt and manage the changing water scenario may be viewed as a constituent component of the overall capabilities of individuals and communities.

Following from this, analyses of social dimensions of water management needs to consider the following *key questions*:

- How the characteristics of poverty, gender relations and the health status of individuals and communities influence their *capabilities* for adaptation.

- What can be learnt from the processes of on-going socio-environmental adaptation for guiding a dynamic process whereby *human well-being* from better access to water is enhanced and *human ill-being* resulting from water related vulnerabilities is reduced?

A description of LASER framework is provided in Appendix 3. The framework provides a flexible methodology and can be easily adapted to the socio-environment context of a given river basin. It will be implemented using the standard participatory research methodologies.

5 Poverty, gender and health conditions from the NeWater Basins

Findings relating to a selection of the case study countries and sites are based here on the BRAVA process carried out in the first year of the NeWater Project, and on the application of the Water Poverty Index methodology to national level data of the countries within case study basins. In addition, a number of indicators specifically referring to the achievement of the Millennium Development Goals have been identified for selected NeWater basins.

In the second phase of the project, we will be applying the Water Poverty Index approach at the sub-national scale, to specific parts of selected basins, or to a cross section along a specific basin, and work shall also be done on the further development of the BRAVA methodology. In addition, further development and evaluation of the LASAR framework will be carried out, and an analysis of existing MDG indicators will be evaluated for their poverty, gender and health relevance.

Information provided here is purely for the provision of an overview, and to illustrate the methodologies to be further examined and developed during the remainder of the project.

4.1 The Nile basin

The Nile river flows from dense tropical forests at its source on the border of Uganda/Burundi, through extreme desert conditions in Sudan and Egypt and finally reaches the Mediterranean sea. Parts of the basin lie within 10 independent countries, so the concept of IWRM is a real political and logistical challenge. As illustrated in Figure 3, the challenge faced by millions of individuals across the basin however, is much greater, however, involving as it does the life and death challenge of finding water in an arid land.

Figure 3 The search for water always gets harder: the impact of a falling water table in the Nile basin

Source: Nile RAP, 2005

5.1.1 Findings from BRAVA process

Very little information on poverty, gender and health has been revealed by the BRAVA process in the Nile basin. There has however been some information collected from the literature which can provide some insights.

There is wide spread poverty within the Nile basin with an average per capita Gross Domestic Product (GDP) of US$250. Five of the riparian countries of the basin are among the 10 poorest in the world. (p.22-23). Population growth coupled with the widespread poverty is the key driver in increased pressure on the water resources. This comes from increased storage and diversion of surface water for increasing energy and agricultural demands. Water stresses and scarcities exacerbate the vulnerability of the affected communities in the Nile basin, particularly the poor and the marginalised, to disasters because these communities often lack the range of sustainable options to minimise disaster risks.

The RAP noted that water-related diseases like malaria, diarrhoea and bilharzia are prevalent throughout the basin. Malaria is noted as the single most important cause of death. Diarrhoea predominantly affects children under four years and is the major cause of death among them. It is related to lack of hygiene and the pollution of drinking water from sewage discharge. The occurrence of bilharzia is more common in Egypt and may be related to slow-moving water evident primarily after the construction of the Aswan High Dam. In general, sedimentation, growth of weeds and water hyacinth in rivers provide conditions for increase in water-borne diseases leading to high mortality throughout the basin. Water pollution affecting the great lakes region in general and the Lake Victoria Basin in particular, heavily impacts the fish population in Uganda, Tanzania and Kenya (p.29-33).

The RAP notes, "*it is urgent that a conceptual framework be developed linking population, including its socio-cultural systems, with the various functions of water and elaborating the connection between environment and development.*" (p.29).

5.1.2 Existing indicators relevant to the MDGs

Table 7 shows the national level values of selected indicators relevant to poverty health and gender in the countries of the Nile basin. This information indicates that despite the many similarities between the countries, there are significant differences in these specific measures between the different countries within the basin.

When data is taken to represent the national picture, it must be recognised that this tends to be based on average values taken across the whole country. This of course cannot reflect the variability that inevitably occurs within all countries, particularly large ones such as the Sudan. An example of variability within a country in the basin is provided in Box 2.

Box 2 Variability within Ethiopia

There is much variation between urban and rural areas in Ethiopia. The access to safe potable water in the year 2000 for Ethiopia as a whole is some 24%, but taking the average for urban areas only, this rises72%. But, if Addis Ababa is excluded from the urban area measure, the figure drops to 38%. To address this problem, Ethiopia has elaborated a poverty reduction program (Government of Ethiopia, 2002) which highlighted the importance of water management for poverty eradication. Water is a cross-sectoral issue that needs to be mainstreamed with many other sector strategies. Also poverty is a cross-sectoral issue that requires careful and coherent attention in many sector policies and strategies. Unfortunately, in spite of good intentions and assistance from various sources, there has been limited success in the way poverty, gender and health are integrated into the principles of IWRM.

Table 7 Current indicators available to assess the MDGs for the countries of the Nile basin

Countries within the Nile basin										
	Egypt	Tanzania	Uganda	Kenya	Sudan	Ethiopia	Burundi	Rwanda	Eritrea	DR Congo
Human Development Indicator (HDI) 2003	0.659	0.418	0.508	0.474	0.512	0.367	0.378	0.450	0.444	0.512
Gender Development Indicator (GDI)-Rank/value	-/-	127/ 0.414	109/ 0.502	117/ 0.472	110/ 0.495	134/ 0.355	132/ 0.373	122/ 0.447	125/ 0.431	131/ 0.373
% of population with access to improved sanitation (1990/2002)	54/68	47/46	43/41	42/48	33/34	4/6	44/36	37/41	8/9	18/29
% of population with sustain-able access to an improved water source (1990/2002)	94/98	38/73	44/56	45/62	64/69	25/22	69/79	58/73	40/57	43/46
Incidence of Malaria (DALY 2002)	156	2.063	1.530	696	796	1.251	184	121	96	3.631
Est. death rate per 100.000 of Malaria (2002)	7,0	156,4	165,0	57,3	67,4	46,3	70,7	35,8	61,4	190,9
Incidence of Diarrhoeal diseases (DALY 2002)	464	1.059	989	818	655	2.100	306	436	87	3.670
Est. death rate per 100.000 of Diarrhoeal diseases (2002)	18,6	87,9	120,9	78,1	59,2	91,6	140,8	160,4	64,8	219,2

Source: Human Development Indicator (HDI) 2003; Gender-related Development Indicator (GDI)-Rank/value; % of population with access to improved sanitation (1990/2002); % of population with sustainable access to an improved water source (1990/2002) out of UNDP (2005) Human Development Report 2005; Est. deaths per 100,000 population by Malaria; Est. deaths per 100,000 population by Diarrhea, out of WHO (2004) World Health Report 2004.

5.1.3 Information about the Nile basin based on an application of the Water Poverty Index

To illustrate the value of the integrated index approach, the Water Poverty Index structure has been applied to three sample NeWater cases – the Nile, the Amudarya and Orange basins. In these cases, key stakeholders (basin commissions) have expressed interest in the tool, and it is hoped this preliminary example can demonstrate the usefulness of its application for policy purposes.

This section illustrates how this approach can illustrate national variations in countries within transboundary basins. This particular example is based on country average scores, and to be more accurate, it would be essential to assess which parts of the basin are within each country and then to assess those parts of each country to get a more reasonable picture. Ideally, this should then be supported by some snapshot analysis of a selection of sites within each country segment.

5.1.3.1 WPI values in the Nile Basin

The Nile basin covers an estimated area of 3.1 million sq. km., and incorporates some180 million people in 9 countries. Huge variations exist between these countries, and at the basin scale, the water is regulated politically by Egypt, under the 1929 Nile Agreement. Hydrologically, the massive Aswan dam with a storage capacity of 169 Km^3, moderates an annual flow of 84 billion m^3 .These characteristics are summarized in Table 8. The unusual thing about this river is that it is the downstream country which actually controls the whole basin. In all the countries of the Nile, poverty is an endemic problem, so the WPI could be used as a tool to reveal inequities in how water is used and managed in each place.

Table 8 Characteristics of Nile basin countries (2000)

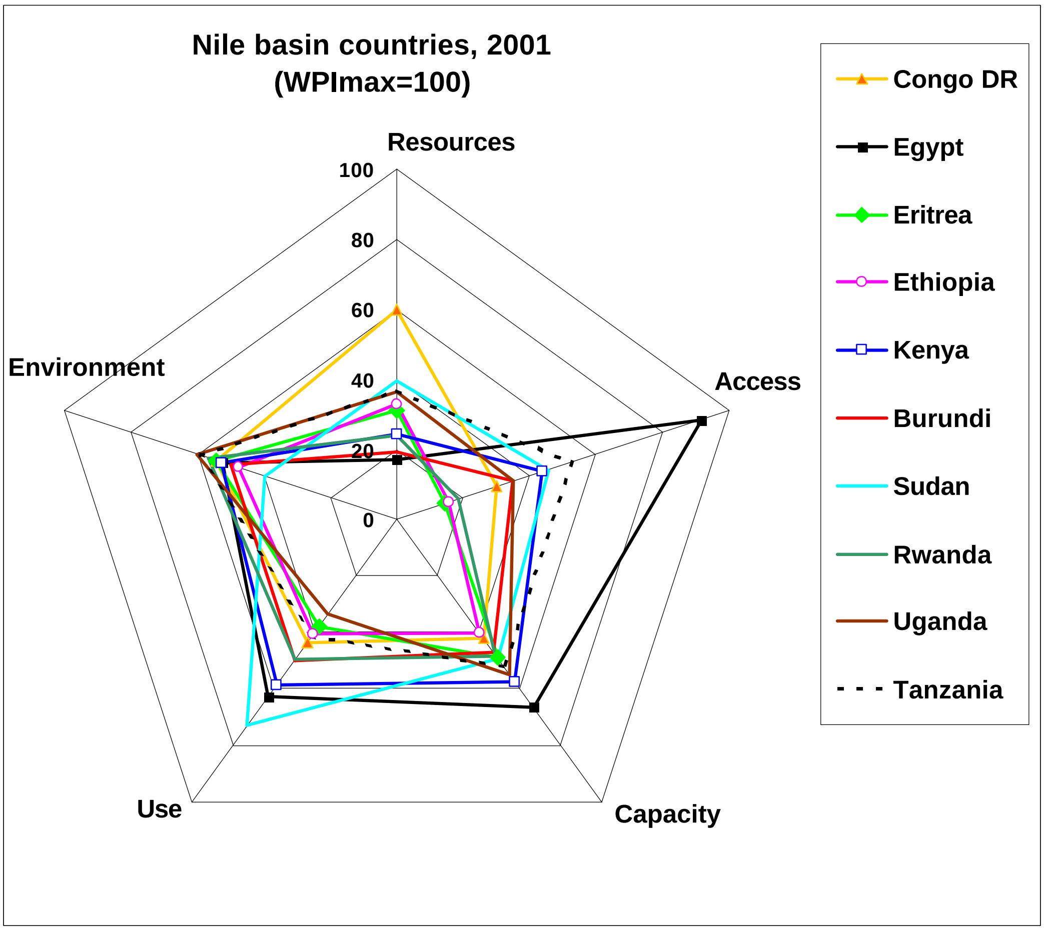
Country	Pop. millions	Land 000 ha	HDI value (1999)	Falkenmark (M^3/cap)	HDI rank (1999)
Egypt	68.470	99,545	0.635	0.44	105
Ethiopia	62.565	100,000	0.321	1.76	158
Tanzania	33.517	88,359	0.436	2.52	140
Kenya	30.080	56,914	0.514	0.84	123
Sudan	29.490	237,600	0.439	3.20	138
Uganda	21.778	19,965	0.435	2.41	141
Rwanda	7.733	2,467	0.395	0.81	152
Burundi	6.695	2,568	0.309	0.54	160
Eritrea	3.850	10,100	0.416	1.51	148

As a demonstration of the possible usefulness of the tool to the Nile Basin Initiative (NBI), a WPI profile is provided for each of the countries. This is summarised in Table 9 and illustrated in Figures 4 and 5.

Table 9 WPI components scores for the Nile basin countries

	Resources	Access	Capacity	Use	Environment	WPI
Egypt	17.00	91.67	66.70	62.51	52.33	58.04
Ethiopia	32.76	15.72	40.13	40.73	47.62	35.39
Congo DR	59.92	30.00	42.19	43.54	54.42	46.01
Tanzania	36.88	52.58	51.88	41.22	59.18	48.35
Kenya	24.29	43.71	57.51	58.52	52.68	47.34
Sudan	39.63	45.54	49.25	72.94	39.59	49.39
Uganda	36.37	35.29	54.73	33.57	60.23	44.04
Rwanda	23.97	18.57	48.27	49.66	56.61	39.42
Burundi	19.23	34.96	47.11	49.77	49.71	40.15
Eritrea	31.00	14.24	49.05	38.06	54.42	37.35

Figure 4 WPI scores illustrated for the 9 counties of the Nile basin



To examine this more closely, the information can be divided into two groups, and these are shown in Figure 5.

5.1.3.2 Interpretation of WPI scores for the Nile basin

The result of this WPI analysis indicates that, on the basis of these figures, Egypt is the least *water poor* of the Nile basin countries, with a WPI score of 58. In contrast, Ethiopia is the most *water poor*, with a WPI score of 35.3, with Eritrea being just slightly better off with a WPI score of 38.4. [note: all locations will fall within the range 0-100]. This can be contrasted with the HDI and Falkenmark index figures for those two countries. The Falkenmark index indicates that the country with the greatest water endowment per capita is the Sudan (with a score of 3.2) while the least well endowed is identified as Egypt, with a Falkenmark score of 0.44. Both Ethiopia and Eritrea which have quite high levels of water resources, have very low HDI scores, reflecting the fact that taking a hydrological measure alone (as in the Falkenmark index) is not comprehensive enough to identify where attention is needed to bring improvements in the water sector.

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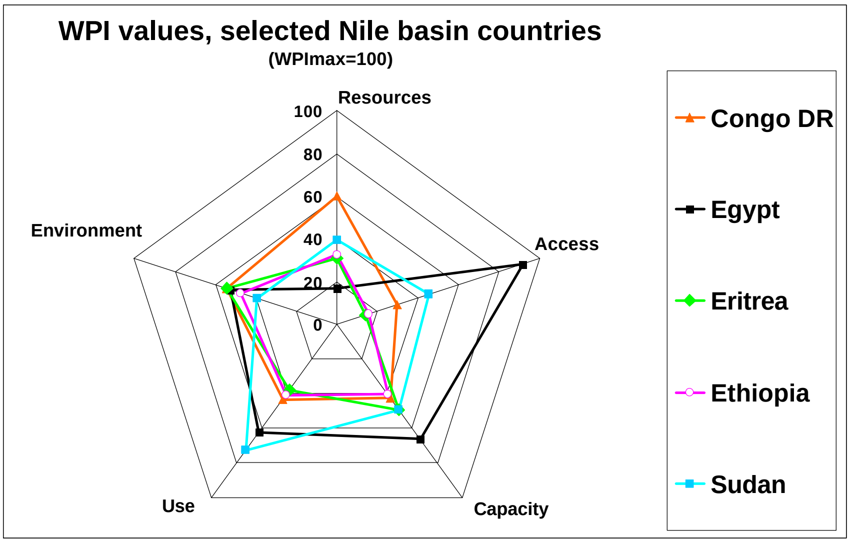
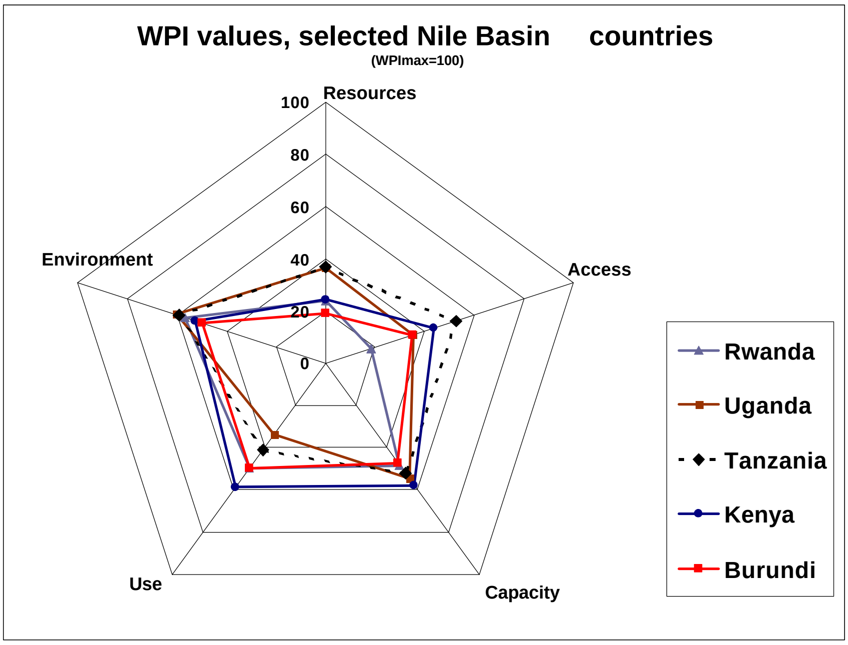
Figure 5 WPI values for lower and upper parts of the Nile

Egypt, Eritrea, Ethiopia, Sudan and DR Congo (ex-Zaire)	
Rwanda, Uganda, Tanzania, Kenya, and Burundi	

With reference to Figure 5, it can be seen that while Egypt has the lowest level of water resources as measured by the WPI, it still manages to provide quite a high level of access to that water, has good capacity to manage it, and is relatively efficient in its use. In contrast, for both Eritrea and Ethiopia, while having more resources, both have low score for capacity and use, and in particular, water access is especially low. This suggests that in the Nile basin, for the purposes of reducing by half the number of people currently unserved with safe water, emphasis should be placed on improvements in those two countries.

On the basis of the water resources figures for Sudan and the DR of the Congo, there is much potential for future development. In both countries, there is a clear need for capacity building for water management, and improvements in environmental impacts, especially in the Sudan. For the Congo, there is also a need to improve efficiency of water use.

It must be noted that these profiles have been calculated on the basis of national scale data available from publicly available global datasets. It may be that the data held in these databases are out of date or inaccurate, but for the purpose of this demonstration, they are felt to be adequate. There is no doubt that a much more accurate picture of each country may be gained through the collection of more reliable data, and it is possible that by identifying what proportions of the basin related to which country, a more accurate assessment of the basin as a whole could be achieved. It is hoped that this can be achieved within the NeWater project as part of the activities of WP2.4.

5.2 The Orange basin

A large majority of people in the Orange basin live in extreme poverty. Poverty reduction is a major objective of both the national governments of the region, and the international donor community. Unemployment is very high in many parts of the basin, with much of Lesotho having a 40 to 50% unemployment rate. Even in the highly industrialised areas in South Africa, such as Gauteng, the average rate of unemployment is 30%. The high prevalence of HIV/AIDS amongst both rural and urban communities is the most significant health threat, the average rate of HIV/AIDS infection in South Africa is 26.5%. (p.12 -13). Figure 6 shows residents in a village in Lesotho who's situation with water problems are exactly the type of problems which can improved through adaptive water management.

Figure 6 Community representatives at a village meeting in Lesotho.

It is noticeable in this figure that there are no women included in this meeting, reflecting the imbalance between the genders in terms of power and influence in water management across the region.

5.2. 1 The BRAVA process

A summary of the threats and uncertainties identified within the Orange basin during the BRAVA process are shown in Table 10.

Table 10 Findings from the BRAVA process in the Orange

Threats	Uncertainty	Priorities
Soil erosion Inequitable access to water Poor land management Conflicting resource use Pollution Siltation Ignorance of water mgt and poor communication Industrialisation	Variable Rainfall Lack of modelling Political regimes - internal and transboundary Monitoring and data availability Understanding land and water relationships Climate change	Efficiency of water use Water Governance Inequitable access to water Variable rainfall Variable stakeholder perceptions Conflicting resource uses

On the basis of numerous stakeholder meetings in the Orange, we have identified two key research questions that might contribute to improving the poverty situation in the basin:
- *What are the opportunities for adaptive water management and poverty alleviation to be positively reinforcing?*
- *How can we enhance the role of river ecosystem services in quality of life of neighbouring communities?*

5.2.2 Existing indicators for the Millennium Development Goals (MDGs)

Several indicators are already in use to monitor progress for the MDGs. A comparison of the scores for the different countries of the Orange basin are shown in Tables 11 and 12.

Table 11 Scores on existing MDG indicators for the Orange basin

Countries with parts belonging to the Orange basin				
*	South Africa	Namibia	Lesotho	Botswana
Human Developement Indicator (HDI) 2003	0.658	0.627	0.497	0.565
Gender Development Indicator (GDI)-Rank/value	92/0.652	96/0.621	114/0.487	100/0.559
% of population with access to improved sanitation (1990/2002)	63/67	24/30	37/37	38/41
% of population with sustainable access to an improved water source (1990/2002)	83/87	58/80	-/76	93/95
Incidence of Malaria (DALY 2002)	3	33	-	6
Est. death rate per 100.000 of Malaria (2002)	0,2	38,8	0,4	9.1
Incidence of Diarrhoeal diseases (DALY 2002)	479	29	49	13
Est. death rate per 100.000 of Diarrhoeal diseases (2002)	30,4	43,2	83,9	20,5

Source: Human Development Indicator (HDI) 2003; Gender-related Development Indicator (GDI)-Rank/value; % of population with access to improved sanitation (1990/2002); % of population with sustainable access to an improved water source (1990/2002) out of UNDP (2005) Human Development Report 2005; Est. deaths per 100,000 population by Malaria; Est. deaths per 100,000 population by Diarrhea, out of WHO (2004) World Health Report 2004.

Table 12 Water- relevant Indicators to achieve the MDG No.7 for South Africa (Orange basin)

(Comparison 1990/2002 based on JMP online data query and comparison 1996/2001 on special reports by JMP)

Years Indicators	1996	2001	1990	2002
Improved sanitation facilities, urban (% of urban population with access)	85%[1]	85%[2]	85%	86%
Improved sanitation facilities, rural (% of rural population with access)	39%[1]	48%[2]	42%	44%
Improved water source urban (% of urban population with access)	98%[3]	98%[4]	99%	98%
Improved water source rural (% of rural population with access)	71%[3]	73%[4]	67%	73%

[1] October HHS 1996; in: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, Coverage Estimates. Improved sanitation, South Africa, updated 2004

[2] South Africa National Census 2001 in: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, Coverage Estimates. Improved sanitation, South Africa, updated 2004

[3] October HHS 1996; in: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, Coverage Estimates. Improved drinking water, South Africa, updated 2004

[4] South Africa National Census 2001 in: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, Coverage Estimates. Improved drinking water, South Africa, updated 2004

The analysis of water management in regard to the integration of poverty, gender and health issues by the means of quantitative and qualitative indicators is just one aspect of an overall analysis. A first step would be the analysis of how far criteria of IWRM are also integrated into policies and programmes: e.g. the existence of documents or elements in official documents of water resource management that underline the importance of specifically targeting the poor. One positive example can be highlighted here - the National Water Resource Strategy of South Africa. There, they have defined priorities for water allocation ranking social need higher than requirements for the national economy. This is illustrated by an extract from the Republic of South Africa's National *Water Resource Strategy* (2004):

"…To facilitate the most beneficial utilisation of water, a general guide on priorities for water use is given below. The priorities are listed in descending order of importance, although the order may vary under particular circumstances.

- *Provision for the Reserve.*
- *International agreements and obligations.*
- *Water for social needs, such as poverty eradication, primary domestic needs and uses that will contribute to maintaining social stability and achieving greater racial and gender equity.*
- *Water for uses that are strategically important to the national economy.*

- *Water for general economic use, which includes commercial irrigation and forestry. In this category, allocation is best dictated by the economic efficiency of use. With the introduction of water trading, demand will automatically adjust over time to reflect the value of water in particular uses.*
- *Uses of water not measurable in economic terms. This may include convenience uses and some private water uses for recreational purposes, which are likely to be of low priority.*

Additional factors to be considered in assessing priorities for the allocation of water are the level of assurance of supply required, the extent to which to use is consumptive and the quality of return flows. It is important to realise that all water use by a particular sector or user is unlikely to be of the same priority. Water to maintain primary production functions, for example, would be of higher value and priority than the additional water required for other uses in the same enterprise. This also relates to the efficiency of water use, with greater efficiency leading to a higher value of water. The same principle applies to a greater or lesser extent to all uses of water…."

Recognizing the aspects of poverty, health and gender in water policies and programmes is the first step and many countries have already achieved doing so. The second more difficult step is the assessment how far these aspects were respected during the implementation of policies and programmes. It is important to differentiate if these issues were respected at all during implementation of water management policies, and how effective they are, once implemented.

5.2.3. Applying the WPI in the Orange basin

The application of the WPI approach to the data from the Orange basin serves to highlight the differences between the parts of the basin. Some basic characteristics of the countries in the Orange basin are shown in Table 13. This clearly shows the variation in size, water availability and level of development in the different countries included in the Orange basin.

Table 13 Some indications from the Orange basin

Country	Pop. Millions, (2000)	Land area 000 ha	HDI value (1999)	Falkenmark index	HDI rank (1999)
South Africa	40.3770	122,104	0.702	1.17	94
Lesotho	2.1530	3,035	0.541	2.43	120
Namibia	1.7260	82,329	0.601	14.98	111
Botswana	1.6220	56,673	0.577	5.43	114

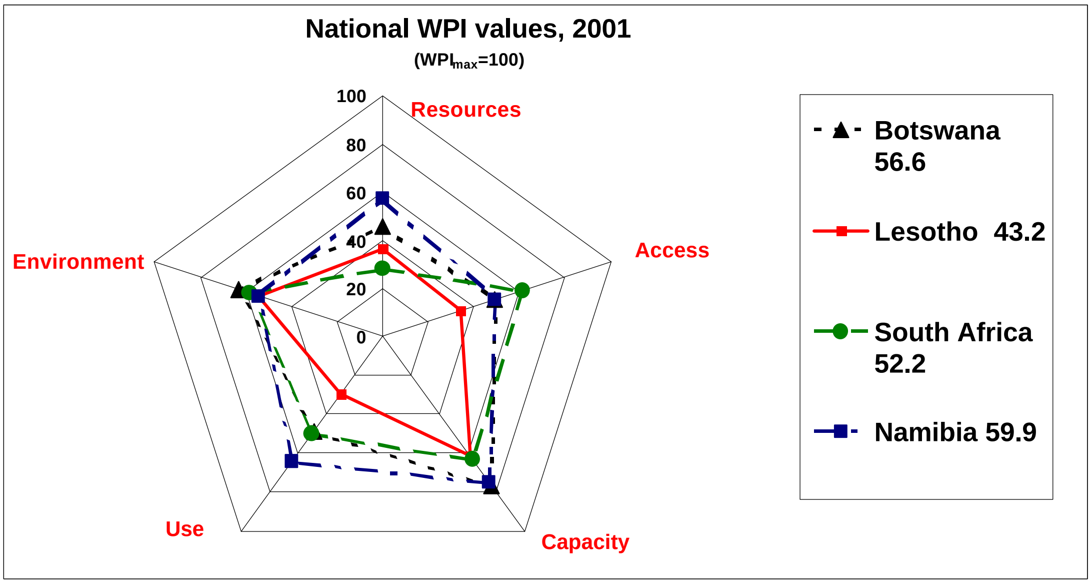
When the WPI is applied, the differences between the countries can be identified in terms of the five components of the WPI score. This helps decision makers to identify what particular aspect of water management that they need to address. This is illustrated in Table 14, and Figure 7.

Table 14 National WPI values for the countries in the Orange basin

	Resource	Access	Capacity	Use	Environment	WPI
Botswana	45.64	48.67	76.87	48.73	63.17	56.62
Lesotho	36.46	34.12	61.53	29.52	54.42	43.21
Namibia	57.25	48.68	75.12	64.44	54.42	59.98
South Africa	28.15	61.04	63.28	50.41	58.21	52.22

Note: Only parts of these countries are in the Orange basin.

Figure 7 National WPI Values for Orange basin countries



5.2.4 Interpretation of WPI scores in the Orange basin

This comparison of these four countries cannot be taken to accurately reflect the situation in the Orange basin as such, as the data used to illustrate this methodology are national level data for the four countries concerned. To provide an accurate picture of the basin, calculations would need to be made on the appropriate data for those parts of the countries which actually fall within the catchment of the Orange basin. This has not yet been done, but we will address this in the next phase of the NeWater project. In spite of this data issue however, we can still make some general observations about the different countries in the basin. On the basis of Figure 7, we can see that overall, Lesotho fares worse than the other countries, with its scores nearer to zero on of the five WPI components. This suggests that efforts are needed on all dimensions to generate a more equitable and effective water management regime. On *Resource* endowment, Namibia fares best, these figures reflecting the investments that have been made in infrastructure for the water sector in that country[7]. This is also reflected in the higher score on the *Use* dimension, reflecting higher returns on water use than in the other places shown.

In South Africa, *Resource* scores are lowest, with the high population putting great strain on the limited hydrological resource endowment in that country. In spite of this however, its score on *Access* is best between these countries, and due to better *Capacity* and *Use* scores, the country achieves a moderate WPI value overall.
In Botswana, the relatively high score on *Capacity* suggests that there is potential to generate progress in that country through better water management, and investment to improve economic returns from water use would be worthwhile.

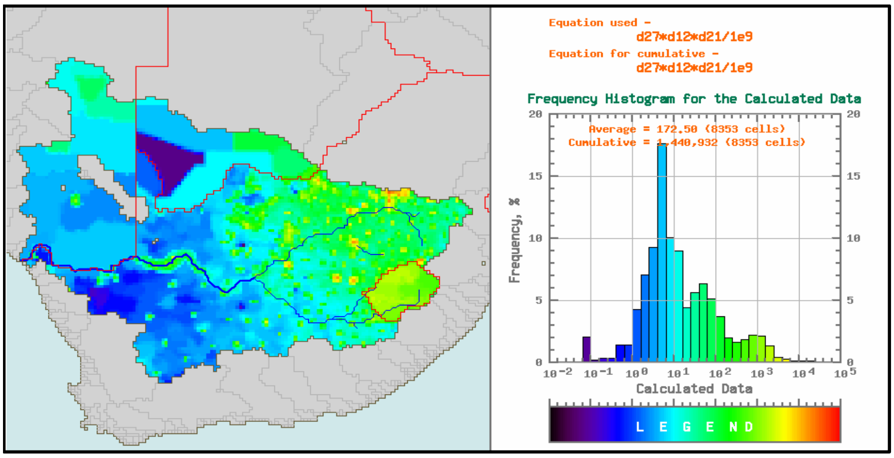
Such data clearly does not adequately differentiate between different locations in a country, nor does it represent the heterogeneity of water resources, but it does indicate key differences between countries in terms of water resource provision and the efficiency of its use. The use of this type of multi-axis diagram enables strengths and weaknesses of each location to be examined and compared.

[7] NOTE: the WPI figures are taken on a per capita basis on all relevant dimensions, and the low population in Namibia, relative to its resources, accounts for this high value.

5.2.5 Using GIS to illustrate indices at the basin scale: the Orange basin.

By applying the WPI methodology to spatially distributed data, it is possible to use GIS to display the results. In Figure 8, the combination of data on malnourished children with that on soil type illustrates the clear spatial pattern which exists in the Orange basin. It clearly shows a more significant problem within Lesotho, highlighted by the green colour on the scale.

Figure 8 Malnourished children on poor soils



(After Sullivan et al., 2006)

5.3 The Amudarya Basin

Source: GWP 2005. Gender Aspects of Integrated Water Resources Management.

The Amudarya basin is made up of a number of countries which were primarily part of the former Soviet Union. During that time in their history, water management was heavily focused on provision of water for irrigation, and most water was used for large scale irrigated agriculture. Both institutions and infrastructure have been managed centrally and there has been very little attempt to involve stakeholders in water management decisions. In this way, this case has much potential to develop more adaptive water management strategies.

5.3.1 The BRAVA process

Very little information on Poverty, Health and Gender has been elicited by the BRAVA process. The baseline assessment included in the Amudarya RAP (NeWater 2005) has however identified the basic conditions of poverty and health in the basin, revealing quite significant differences between countries in the basin. Tajikistan has the largest low income population, 83 % of its population living below the national poverty line. In Uzbekistan, this figure is about 28% (RAP p.11-12). In the delta and the low reach areas water quality is one of the most pressing issue due to discharges of drainage water and industrial pollutants in the Amudarya. Poor water quality leads to problems of potable water supply and consequently causes health problems, and it has negative impacts on harvest and soil fertility. (p.32) Human health problems are often caused by point contamination (industrial, municipal and livestock farming sewage) and distributed contamination (collector and drainage flow from irrigated areas) sources that contribute to parasitic and toxic diseases such as hepatitis, cancer and poisoning (p.11)

5.3.2 Information from the MDGs

The same indicators used to illustrate the Nile and Orange basins have also been identified for the countries of the Amudarya. While some data is missing, these provide some useful background for comparison between countries. This is summarized in Tables 15 and 16.

Table 15 Selected MDG indicators

Countries with parts belonging to the Amurdarya Basin					
	Uzbekistan	**Tadjikistan**	**Kyrgyztan**	**Turkmenistan**	**Afghanistan**
Human Development Indicator (HDI) 2003	0.694	0.652	0.702	0.738	-
Gender Development Indicator (GDI)-Rank/value	86/0.692	93/0.650	85/0.700	-	-
% of population with access to improved sanitation (1990/2002)	58/57	-/53	-/60	-/62	-
% of population with sustainable access to an improved water source (1990/2002)	89/89	-/58	-/76	-/71	-/13
Incidence of Malaria (DALY 2002)	-	13	-	-	64
Est. death rate per 100.000 of Malaria (2002)	-	0,5	-	-	4,1
Incidence of Diarrhoeal diseases (DALY 2002)	38	68	26	39	1.343
Est. death rate per 100.000 of Diarrhoeal diseases (2002)	2,1	32,8	13.0	22,9	179,5

Source: Human Development Indicator (HDI) 2003; Gender-related Development Indicator (GDI)-Rank/value; % of population with access to improved sanitation (1990/2002); % of population with sustainable access to an improved water source (1990/2002) out of UNDP (2005) Human Development Report 2005; Est. deaths per 100,000 population by Malaria; Est. deaths per 100,000 population by Diarrhea, out of WHO (2004) World Health Report 2004.

Table 16 Access to public utilities in Uzbekistan (rural/urban)

Public Utility	Urban Households	Rural Households
Access to piped water	85%	29%
Use of pit toilets (not flush toilets)	44%	89%
Use of public tap	-	27%

Source: Survey estimates of share of households in urban and rural areas with access to selected public utilities, 2002 (in %) (ADB, Gender Country Assessment – Uzbekistan, 2005)

Available data on world development indicators must be handled with care. Direct comparisons are hardly acceptable because primary data sources often worked with different indicator definitions. Time series are often incomplete and data inaccurate. Despite many options to access data online it is hard to judge its reliability. Even data provided by the Joint Monitoring Programme of UNICEF and the WHO for the same year may differ between the online data query (supposed to be the most updated), the Global Water Assessment Report 2000 or selected country papers.

The examples given in the table below are based on special reports on Uzbekistan by the Joint Monitoring Programme (JMP) for Water and Sanitation of the WHO and UNICEF (comparison of 1996 and 2000) and the Water & sanitation data query tool provided on the JMP website (http://www.wssinfo.org/en/watquery.html) [8] (comparison of 1990 and 2002).

In the case of Uzbekistan there is a strong indication that especially women in rural areas suffer under drought conditions (RAP Amurdarya: NeWater document 2005) Women are responsible for accessing alternative water sources in case of failure (drying up) of their conventional facilities and sources. The distance to travel increases, the time to fetch water therefore increases – not forgetting their burden in general to carry heavy loads over larger distances! In this context, it appears that women have to carry water for larger distances in drought situations than may be relevant in the Nile and Orange basin. The difference between urban and rural coverage is shown in Table 17.

[8] Same data can be also found in WHO/UNICEF 2004. Meeting the MDGs Drinking Water and Sanitation Target. A mid-term assessment of progress.

Table 17 Water- relevant Indicators to achieve the MDG No.7 for Uzbekistan (Amurdarya basin)

Years Indicators	1996	2000	1990	2002
Improved sanitation facilities, urban (% of urban population with access)	71%[9]	76%[10]	73%	73%
Improved sanitation facilities, rural (% of rural population with access)	43%[8]	54[9]	48%	48%
Improved drinking water source (% of urban population with access)	99%[11]	94%[12]	97%	97%
Improved drinking water source (% of rural population with access)	88%[10]	78%[11]	84%	84%

5.3.3 Application of the Water Poverty Index to the countries of the Amudarya basin

The following analysis (see Table 18 and Figure 9) is based on publicly available data from a variety of sources. While it is possible to doubt the validity of such data from all countries, it is based on nationally generated official figures and therefore represents some degree of reality. To fully evaluate the picture this provides of the variation within the Amudarya basin, it would be necessary to work with local agencies to find more recent and accurate data which is locally relevant to the case studies.

Table 18 WPI component values for countries of the Amudarya basin

Country	Resources	Access	Capacity	Use	Environment	WPI
Afghanistan	37.41	22.90	71.00	61.61	54.42	49.47
Kyrgyzstan	52.50	88.33	69.01	67.44	43.91	64.24
Tajikistan	54.51	60.00	68.41	59.65	54.42	59.40
Turkmenistan	50.14	88.33	73.66	83.34	54.42	69.98
Uzbekistan	29.94	96.67	73.00	63.36	41.23	60.84

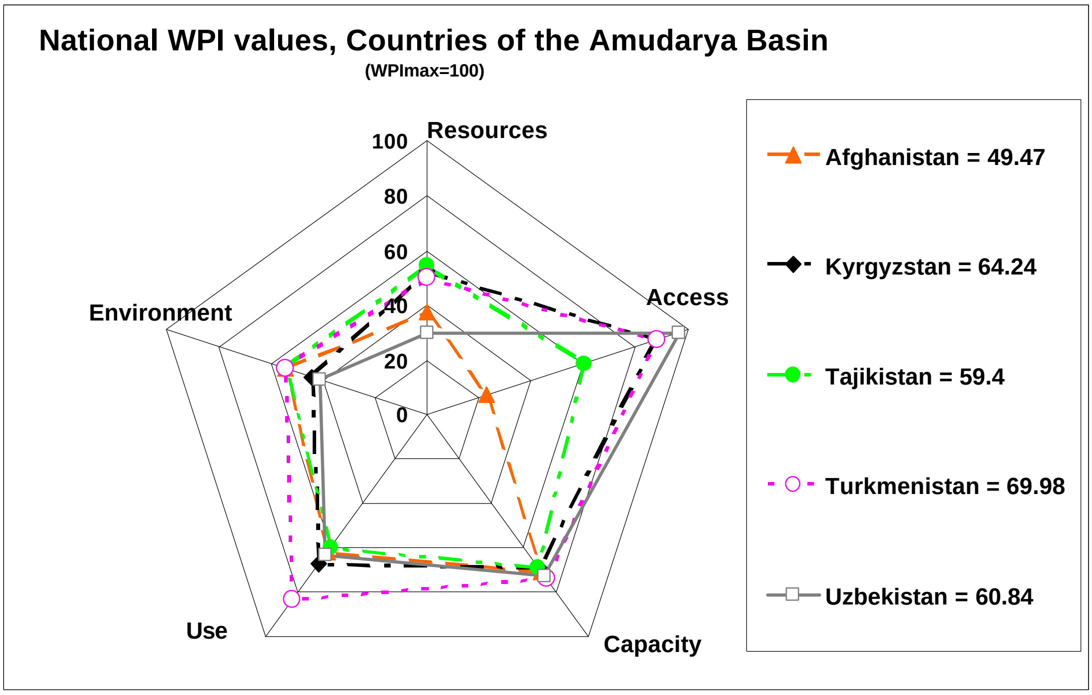
[9] DHS; Demographic Health Survey Uzbekistan 1996 in: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Coverage Estimates 1980-2000. Access to improved sanitation, Uzbekistan, 2001

[10] MICS (Multiple Indicator Data Survey), Republic of Uzbekistan 2000 in: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Coverage Estimates 1980-2000. Access to improved sanitation, Uzbekistan, 2001

[11] DHS; Demographic Health Survey Uzbekistan 1996 in: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, Coverage Estimates. Improved drinking water, Uzbekistan, updated 2004.

[12] MICS (Multiple Indicator Data Survey), Republic of Uzbekistan 2000 in: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Coverage Estimates. Improved drinking water, Uzbekistan, updated 2004.

Figure 9 Applying the WPI to the Amudarya basin countries.



Note: In this calculation, due to lack of data, the capacity figure for Afghanistan is based on an average for the other four countries of the basin.

5.3.4 Interpretation of the WPI values for the Amudarya

On the basis of the information provided in Table 18 and Figure 9, it is clear that in terms of resources, Tajikistan has the largest amount of water resources, closely followed by Turkmenistan. Usbekistan has the lowest score on the resources component. In terms of access, Afghanistan has by far the lowest level of provision, this also likely to have been worsened more recently as a result of the present conflict situation there. Tajik households, in spite of having the best resource score, have a low level of access to water and sanitation. Reflecting the political, economic and social history of the basin, the capacity scores in all countries are similar, and indeed, in the absence of appropriate data, the average of four basin countries has been used to reflect capacity scores for Afghanistan. This of course may be inaccurate, but it does enable us to complete the calculation of the WPI for all of the the basin countries. On the basis of the overall WPI scores, Turkmenistan has a relatively high score, (similar to New Zealand, Slovenia and France), and it is noticeable that the use component reflects this higher score, suggesting that in that country, water is used more efficiently for productive purposes.
Note: Once again, these scores represent country values, and only parts of the country fall within the Amudarya basin, so these figures cannot be taken to accurately represent those parts of the countries within the basin. This would need to be calculated on the basis of locally relevant data generated by local stakeholders and researchers. It is hoped during the NeWater Project, this may be achieved.

6 Integrating poverty, health and gender into the NeWater project

In an attempt to produce a rapid appraisal approach specifically for poverty, health and gender in the NeWater project, we propose to create a specific index, focusing explicitly on those issues. Over the next 18 month period, we will construct an index based on an integrated structure to be developed through interactive consultation with users in the Orange, Amudarya, Guadiana and Nile basins. Through this process, suitable characteristics of each attribute will be identified, and representative variables relating to the Millennium Development Goals for each of these will be selected. Existing data will be used as far as possible in this process, and the methodology will then be tested in selected case study sites, and at various scales. We will also continue to develop and refine the Water Poverty Index methodology which specifically addresses the problem of poverty in the context of IWRM.

As part of the wider evaluative process of poverty, gender and health, we will also work to develop the new analytical approach being developed as part of this work package, here referred to as the LASER approach. This will be rigorously examined in the Amudarya basin in particular, and a generic methodology will be developed.

6.1 IWRM, Adaptive Management and the Water Poverty Index

Achieving Integrated Water Resources Management (IWRM) is currently the water management objective for many countries throughout the world. In the NeWater project, we hope to contribute towards the achievement of this objective, through the development of more *Adaptive* management strategies. In essence, adaptive management requires an exchange of information from communities to management authorities. The Water Poverty Index is designed to capture a holistic representation of appropriate information for integrated water management, and present it in such a way as to make it accessible and easy for policy makers and other stakeholders to understand and use. On the basis of the findings of this report, it is interesting to note that the WPI provides a comprehensive and integrated assessment of the social dimension of water resource management, and through its transparent and standardised calculation, it is possible to use it for the purposes of comparison both between and within large transboundary basins.

Through the use of this tool, variations in water provision and availability can be revealed, making the whole process of water management more accountable. Because of this fact, The WPI also serves to empower water managers, giving them standardised framework on which to base their decisions. For communities, through the calculation of the WPI, they are able to lobbv their representatives to bring about an improved water service. In addition, by incorporating the environmental component in the WPI, it is possible to ensure that water management is carried out in such a way as to minimise negative effects on the ecosystem on which it depends.

The whole process of information provision is fundamental to the achievement of Adaptive Water Management, and it is in that context, that the Water Poverty Index and other integrated indices can be applied. The concept of participatory weighting of components enables a wide range of views to be included in the decision making process, and the use of a transparent evaluation framework means that the tool can contribute to more equitable water management outcomes.

7 Conclusions

Huge progress has been made in recent years in the achievement of integrated water resources management, but in spite of much effort in awareness-raising by interested parties, the issue of gender is still much neglected. Furthermore, although the links between water management, health and poverty are recognized, there has been little real improvement to explicitly address these issues within day-to-day water management decisions. Until this occurs, there will inevitably be problems arising from inequitable distributional impacts of water development processes. As the most politically and economically disenfranchised groups, women, children, and the poor, are rarely included in such decision-making, and thus their needs are often not considered.

In this report we have provided a conceptual introduction to the work to be carried out in WP2.4 of the NeWater project. We have outlined the methodologies that will be further explored during the remainder of the project, and we have highlighted the specific issues of health and poverty which will also be central to our analysis. We have also provided an indication of how this analysis can be integrated into the existing mechanisms and tools used for the purpose of IWRM. In this respect, our objective is to provide a robust analytical tool for the evaluation of poverty, gender and health, within the context of IWRM.

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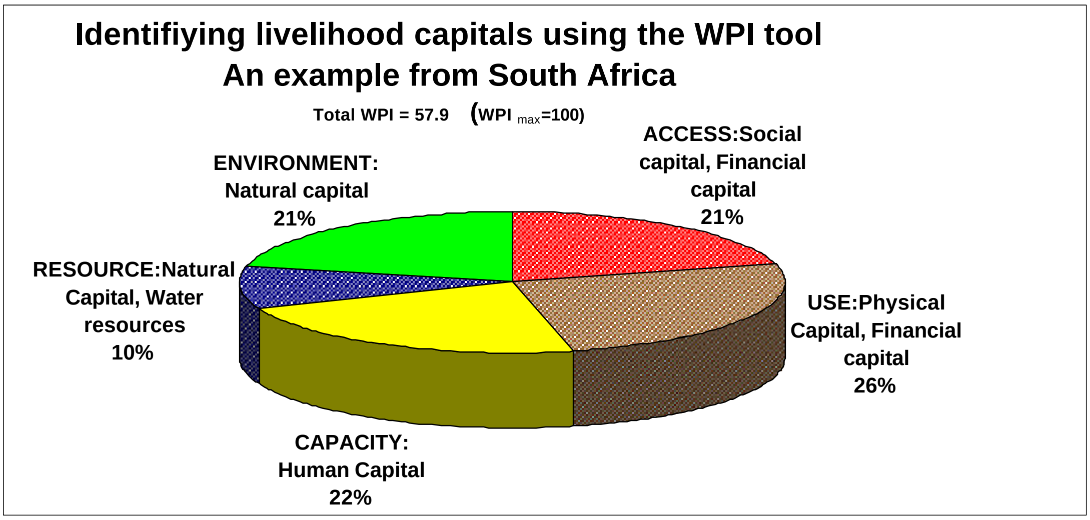
APPENDICES

Appendix 1. Background to the Water Poverty Index

The Water Poverty Index has been originally developed and tested under a DFID funded project between 2001-2003. Since that time, it has been the subject of much interest, and it has been independently applied by many researchers in many different parts of the world. It has been designed specifically to be based (where possible) on existing data, and has a structure which enables its calculation without complex and expensive software. Its purpose is to provide a framework through which robust comparisons of different places can be made. The approach also serves to reveal the strengths and weaknesses of specific locations, allowing prioritization of investments in the water sector.

The WPI has been specifically designed to be able to reflect the nature of the distribution of livelihood capitals as outlined in the sustainable livelihoods framework (Scoones, 1998; Carney, 1998). An example for the Republic of South Africa is shown in Figure 11.

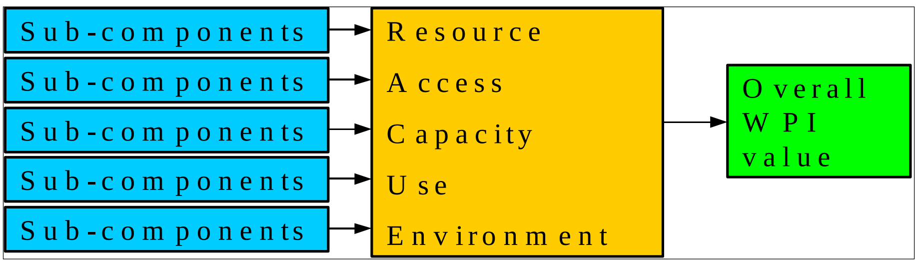
Figure 11 How the WPI components relate to the structure of the Sustainable Livelihoods Framework



The Mathematical structure of the WPI

The WPI is calculated using a composite index approach. The structure of the composite approach is based on the *Human Development Index* (HDI). Using this approach, various elements measured in different units can be aggregated together, as shown in Figure xxx.

Figure 12 How the WPI is calculated



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The five key components **Resources** (*R*), **Access** (*A*), **Capacity** (*C*), **Use** (*U*), and **Environment** (*E*) have been identified after extensive consultation with water managers, scientists, health experts, municipal institutions, economists and policy makers (Sullivan et al. 2002). To determine the index, each of the components is first standardised so that it falls in the range 0 to 100; thus resulting in WPI values also ranging between 0 and 100. A low score on the WPI indicates a more extreme case of water poverty. Calculating the WPI in this way provides the weighted average of the five components, which are combined using the general expression:

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

where *WPI* is the Water Poverty Index value for a particular location, X_i refers to component *i* of the The application of the transparent framework provided by the WPI enables a more consistent approach to decision making, and decisions can be both audited and defended. Depending on the purpose of its use, the WPI can be applied at a range of different scales. To determine the degree of need for water provision, it can be applied at the community level, and at the intermediate and national scales. Consistent representation of components at each scale facilitates meaningful comparisons, and variables can be determined by stakeholders according to local needs.WPI structure for that location, and w_i is the weight applied to that component. Each component is made up of a number of sub-components, and these are first combined using the same technique in order to obtain the components. For the components listed above, the equation can be re-written:

$$WPI = w_r R + w_a A + w_c C + w_u U + w_e E$$

with the condition that

$$w_r + w_a + w_c + w_u + w_e = 1$$

The weight given to the elements w_i , represents the relative importance given to each of the them. These *weights* must be determined by stakeholders and policy makers from the region in which the tool is being applied. It is important however in the first instance, that the weights of all variables and components must be retained at a constant value, to ensure that information is not distorted by political subjectivity. By retaining the total value of all weights as equal to one, the matter of trade-offs between alternative options can be made more explicit.

5. Converting scores to indices

Scores for each index and sub-index are calculated by the formula:

$$x_i - x_{min} / x_{max} - x_{min}$$

where x_i , x_{max} and x_{min} are the original values for location i, for the highest value country, and for the lowest value country respectively.

The index for any one indicator lies between 0 and 100. The maximum and minimum values can be based on actual data for a specific place, or can be based on predetermined values which are considered to be applicable for all places. Either way, these are usually adjusted so as to avoid values of 0 or 100. The aim is to get index values in the range 0 to 100 for each quantity being considered, and a decision needs to be made about the way the data is to be displayed, for example, if 0 is worst, and 100 is best, or vice versa. Using this process, when these index values are then combined to make a composite index, each component is being measured on the same scale (ie 1 – 100) and thus incommensurability of information is reduced.

Examples based on national scale analyses:

(a) Percentage access to safe water

- Values range from 12% to 100%.
- Use directly as index

(b) GDP per capita (PPP)

- Values range from US$ 448 to $ 31872
- Calculate: Index = 100.(GDP – 300)/32000
- Result has range 0.5 to 98.7

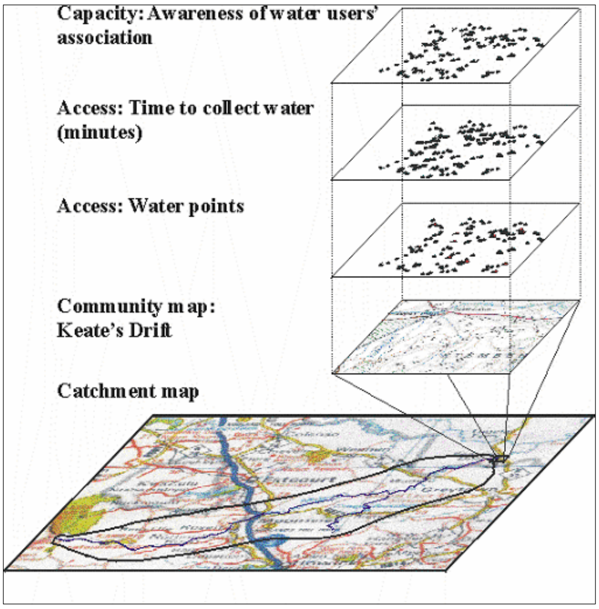
(3) Under-5 mortality rate (u)

- Values range from 4 to 320 per 1000 live births
- Calculate: Index = 100.(350 - u)/350
- Result has range 8.6 to 98.9
- High mortality –> low index value

How GIS can be used to display index information

When indices have been calculated they can then be displayed graphically. Figure 13 provides an example of how different information can be linked in this way and displayed for policy application.

Figure 13 Linking different types of data through GIS



An example of applying the WPI method at the sub-national scale: community level Water Poverty Index scores

To capture the degree of water poverty at a community level, it is necessary first to understand something about the diversity of what can constitute 'communities'. For practical purposes, we argue that this should be defined by the existing municipal institutions in place within any country's governance system. The variation in conditions within communities is illustrated in Figure 14.

After identifying the subcomponents which are appropriate to capture the nature of the situation in the communities in question, variables used to represent them can be selected on the basis of local consultation with stakeholders. For the purposes of comparison however, the same sub-components must be chosen. A selection of the types of data used for community level application of the Water Poverty Index is shown in Table 19, and Figure 15 illustrates its application in four rural and peri-urban areas of South Africa.

Figure 14 Different types of households in peri-urban communities the Orange basin countries

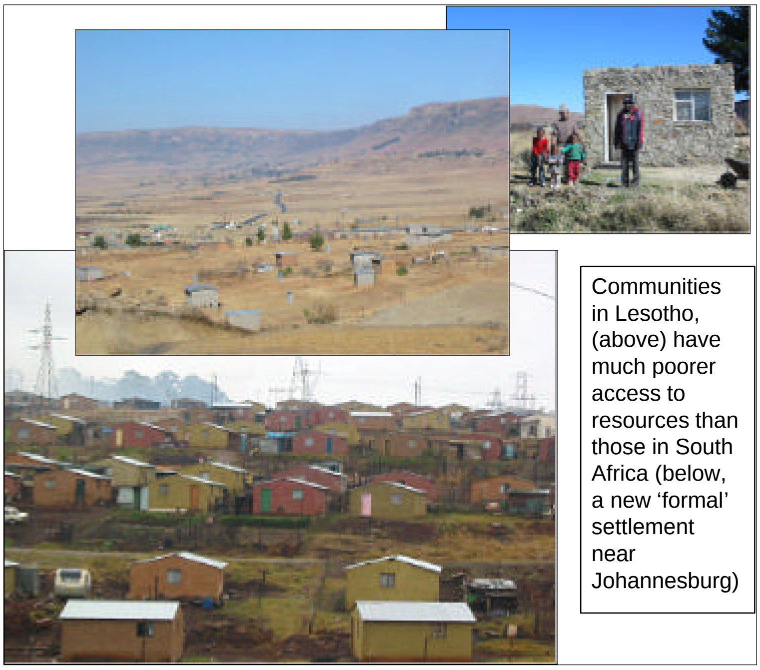


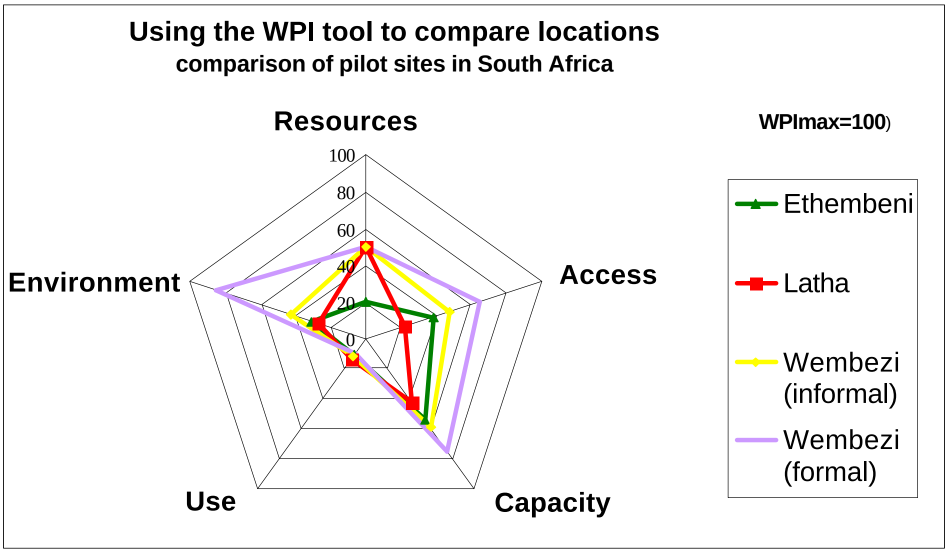
Table 19 Data used for community level application of the WPI

WPI component	Sub-components 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, based on people reporting that they used water for purposes other than domestic and agricultural
Environment (E)	• people's use of natural resources • reports of crop loss during last 5 years • % households reporting erosion on their land (*Note:* In the absence of any acceptable figures to represent environmental integrity or environmental water needs, these alternative proxy data were used.)

Source: Sullivan et al., 2002, 2003

Note: In this example, the data were collected specially as part of the development of the WPI. If the WPI were to be implemented more widely, many of the data needed would be available from censuses, or other surveys (demographic, health, expenditure, agricultural, industrial, etc). Data from the smallest available collection unit (usually the 'enumerator district') would be utilised, so adding value to existing data and making the implementation of the WPI cost effective.

Figure 15 Comparing WPI values in pilot study sites



Using this type of diagram makes it very useful to display the information to policy makers and other users so that the strengths and weaknesses of each location can be highlighted and compared

NOTE: This scale application of the WPI is most appropriate to be able to cope with the heterogeneity of water resources and their use. Data for this level should be collected at a local, sub-national /municipal level. Much municipal level data is available both from local institutions and also from national data sources.

Conclusion

To be of practical use to policy makers, indicators must be:

- Easy to calculate
- Cost effective to implement
- Based as far as possible on existing data
- Transparently calculated
- Easy to understand

Through the opportunity provided by the NeWater project, the further development of an integrated water index will hopefully be achieved. By facilitating a rapid appraisal technique for poverty, health and gender, this work will contribute to the more effective integration of these issues into water management decisions. If this then were to be adopted for policy purposes, it will go some way to contribute to a more equitable situation in the water sector, and in turn could eventually contribute to a consequential rise is the standard of living of poor people throughout the world.

Appendix 2 Background to the BRAVA approach

The BRAVA[13] *(Baseline Rapid Vulnerability Assessment)* is developed for a rapid vulnerability assessment for all the case studies to identify priorities and gaps in existing knowledge. The interdisciplinary dataset that it intended to generate for each basin would be useful for subsequent tasks. Building on the baseline, stakeholders and project teams will be able to select which issues they want to pursue further.

A vulnerability assessment provides a baseline of exposure to stresses. In the NeWater project, the rapid vulnerability assessment is intended to look across a wide range of threats, hazards and stresses. It is not confined to climate change or climatic hazards. In many cases, the threat of pollution events, regulation and financial constraints are more pressing than coping with droughts or floods.

For a river basin, it provides a first inventory of questions such as:

- Who and what are the exposure units?
- What hazards and stresses are they exposed to?
- How resilient are the exposure units to current stresses?
- What has been the impact of historical episodes, such as droughts and floods?
- Are the exposure units and stresses changing? In what ways?
- What indicators capture current and future vulnerability?

A number of broad tasks are developed to carry on this assessment. These are:

Task 1. Supplementary information on the system description
This task develops basic information on:

- Geographic location, climatic zones, elevation, etc.
- Elements of the water resource system: rivers, aquifers, water infrastructure, demand nodes, population
- Current management and public issues in the basin, such as conflicts over environmental flows, plans to build new reservoirs
- Case study team: members, skills, links to major stakeholders
- Additional supporting material and data available.

Task 2. Scoping of threats and exposure units
The inventory of threats and exposure units involves:

- Inventory of threats
- Major impacts of threats, significant historical events
- Inventory of the exposure units that will be used for subsequent analysis

Exposure units might be a mixture of:

- Socio-economic classes of people, such as a typology of water users based on income and consumption patterns, relative poverty,
- Demographic classes, such as women, children or the elderly, or ethnic groups
- Environmental components of the catchments, such as groundwater, groundwater recharge zones, wetlands, or endangered habitats

[13]This section is based on NeWater Rapid baseline vulnerability assessment 1-order and 2-order draft 2005.

- Public infrastructure, such as bridges, roads, and reservoirs may also be considered as exposure units—in the sense that they are vulnerable to specific hazards

Task 3. An exposure matrix and narrative

The threats and exposure units are brought together:

- Matrix of vulnerable groups and their relative exposure to different threats
- Narrative of vulnerability

Task 4: Subjective profile of vulnerability

The final analysis helps compare the case studies in terms of vulnerability for different exposure units and basins. Scoring (1 to 5) is used to indicate this. For gender and poverty the following indications are used:

Task 5. Next steps in NeWater

This rapid appraisal of vulnerability may be extended in several ways:

- toward more quantitative indicators and profiles
- to integrate with water basin analyses
- to address dynamic aspects of vulnerability over time.

The output from BRAVA includes:

- Identification of the different exposure units. The exposure units, or the elements of the 'water management system', are the basis for subsequent analysis.
- A list of major threats.
- An impact matrix with subjective score relating the exposure units to the major threats.
- A concise summary of current vulnerability. Mostly in qualitative terms, the answers to the key questions will help define priorities for further assessment.
- A subjective profile of vulnerability along common dimensions for use in comparing the case studies (and to help identify priorities for further work)
- A checklist of initial plans for more formal assessment of indicators and future vulnerability.

Social Dimensions in BRAVA

Specific questions on gender, age and social vulnerability are incorporated in Task 2 while analysing the impacts of threats and in Task 4 in scoring the subjective profile of vulnerability. Examples of these tables are presented below:

Table 20 Impacts of threats

Basin: **Location:**

	Impacts					
Historical risk	**Lives lost**	**Population affected**	**Gender, age, social vulnerability**	**Economic impacts**	**Environmental effects**	**Notes**

Table 21 Relative scoring of common attributes of vulnerability

Attributes	Low	1	2	3	4	5	High
Gender	Equitable distribution of resources, effective means to promote participation by women						Inequitable impacts of hazards, discrimination against women in decision making
Poverty and income	Almost all water users have sufficient income to secure their water needs						Large population affected by poverty, inequitable water charges

BRAVA is designed to be flexible and adaptable to local conditions. At each step there are several options for the level of detail for the team to decide on depending on their particular situations. In Section 3 we shall analyse the information on gender, poverty and health as they are collected in the case study basins.

Appendix 3 Background to the LASER framework

LASER (Learning from and Adapting to Social-Environmental Realities) framework for Water Management

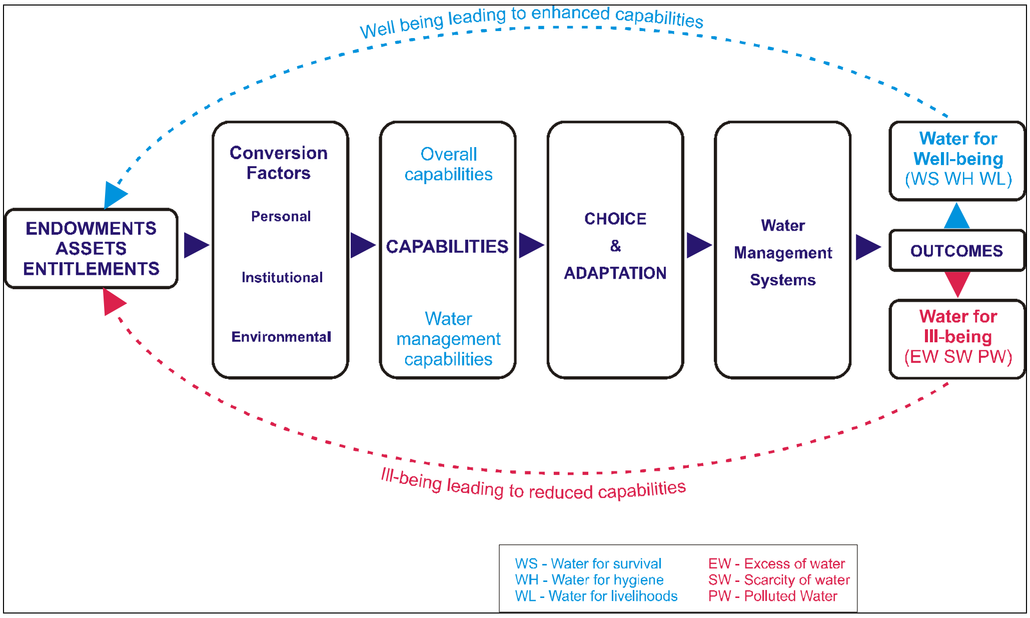
This framework is intended to provide guidance towards achieving reductions in poverty, inequality and the related phenomenon of ill-health through better water management. In this context poverty is seen as *deprivation of capabilities or opportunities* rather than merely as lowness of income. This enables us to recognise water management activities as an important aspect of poverty reduction and as an important element in people's capabilities. It also provides a comprehensive conceptualisation of inequality including that of gender, and health issues in water management. For example, having access to drinking water is considered as an important element in the capability set of a person as it enhances his/her opportunities to survive and achieve basic sanitation requirements. Having access to water for livelihoods further enhances the capability of reducing poverty and increasing well-being. On the other hand, a capability to reduce the risk of being exposed to floods or polluted water may help a person to achieve a lower level of ill-being resulting from water related hazards. Thus we can assume that the larger the capability set of a person, the greater is the choice he/she will have in achieving an increase in water-related well-beings. As presented in Figure 1, we may identify these well-beings as water for survival (WS), water for hygiene and sanitary arrangements (WH) and water for livelihoods (WL). Similarly, a larger capability set may also help in achieving a reduction in ill-beings from floods or excess of water (EW), drought or scarcity of water (SW) and polluted water (PW). Water for ecosystem is also an important element in both increasing well-being and reducing the ill-beings. It is important to note that well-being achieved from water may also enhance other types of intangible well-beings like aesthetic well-beings, if one can grow flowers in her garden with the use of water, or enhance spiritual well-being from having secure and clean water needed for worship in certain religious traditions. On the other hand, ill-beings from water may also impact on other ill-beings like not being able to continue one's education due to decrease in income as a result of flood affected crop loss, or an increase in gender based violence during or in the aftermath of hazards like a severe hurricane or floods.

The process of transition from capability (opportunity or potential functioning) to achievement (or achieved functioning) reveals people's *choice* regarding a particular opportunity. This choice may be informed by their *adaptive preferences* as very often individuals tend to adapt to the conditions and constraints of their lives in making decisions on what they do or do not do. In a situation of absolute poverty and vulnerability, adaptive preferences may be conceived as being narrow and constrictive. On the other hand, expansion of capabilities may also contribute to expanding the scope for adaptation. It is important to note that capabilities are also inter-linked and may result in coupling of advantages or disadvantages in adaptation and achievement of well-being. For example, increase in the availability of irrigation water (in itself a generation of capability) may result in different achievements for different people depending on their overall capability set. Individuals with greater capability of income (to pay for the water), land (to use the irrigation water), technology (equipments needed to irrigate land) and labour power (to undertake the tasks of irrigating) may tend to achieve greater well-beings from this intervention. Others who do not have any of these capabilities or have them in insufficient amount may not be able to take advantage of this intervention and can effectively remain excluded. In another example, a flood warning (i.e., a generation of capability in terms of creating opportunities for people to take decisions) may result in different responses from different individuals depending on their capability set. Capabilities of having access to transport to evacuate, access to property security and insurance, physical ability to move, particularly having handicaps such as age, disability or illness, or social norms on taking refuse in a public shelter particularly for women, will result in different achievements. Thus it seems plausible to argue that capability for adaptation is essentially a *constitutive element* of overall capability. Understanding the nature of adaptation therefore needs analyses of the nature and composition of overall capabilities, namely, what is included in it *and* what is excluded from it, at the disposal of individuals and communities in a given circumstances. In a dynamic sense, adaptation is not only influenced by overall capabilities but in turn also influences them: a successful adaptation may have an enhancing effect on the other capabilities while a failed adaptation may result in further diminishing them. This is presented by the dotted line connecting achieved well-beings and ill-beings to the resource base indicating dynamic processes at work.

Capabilities may be viewed as resources, i.e., incomes, entitlements, market and non-market goods and services and so on. But what use people can make of a given bundle of resources will often depend on a number of contingent circumstances. It may depend on factors like personal heterogeneities, social and political institutional norms and rules, policies and practices, market structure, and environmental diversities, among others. These are the *conversion factors* and are crucial in a process through which incomes and resources are converted into capabilities or opportunities. For example, to make use of a piece of land for cultivation, one may need to be a member of a local irrigation group that may have certain criteria on members' personal characteristics, i.e., being educated, or adult or male, or being member of a particular political party, or having land with certain physical characteristics of being located in upstream or downstream or in proximity to the irrigation facilities that are on offer and so on.

As Figure 10 shows, the pathways from resources (or means to achieve) to capabilities (freedom to achieve) to achievement (adaptation) leading to well-being is a dynamic one.

Figure 10 LASER (Learning from and Adapting to Social-Environmental Realities) Framework



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As can be seen in Figure 10, Intervention in one element can set in motion a positive or negative trend that may tend to offset each other with equal strength producing no visible enhancement or reduction in well-being or ill-being respectively. It may also produce and sustain a positive trend whereby enhancement in well-being is reproduced through enhancement of resources and capabilities to produce a greater level of well being to continue until a shock intervenes to change this trend. On the contrary, a failure to reduce vulnerability to hazards may set a negative trend whereby a reduction in well-being is reproduced through further decline in resources and capabilities to produce an even greater level of ill-being until a positive intervention is made to discontinue the trend.

The *challenge for adaptive water management* is to produce and sustain a process of adaptation that will enhance well-being, reduce ill-being and on balance produce a net gain in overall well-being that people may derive from water.

The theoretical underpinning of this framework comes from Amartya Sen's Capability Approach. The capability approach is a broad normative framework that is used in a wide range of fields, most prominently in analysing poverty and inequality, and in design and evaluation policies. (Sen 1999)