

INDICATORS - MEASURING THE PROGRESS OF THE AFRICAN WATER VISION

The Africa Water Vision 2025 was formulated to guide the development and management of water resources for sustainable development. By instituting rational and integrated development of these resources, it would help prevent improper orientation of the planning and implementation of relevant projects and programmes within and across nations and, by so doing, contribute positively to the general development of the continent while maintaining the integrity of the ecosystems. A number of indicators were selected along the lines of the methodologies developed for the World Water Development Report (WWDR) in order to quantitatively measure progress in the implementation of water-related projects. These indicators reflect the socio-economic drivers for the implementation of Integrated Water Resources Management (IWRM) principles and the goals of the Africa Water Vision. The IWRM principles and the Africa Water Vision goals together inform the first edition of the African Water Development Report (AWDR)

Identification and Development of Indicators

As indicators can be used in scientific, economic and social contexts to infer, show and gauge conditions and information, they are indispensable tools for policy making, implementation, monitoring and evaluation. Since water systems and the way they interact with other natural and human conditions to which they are intricately linked are much more complex than they appear, the development and management of these systems no doubt require indicators:

- (a) To present projects and programmes in a meaningful, understandable and comparable objective numbers to guide decision makers and the public; but the identification and choice of indicators themselves is a task on its own;
- (b) To establish objective benchmarks to analyse changes over time and space, thus serving as a useful tool for feedback.

Approaches

Water policy, like most other socio-economic policies, uses the following approaches to obtain and process information that eventually leads to the identification and choice of an indicator or indicators:

The bottom-up approach

This approach is based on logic, but has its weaknesses:

The Logic framework: goes from data to variable to parameter to indicator.

It is based on the information pyramid, whereby available primary data are aggregated into hierarchical levels, using intuitive and mathematical tools. It is mostly used in data rich situations.

Weaknesses: This could be through a simplification of analogy in an attempt to explain a complex process or phenomenon, thus boiling down to a reductionist approach leading to reduction of internal variability and loss of relational relevance to other resources and processes.

The top-down approach

A top-down approach also uses the logic framework but in the reverse or inverted-pyramid form. Here:

The logic framework: goes from vision to themes to indicators in terms of the cause-effect approach and the system approach.

It is based on the log frame, which is a Programme Management Tool serving purposes in both design and monitoring within the Programme Cycle Management.

A generalized log frame approach consists of:

- (a) A Goal – a real world attainable outcome;
- (b) Purpose – designed actions around interventions; and
- (c) Output – backed by a number of activities.

Methodological Approaches

The methodological approaches include the Systems and the Cause and Effect approaches:

- (a) **Systems Approach:** This approach is based on the hypothesis that all systems depend to some degree on the resource providing capacities and waste absorbing capacities of their environment. The systems approach has various applications, as follows:
 - (i) **Applications to sustainability indicators**
 - a. Human systems – social and individual development and governance;
 - b. Support systems – economic and infrastructure;
 - c. Natural systems – resources and environment.

- (b) **Cause and Effect Approach:** This is the most widely used approach, and its first conceptual framework is called:

PRESSURE – STATE – RESPONSE (P-S-R) (OECD, 1994), which is based on:

- (a) Enabled trade-offs; and
- (b) Link between environmental, economic and social indicators.

Weakness: This form of the systems approach often fails to take entire systems into consideration and lacks explicit linkage to policy.

Other cause-effect classifications based on P-S-R- Framework:

- (a) Driving force-Pressure-State-Response (D-P-S-I-R) framework (EEA, UNEP, WRI);
- (b) Driving force-State-Response (D-S-R) framework, used by the United Nations Commission on Sustainable Development for Agenda 21 Indicators;
- (c) Pressure-State-Impact-Response (P-S-I-R) framework;
- (d) Driving force-Pressure-State-Exposure-Effects-Action (D-P-S-E-E-A) framework used in the Burden of Disease (BOD) studies of WHO/UNICEF/WSSCC.

Indicator-selection criteria

Scientific requirements

- (a) Robust, well-founded basis in scientific knowledge;
- (b) Representativeness, describing the state or quality of an issue or subject, giving significant and precise information;
- (c) Clearly and consistently defined so as not to be ambiguous, lend themselves to various interpretations, or to give inconsistent results in different situations;
- (d) Be developed within an agreed upon conceptual and operational framework;
- (e) Quantitative expression;
- (f) Be sensitive such that any small change to be measured should result in a measured change in the indicator;
- (g) Anticipatory, early warning, signalling: capable of indicating a degradation before serious harm occurs;
- (h) Stability: low natural variability in order to separate stress caused effects from random fluctuations;

- (i) Specific for a certain stress or effect;
- (j) Broadly applicable to many stressors and sites, usable in different regions;
- (k) Capable of specifying uncertainties;
- (l) Transformable (intelligent).

Policy requirements

- (a) Tailored to the needs of the primary users;
- (b) Have ownership by users;
- © Problem has to be manageable, thus cause-effect chain of indicator has to be known to enable tackling of the problem;
- (d) Having a target or threshold against which to compare or an explicit scale ranging from undesirable states to desirable states (along with specific weightings) in order to assess the significance of the information;
- (e) Recording either changes in the means recommended by policy or changes in the development impact attributable to policy;
- (f) Lend itself to be linked to models, forecasting and information systems;
- (g) Simple, easily interpretable and appealing to society in order to ease communication between policy makers and society;
- (h) Matching with national and international policy plans and indicating the progress of policy;
- (i) Availability of historical data in order to show trends over time;
- (j) Data should be readily collectable and, thereby, lowering the technical and collection costs; and
- (k) Normalized to make things comparable and providing a basis for regional, national and international comparison.

Collected from: Report WWDR indicator workshop, Hoon et al., 1997, Van Harten 1995, De Zwart 1995, Hendriks 1995, Swart & Bakkes 1995, OECD 1994, Kuik & Verbruggen 1991, Liverman et al. 1988.

Overview of a number of indicators, their aims and the correct spatial scale of their use

Indicator	Information provided	Aim	Spatial scale
Gross National Product (GNP)	Economic activity per country	Comparison of economic activity between countries	Global
Water Stress Index (WSI)	Percentage of water demand that cannot be satisfied without taking measures	Indication of areas suffering from water stress	Low spatial scale: grid cell or watershed
Water Poverty Index (WPI)	Index based on the components resource availability, access to water, capacity of people to manage water, use of water, environment	Providing information on water and poverty related issues	Different scales possible depending on the aim: <ul style="list-style-type: none"> - Communities and regions for comparison within a country - Countries for comparison on a global scale
Indicator species	Presence or abundance of the species	Indication of the ecosystem quality	The scale of one ecosystem or comparable ecosystems located in same climate range

Source: WWDR, UNESCO, 2003

List of minimum significant indicators selected for the first edition of AWDR

Challenge Areas	Indicators
Drivers	<ul style="list-style-type: none"> (a) Human poverty index: 5 indicators (b) Incidence of water-related diseases (c) Population figures/growth rates (d) Internal renewable water resources with a country (e) Withdrawals: % of total annual renewable freshwater (f) Water scarcity: proportion of people affected (g) Water shortages: proportion of people affected today (h) Proportion of people without minimum drinking water (i) Trans-boundary rivers: % of population dependent on (j) Polluted water: % of population exposed to pollution indicators like coliforms, industrial substances, acid, heavy metals, nitrates, sediments, salinization, pesticides (k) Natural disasters: deaths from water-related causes (l) Climate change: effect on water scarcity
Meeting basic needs	<ul style="list-style-type: none"> (a) Actual and total water supply coverage (urban, rural disparities) (b) Actual and total sanitation coverage (urban, rural disparities) (c) Percentage or number of people not served with basic sanitation (d) Percent or number of people not served with improved drinking water and extension of piped water supply (e) Incidence of water-related diseases (f) Investment in drinking water supply and sanitation (g) % of Health Impact Assessment (HIA) of water resources development and compliance with HIA recommendations
Water for cities	<ul style="list-style-type: none"> (a) Growth of mega-cities (b) Proportion of urban population with access to improved water supply and sanitation (c) Access to "improved" water supply: % for different types (house connection, yard tap, public tap, not served) (d) Water supply cost per litre (e) Water supply: unaccounted for water- % of distribution input (f) Water consumption levels: Domestic: litres per capita per day, water meter tariff punitive structure aimed at reducing undue consumption) (g) Types of water sources (ground water, river, mix.) (h) Industry & commercial consumption: m³ per day (i) Under-five child mortality rates: death per 1000 live births (j) Children < 5yrs: diarrhoeal diseases linked to inadequate water and sanitation (k) Water source (river) distance from demand center: > 8 km, inter-basin transfer: %
Securing food supply	<ul style="list-style-type: none"> (a) Average food price (b) Average per capita food consumption (country and regions): show breakdown into cereals, oil crops, livestock and fish (c) Irrigated area versus total arable land in the country (d) Agricultural water use by country (e) Average grain yield (f) Consumption of livestock products (regions and countries) (g) Fish consumption (marine, inland and aquaculture for whole country) (h) Water use for irrigation (net and gross) (i) Internal and external investment sources for irrigation and drainage (j) Food imports/exports

Water and ecosystem	<ul style="list-style-type: none"> (a) Land converted to agriculture (b) Area of wetland drained (c) Hydrological indicators (flow etc.) (d) Emissions of water pollutants by sector (e) Compliance with water quality standards for key pollutants (f) Number or presence/absence of non-native (alien) species (g) Rapid Biodiversity Inventory- Conservation International/Field museum AquaRAP (h) Numbers and proportion of threatened species (i) Commercial and other fisheries catch (j) Food production trends
Water and industry	<ul style="list-style-type: none"> (a) Industrial use per capita by total developed water (b) Efficiency/productivity (output per m³) (c) Pollution (limited available data)
Water and Energy	<ul style="list-style-type: none"> (a) Distribution of households with access to electricity (rural, urban) (b) Total electricity production and sources (c) Cost per unit of electricity (d) Hydroelectricity (potential and developed capacity) (e) Efficiency/productivity of hydro power plant (output per m³) (f) Pollution (limited available data)
Sharing water	<ul style="list-style-type: none"> (a) Dependence of countries water resources on inflows from neighbouring countries (b) Inflow as ratio of total water availability) (c) Number of international basins (d) Number of treaties/cooperative events for international rivers (e) Shared aquifers- number/resource volume/conflicts relating to changes that might suggest international basins where there is a requirement for greater co-operation. (f) Indicators of these types of changes are: <ul style="list-style-type: none"> (i) Newly internationalized basins; (ii) Basins with unilateral projects and lack of institutional capacity; (iii) Treaties/bodies/positive relations; (iv) International basins where non-water-related hostilities exist between states (g) Proportion of water use by industry, agriculture and domestic sector
Managing risks	<ul style="list-style-type: none"> (a) List of severe natural disasters since 1994 (b) Losses in human life (number per year) (c) Losses in real and relative social and economic values (total losses, % of GNP, growth, investments and development benefits) (d) Population exposed to water-related risk (number of people per year, income groups) (e) Number of people living within 100-year flood zone. Vulnerability map based on the proportion of land within 1 km of river with slope of less than 1 degree (f) Legal and institutional provisions for risk-based management (established /not established) (g) Budget allocation for water risk mitigation (total and % of total budget/yr) (h) Risk reduction and preparedness action plans formulated (% of total number of countries)
Valuing water	<ul style="list-style-type: none"> (a) Annual investment in water for agriculture, water supply and sanitation and environment & industry (b) Sources of investment funds (c) Level of cost recovery for water supplies for agriculture and rural water supplies (d) Level of cost recovery for water supplies for urban water supplies (e) Costs per litre of urban and rural water supplies (f) Price of water charged to farmers for irrigation (g) Comparison of the price of water from the public utilities and informal water vendors.

Governing water	<p>(a) Existence of institutions (water resources authorities) responsible for management (including issuing abstraction and discharge licences), which are independent of water users. Percentage of land area covered by such institutions. Number of water authorities and average area covered by each</p> <p>(b) Existence of water quality standards, for effluent discharges, minimum river water quality targets</p> <p>(c) Numbers of instances when water service providers experience a raw water shortage</p> <p>(d) Existence of legislation advocating Dublin principles</p> <p>(e) Institutional strengthening and reform since 1992</p>
Ensuring the knowledge base	<p>(a) Gross primary school enrolment</p> <p>(b) Illiteracy rate</p> <p>(c) Density of hydrological monitoring stations by river basin and national</p> <p>(d) Research and development expenditure</p> <p>(e) Number of television sets and radio receivers per 1000 people</p> <p>(f) Number of telephone lines per head</p> <p>(g) Inventory of water-related data bases</p>

Logical framework (draft) of the GWP used to prepare the Framework for Action of the WORLD WATER VISION 21

Intervention logic

- (a) **Goal:** Economic well-being and social development under environmental sustainability and regeneration improved;
- (b) **Purpose:** Global water security provided through efficient, equitable and sustainable management and use of water;
- (c) **Outputs:**
- (i) Political will to mobilize people and resources secured;
 - (ii) Effective water Governance for IWRM achieved;
 - (iii) Effective water wisdom generated;
 - (iv) Solutions to urgent water priorities prepared: protecting the resource, enhancing crop productivity per drop, improving sanitation, urban upgrading, improved flood management;
 - (v) Investment needs for water security identified and agreed upon.

TARGETS

International development targets met, in particular:

- (a) The proportion of people living in extreme poverty in developing countries should be reduced by at least one-half by 2015 (Copenhagen).
- (b) death rate for infants and children under the age of five years should be reduced in each country by two thirds the 1990 level by 2015 (Cairo).
- (c) There should be a current national strategy for sustainable development, in the process of implementation, in every country by 2005, so as to ensure that current trends in the loss of environmental resources are effectively reversed at both global and national levels by 2015 (Rio).
- (d) The number of undernourished people on earth should be reduced by half by 2015 (Rome).

Purpose: Global water security provided through efficient, equitable and sustainable management and use of water

Global water security targets achieved:

- (a) Comprehensive policies and strategies for IWRM in the process of being implemented in 75% of countries by 2005 and in all countries by 2015
- (b) Pro portion of people not having access to hygienic sanitation facilities reduced by half by 2015
- (c) Proportion of people not having sustainable access to adequate quantities of affordable and safe water reduced by half by 2015
- (d) Increase water productivity for food production from rain-fed and irrigated farming by 30% by 2015
- (e) Reduce the risk from floods for 50% of the people living in floodplains by 2015
- (f) National standards to ensure the health of freshwater ecosystems, established in all countries by 2005, and programmes to improve the health of freshwater ecosystems implemented by 2015

Outputs: Political will to mobilize people and resources secured

- (a) Complete targets and logical frame for water security by August 2000.
- (b) Regional and National Programmes for Action completed by August 2001.
- (c) Programmes for Action discussed at the Bonn Conference (Dublin+10) in January.
- (d) Programmes for Action and national targets prepared by Governments before Rio+10 meeting in mid 2002.
- (e) 3rd World Water Forum (on major water issue arising from 2nd World Water Forum) held in March 2003.
- (f) First edition of World Water Development Report published March 2002.

Effective water Governance for IWRM achieved.

- (a) IWRM mainstreamed in policy and strategy implementation processes in all countries by 2005.
- (b) Cooperation mechanisms between riparian States in all major river basins developed and strengthened by 2005, and shared waters agreements formulated by 2015.
- (c) The economic value of water recognized and reflected in national policies and strategies by 2005, and mechanisms established by 2015 to facilitate full cost pricing for water services.
- (d) GWP Toolbox of options for water management developed by 2001.

Effective water wisdom generated.

- (a) Water awareness initiatives instigated in all countries by August 2001.
- (b) Capacity for informed decision making at all levels and among all stakeholders increased by 2005.
- (c) Investment in research on water issues increased by August 2001.
- (d) Hygiene education in 80% of all schools by 2010.

Solutions to urgent water priorities prepared: protecting the resource, enhancing crop productivity per drop, improving sanitation, urban upgrading, and improved flood management.

- (a) Programmes to tackle urgent priorities formulated, resourced and under implementation in all countries by 2005.
- (b) Action programmes to protect surface and groundwater resources prepared and in the process of being implemented by 2003, and defined standards achieved by 2010.
- (c) Task force on food-water security reports by end 2001 and action programmes for enhancing crop per drop prepared and in the process of being implemented by 2003.
- (d) Action programmes for sanitation formulated and in process of implementation, and knowledge/information about good hygiene practices made universal by 2003.
- (e) Action programmes to integrate water needs (supply and waste) with spatial planning and social and economic needs prepared and in the process of being implemented by 2003.
- (f) Action programmes for flood preparedness and protection formulated and in the process of being implemented by 2003.

Investment needs for water security identified and agreed upon.

- (a) Investment needs for closing the resource gaps identified and (indicative) investment plans developed in all countries by 2002.
- (b) Mechanisms for mobilizing new financial resources identified and in the process of being implemented by 2003.
- (c) Investments committed to the water domain doubled by 2005.
- (d) Private sector-led International Research Foundation established by 2002.

An example of indicator values per state on water supply and sanitation as a percentage of people with access to improved drinking water resources and those with access to improved sanitation facilities.

	% of population with access to improved drinking water in the year 2000			% of population with access to improved sanitation facilities in the year 2000		
	Total	Urban	Rural	Total	Urban	Rural
Congo Rep.	44	63.7	17.1	68.5	85.6	44.9
Nigeria	57	81	39	63	85	45
Gabon	70	73	55	21	25	4
Benin	63	74	55	23	46	6
Dem R. Congo	77	89	26	20	53	6
Burundi	65	94	63	89	67	90

(Source: AWDR National Authors: 2003).

Table 5.1: Adopted targets and indicators for use in the first Cameroon Water Development Report

Targets	Indicators
<p>1. To reduce by 25% the proportion of people without access to safe and adequate water supply by the year 2005, by 75% by the year 2015 and by 95% by the year 2025.</p> <p>2. To reduce by 25% the proportion of people without access to safe and adequate sanitation by the year 2005, by 70% by the year 2015 and by 95% by the year 2025.</p>	<ul style="list-style-type: none"> • Actual and total water supply coverage (urban, rural disparities) • Actual and total sanitation coverage (urban, rural disparities) • % or number of people not served with basic sanitation • % or number of people not served with improved drinking water and extension of piped water supply • Investment in drinking water supply and sanitation • % of Health Impact Assessment (HIA) of water resources development and compliance with HIA recommendations • Incidence of water-related diseases like diarrhoea, cholera, and malaria.

Holistic indicators for sustainable development

The Water Poverty Index (WPI): This is an easy-to-use indicator designed to provide a standardized framework for monitoring how best water can be managed to meet the basic needs of development. Monitoring progress in the water sector requires an interdisciplinary approach that may involve both qualitative and quantitative assessment techniques. These should be integrated in such a way as to allow a range of issues to be addressed, while at the same time allowing the views and values of a range of stakeholders to be represented. The Water Poverty Index (WPI) measures, for a given country, the impact of water scarcity and water provision on human populations. WPI is a number between 0 and 100, where a low score indicates water poverty and a high score indicates good water provision. WPI is the culmination of an interdisciplinary approach that combines the physical quantities relating to water availability and the socio-economic factors relating to poverty to produce an indicator that addresses the diverse factors that affect water resources management.

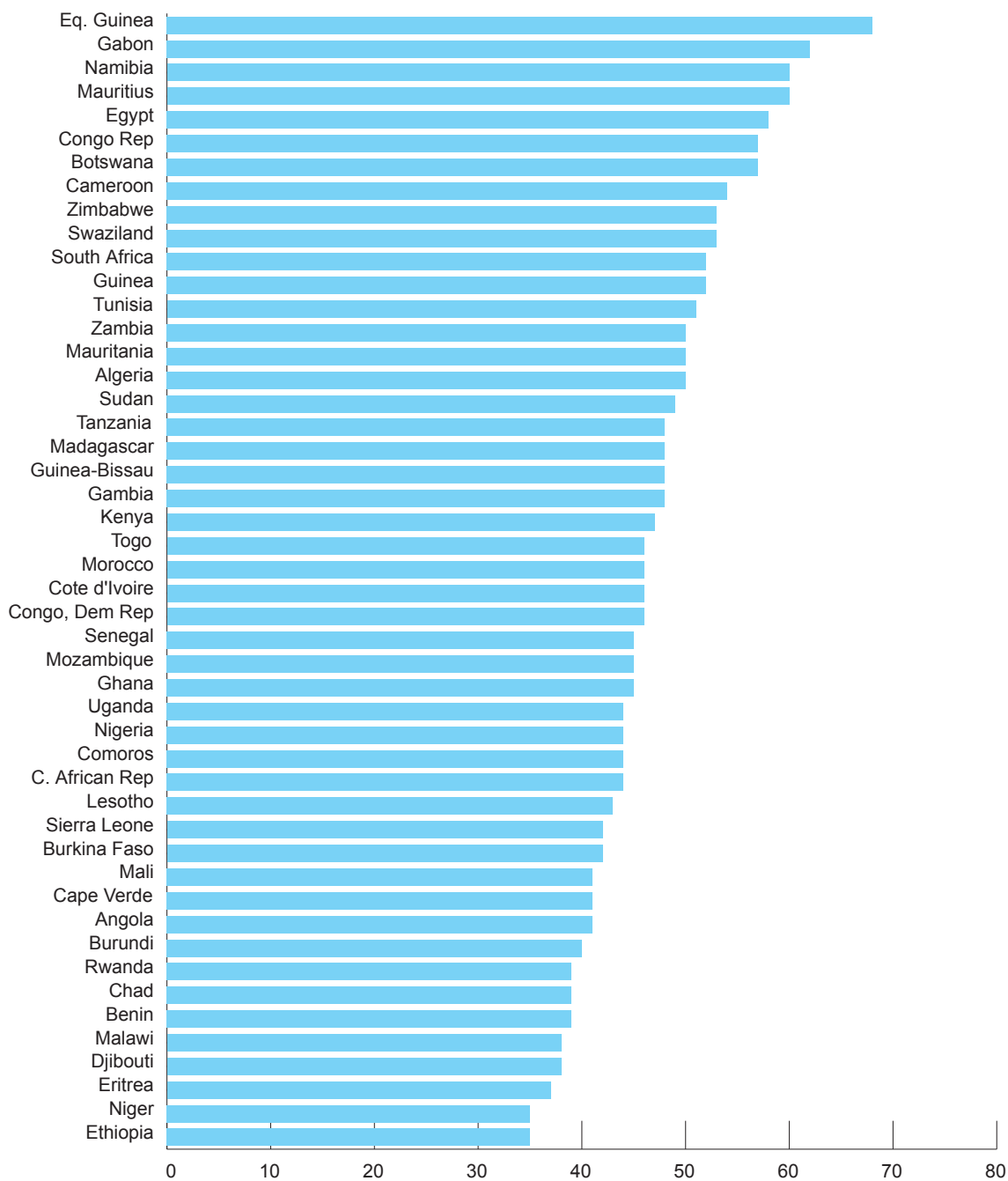
The Water Poverty Index is therefore based on the formulation of a holistic framework for water resources evaluation, which incorporates a wide range of variables in keeping with the Sustainable Livelihoods Approach used by many donor organisations to evaluate development progress.

The scores of the index range on a scale of 1 - 100, with the total being generated as a weighted additive value of five major components, where a low score indicates water poverty and a high score indicates good water provision. Each of the 5 components is also scored on a scale of 1 - 100, and they are:

- (a) **Resource:** The measure of ground and surface water availability, adjusted for quality and reliability;
- (b) **Access:** Indicates the effective access people have to water for their survival;
- (c) **Use:** Captures some measure of how water is used, including sectoral shares;
- (d) **Capacity:** Represents human and financial capacity to manage the system; and
- (e) **Environment:** Tries to capture an evaluation of ecological integrity related to water

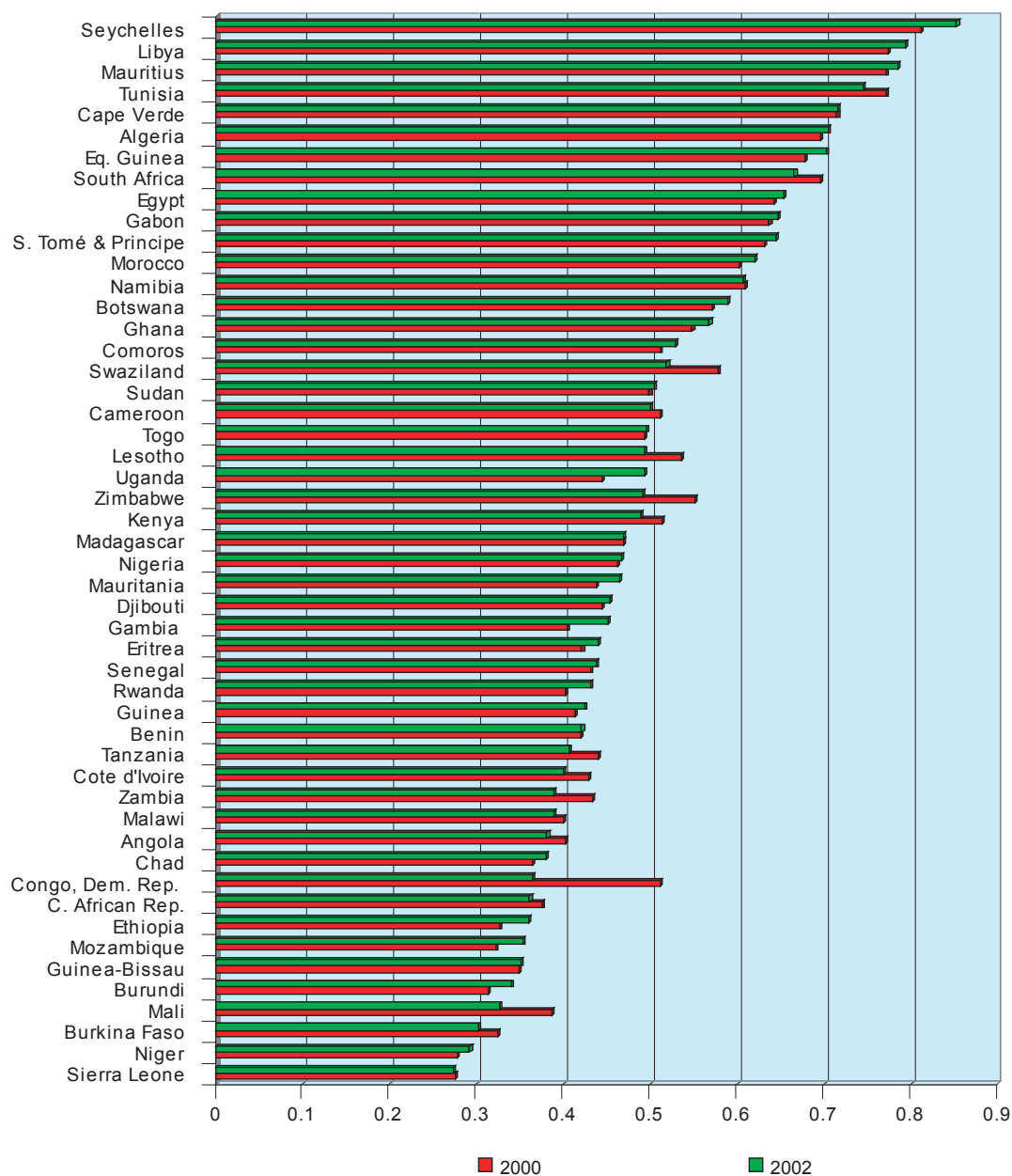
The raking of African countries according to their water poverty index is shown in the figure below.

Water Poverty Index - African Region



Source: World Resources Institute, Natural Environment Research Council, Centre for Ecology and Hydrology. 2002. Note: For a detailed account of alternative methods and their shortcomings, please refer to the 2002 print publication *Calculating a Water Poverty Index*: <http://www.nerc-wallingford.ac.uk/research/WPI/images/WaterPovertyIndexPaper.pdf>.

Human Development Index (HDI): This is a brief measurement of human development, established by the United Nations Development Programme (UNDP). It measures the average achievement in three basic dimensions of human development: A long and healthy life, as measured by life expectancy at birth; knowledge, as measured by a combination of adult literacy (two-thirds weight) and the combined primary-, secondary- and tertiary- gross enrolment ratios (one-third weight) and; a decent standard of living, as measured by GDP per capita (PPP \$US). HDI is calculated as a simple average of the dimension indices that refer to the relative level of actual attainment between the maximum and minimum values.



Source: UNDP (2001, 2004)

From the UNDP Human Development Reports (2002, 2004) it can be noted that only Seychelles was ranked among the high-income group in 2002 (UNDP, 2004) while about 18 countries fell into the medium group. Even though the report indicates that the methodology has been updated in such a way that care must be taken when comparing the figures for 2000 and 2002, it is worth noting that in the report of 2002, about 21 countries were ranked in the medium income group. The human development index (HDI) values and corresponding ranks of African countries are shown in the figure above and the table below.

Ranking of African countries according to the Human Development Index 2002

I Human development index

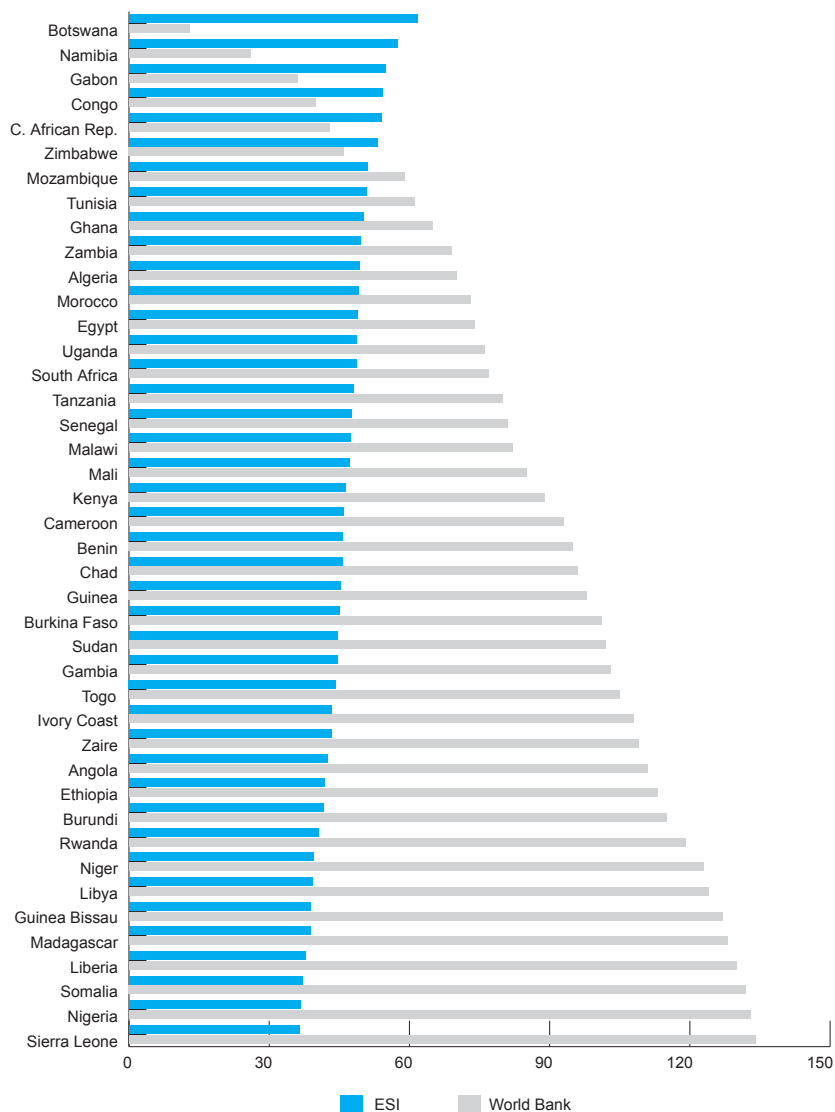
MONITORING HUMAN DEVELOPMENT: ENLARGING PEOPLE'S CHOICES ...

AFRICA	Life expectancy at birth (years) 2002	Adult literacy rate (% ages 15 and above) 2002 ^b	Combined gross enrolment ratio for primary, secondary and tertiary schools (%) 2001/02 ^c		GDP per capita (PPP US\$) 2002	Life expectancy index	Education index	GDP index	Human development index (HDI) value 2002	GDP per capita (PPP US\$) rank minus HDI rank ^d				
HDI rank ^a														
High human development														
35	Seychelles	72.7	m	91.9	l	85	18,232	p,q	0.8	0.9	0.87	0.853	-2	
Medium human development														
58	Libyan Arab Jamahiriya	72.6		81.7		97	h	7,570	v	0.79	0.87	0.72	0.794	6
64	Mauritius	71.9		84.3	l	69		10,810		0.78	0.79	0.78	0.785	-15
92	Tunisia	72.7		73.2		75	h	6,760		0.79	0.74	0.7	0.745	-23
105	Cape Verde	70		75.7		73	h	5,000	q	0.75	0.75	0.65	0.717	-12
108	Algeria	69.5		68.9		70	h	5,760	q	0.74	0.69	0.68	0.704	-25
109	Equatorial Guinea	49.1		84.2	f,k	58		30,130	f,q	0.4	0.76	0.95	0.703	-103
119	South Africa	48.8		86		77		10,070	q	0.4	0.83	0.77	0.666	-66
120	Egypt	68.6		55.6	f,l	76	f,t	3,810		0.73	0.62	0.61	0.653	-12
122	Gabon	56.6		71	w,x	74	h	6,590		0.53	0.72	0.7	0.648	-50
123	São Tomé and Príncipe	69.7		83.1	m	62		1,317	f,s	0.75	0.76	0.43	0.645	29
125	Morocco	68.5		50.7		57		3,810		0.72	0.53	0.61	0.62	-17
126	Namibia	45.3		83.3		71		6,210	q	0.34	0.79	0.69	0.607	-48
128	Botswana	41.4		78.9		70		8,170		0.27	0.76	0.73	0.589	-67
131	Ghana	57.8		73.8		46		2,130	q	0.55	0.65	0.51	0.568	-3
136	Comoros	60.6		56.2		45		1,690	q	0.59	0.53	0.47	0.53	4
137	Swaziland	35.7		80.9		61		4,550		0.18	0.74	0.64	0.519	-37
139	Sudan	□		55.5		36		1,820	q	0.51	0.52	0.48	0.505	-3
141	Cameroon	46.8		67.9	z	56	h	2,000		0.36	0.64	0.5	0.501	-9
Low human development														
143	Togo	49.9		59.6		67		1,480	q	0.41	0.62	0.45	0.495	5
144	Congo	48.3		82.8		48	h	980		0.39	0.71	0.38	0.494	17
145	Lesotho	36.3		81.4	z	65		2,420	q	0.19	0.76	0.53	0.493	-24
146	Uganda	45.7		68.9		71		1,390	q	0.34	0.7	0.44	0.493	4
147	Zimbabwe	33.9		90		58	h	2,400	f	0.15	0.79	0.53	0.491	-25
148	Kenya	45.2		84.3		53		1,020		0.34	0.74	0.39	0.488	11
150	Madagascar	53.4		67.3	f,k	45		740		0.47	0.6	0.33	0.469	20
151	Nigeria	51.6		66.8		45	f,t	860		0.44	0.59	0.36	0.466	15
152	Mauritania	52.3		41.2		44		2,220	q	0.45	0.42	0.52	0.465	-25
154	Djibouti	45.8		65.5	f,k	24		1,990	q	0.35	0.52	0.5	0.454	-21
155	Gambia	53.9		37.8	f,k	45	h	1,690	q	0.48	0.4	0.47	0.452	-15
156	Eritrea	52.7		56.7	f,k	33		890	q	0.46	0.49	0.36	0.439	8
157	Senegal	52.7		39.3		38	h	1,580		0.46	0.39	0.46	0.437	-11
159	Rwanda	38.9		69.2		53		1,270	q	0.23	0.64	0.42	0.431	-6
160	Guinea	48.9		41	w,x	29	f	2,100		0.4	0.37	0.51	0.425	-30
161	Benin	50.7		39.8		52	h	1,070		0.43	0.44	0.4	0.421	-5
162	Tanzania, U. Rep. of	43.5		77.1		31	f	580		0.31	0.62	0.29	0.407	12
163	Côte d'Ivoire	41.2		49.7	f,k	42		1,520		0.27	0.47	0.45	0.399	-16
164	Zambia	32.7		79.9		45		840		0.13	0.68	0.36	0.389	3
165	Malawi	37.8		61.8		74	h	580		0.21	0.66	0.29	0.388	9
166	Angola	40.1		42	w,}	30	f	2,130	q	0.25	0.38	0.51	0.381	-38
167	Chad	44.7		45.8		35	f	1,020	q	0.33	0.42	0.39	0.379	-8
168	Congo, Dem. Rep. of the	41.4		62.7	f,k	27	f,}	650	q	0.27	0.51	0.31	0.365	4
169	Central African Republic	39.8		48.6	z	31		1,170	q	0.25	0.43	0.41	0.361	-15
170	Ethiopia	45.5		41.5		34		780	q	0.34	0.39	0.34	0.359	-1
171	Mozambique	38.5		46.5		41		1,050	q	0.22	0.45	0.39	0.354	-14
172	Guinea-Bissau	45.2		39.6	f,k	37	f	710	q	0.34	0.39	0.33	0.35	-1
173	Burundi	40.8		50.4		33		630	q	0.26	0.45	0.31	0.339	0
174	Mali	48.5		19	f,l	26	f	930		0.39	0.21	0.37	0.326	-11
175	Burkina Faso	45.8		12.8	f,l	22	h	1,100	q	0.35	0.16	0.4	0.302	-20
176	Niger	46		17.1		19		800	q	0.35	0.18	0.35	0.292	-8
177	Sierra Leone	34.3		36	w,x	45	f	520		0.16	0.39	0.28	0.273	-1

Source: UNDP (2004)

The Environmental Sustainability Index (ESI) is a measurement of overall progress towards environmental sustainability. It was developed for 122 countries. ESI scores are based upon a set of 22 core “indicators”, and each of them combines two to six variables for a total of 67 underlying variables. The indicators and variables are chosen through careful review of the environmental literature and available data combined with extensive consultation and analysis, identification of best practices and investigation into interactions between environmental and economic performance. Although in broad terms high-income countries scored higher, among countries of similar levels of per capita income no strong correlation exists between income and overall environmental sustainability. ESI has been developed through a transparent and interactive system of parameters.

The figure below shows the 2002 ESI values for African countries and their respective placements in the world ranking.



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Minimum Significant Indicators from some National AWDR Reports

Economic and social indicators of Morocco

Amounts (billions of DH)	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
National accounts											
Gross domestic product at constant prices	110.3	109.1	121.2	112.7	126.2	124	133	134	135	143	148
Agricultural GDP	15.5	14.5	23.3	13.1	23.4	17.1	21.4	18.3	15.4	19.6	20.7
Non-agricultural GDP	94.8	94.6	97.8	99.6	102.8	107	111	115	120	124	127
Gross domestic product at current prices	241.2	247.7	279.3	281.2	320.9	318	343	346	354	383	398
Agricultural GDP						49.1	58.1	52.9	49	59.7	64.1
Non-agricultural						269	285	293	305	324	334
National income available	253.2	256.7	289.4	289.3	330.3	330	357	359	372	415	426
National Consumption	199.8	208.6	236.5	241.7	270.1	264	281	281	294	309	320
Gross fixed capital formation	54.9	55.4	57.9	62.9	64.7	65.8	76.7	81.9	85.4	85.4	91.1
National savings	53.3	48.1	53	47.5	60.3	65.1	75.8	78.3	78.9	106	107
Indices of the costs for life (base 100 into 1989)	122.2	128.5	135.1	143.4	147.7	149	153	154	157	158	163
Foodstuffs	125.3	133.2	142.5	153.9	155	153	158	157	159	158	164
Non-foodstuffs and services						146	149	152	156	159	161
External accounts											
Total exports	34	34.3	36.5	40.2	41.3	67.1	68.6	73.6	78.8	80.7	86.6
Total imports	62.8	61.8	66	72.9	71.9	90.7	98.7	106	123	125	130
Global commercial balance	-28.8	-27.5	-29.4	-32.6	-30.6	-24	-30	-32	-44	-44	-44
Trips balance	+9.6	+9.2	+8.6	+7.3	+9.0	10.8	12.7	14.7	17.1	24.8	24.3
Balance current transfers						21	22.5	21.1	26.4	40.2	36.7
Currant account balance	-3.7	-4.9	-6.7	-13	-5.7	-0.8	-1.4	-1.6	-5	18.2	16.4
Currant account balance as % of GDP	(1.6)	(2.0)	(-2.4)	(-4.6)	(1.8)	-0.3	-0.4	-0.5	-1.4	4.8	4.1
Total service of the external national debt	22.3	29.4	27.7	30.1	28.3	29.8	28.2	28.7	26.6	27.8	28.3
Outstanding national external debt						186	179	177	171	163	142
National external debt as % of the GDP						58.4	52.4	51	48.3	42.6	35.7
Public finance											
Ordinary balance	+12.6	+13.8	+9.8	+4.9	+7	12	8.1	24.9	7.3	26.4	8.4
Investment expenses	17.2	19.5	19	19.7	16.6	18.4	14.9	18.9	19.2	21.3	20.3
Budget deficit	-5.4	-5.7	-8.9	-14.8	-9.7	-6.3	-10	3	-21	-10	-17
Budget deficit as % of GDP	(2.2)	(2.3)	(-3.2)	(-5.3)	(-3)	-2	-3.1	0.9	-5.9	-2.6	-4.3
Top of form Currency Bottom of form											
M1 aggregate							150	168	181	210	229
Monetary mass (M1)	146.5	159.3	174.2	186.5	198.8	231	245	270	293	334	355
Top fo form External assets Bottom of form	33.7	38.2	41.5	34.1	36.3	40.6	43	59.1	54.7	102	111
State debt	55.5	60.5	65.2	74.2	76.4	86.4	84.5	76	85.9	78.3	80.7
Contribution to the economy	66	71.8	79.3	91.4	100.9	159	176	193	208	217	227
IDH # I, I\$											

Significant Indicators - Libya

1. Life expectancy: 72.5 yrs (2003), 70 yrs (2002), 46 yrs (1970)
2. Infant mortality: 118 per 1000 (1973), 24 per 1000 (1995)
3. Social and health services: 11% of the budget (1973-1985); 19% of the budget (1976-2000)
4. 95% of population with access to medical services (1995)
5. 45% of population with access to medical services (1973)
6. Illiteracy rates: 14% (2000), 61% (1973)
7. School enrollment for ages between 6 and 24 yrs. 77% (2001), 64% (1973)
8. Female enrollment in basic education: 78.5% (1995), 11% (1973)
9. Male enrollment in basic education: 80.4 (1995), 23%(1973)
10. 76% of housing units are connected to potable water networks (2002), 61% (1973)
11. 48% of housing units are connected to sewage collection networks (2002), 17% (1973)
12. 99% of housing units are connected to electrical power supply (2002)
13. Administrative and managerial staff (% of females) 10% (1995)
14. Unemployment rate (2003): Male 16.87, Female 18.47, Total 17.28
15. Unemployment rate (1995) Total 10.86
16. % of workers in agriculture, fisheries (2003) 4.8%
17. Rural population (as % of total) 15.0 (1995)
18. Annual growth rate of rural population: (-2.20) 1995
19. Education budget (as % of national budget): 38.2 (1998)
20. Number of centers and institutions for scientific research: 18 (1998)
21. Number of staff at R&D centers (as per 100000 people): 1100 (1998)
22. Percentage of female (as % of staff at R&D centers): 13.0 (1998)
23. University degree holders (as % of the staff at R&D centers): 80 (1998)
24. Urban population (as % of total) 60.2% (1973), 85.7% (1995)
25. Annual population growth rate (973-1995): 3.5%
26. Electricity consumption (kw per capita): 2688 (1998)
27. Real GDP (million dinars) based on 1997 prices:
1998: 13159.2
2000: 14141.6
2001: 14206.2
2002: 14557.6
2003: 15234.9
28. Average of inflation rate in 1998 (as % of 1992): 48
29. GDP growth rate in 1997 (as % of 1992=100): 136.3

SOUTH AFRICA

INDICATORS FOR DRIVERS				
Serial	Indicator	Quantified Indicators		Qualified Description or Comment
		VALUE	YEAR	
1	Human Poverty Index: 5 indicators	16.4 22.3	1995 2003	
2	Incidence of water-related diseases	2778 11243	2004 2004	Cholera cases Malaria cases
3	Population	46.6m	2004	
4	Population growth rate	2%	1996-01	Growth between official census figures
5	Renewable water resources within a country	49 040 Mm ³		
6	Withdrawals: % of total annual renewable fresh-water	26.2 %	2000	
7	Water scarcity: number of countries			South Africa is on the threshold of water scarcity
8	Water shortages: no. of people without formal infrastructure in South Africa	3.7m	2005	Unable to interpret this indicator to South Africa
9	No. of countries unable to supply minimum drinking water			South Africa is able to supply minimum drinking water
10	Transboundary rivers: (% population dependent on them)	72.3%	2000	
11	Polluted water: (% of population exposed to it)			Unable to interpret this indicator to South Africa
12	Natural disasters: deaths from water-related causes	1406	1950-96	Flood related
13	Climate change: effects on water scarcity	-10%	2015	Reduction in runoff in the western areas of the country
	SOURCES ACCORDING TO SERIAL NUMBER:			
1	UNDP. The Challenge of Sustainable Development in South Africa. Third Human Development Report. 2003. p45			
2	SA Department of Health. on 11 April 2005			
3	SA Department of Health. on 11 April 2005			
4	Statistics South Africa. Mid-year population estimates, 2004. Statistical release P0302			
5	Statistics South Africa. Census 2001: Census in Brief. 2003			
6	National Water Strategy, Table 2.1. Sept 2004			
10	National Water Strategy, Table 2.1. Sept 2004			
12	National Water Strategy, Fig 2.3 (underlying data). Sept 2004			
13	DWAf. Historical flood documentation in South Africa – 1652 to 1996. Report TR152. 1997			
	South Africa. Initial National Communication under the United Nations Framework Convention on Climate Change 2000 p35			

References

- Africa Facts: <http://www.nationmaster.com>
- Andah K. (2003): Analysis of Significant Indicators for IWRM. Presented as a Resource Person at the Central African Consultative Meeting on the African Water Development Report at Yaonde
- AWDR Draft Synthesis of National Reports of the Northern Sub Region, 2005.
- AWDR National Reports (Congo Rep., Nigeria, Cameroon, Benin, Burundi, Niger, D.R. Congo, Gabon), 2003.
- AWDR National Reports (Egypt, Algeria, Tunisia, Mauritania, Libya, Sudan, Morocco, Ethiopia, South Africa, Malawi, Zimbabwe, Mauritius, Botswana, Swaziland), 2005
- ECA: State of the Environment in Africa, United Nations Economic Commission for Africa, Addis Ababa, 2001.
- ECA: Transboundary River/Lake Basin Water Development in Africa: Prospects, Problems, and Achievements. United Nations Economic Commission for Africa, Addis Ababa, 2000
- Environmental Sustainability Index 2005 Report available online at www.yale.edu/esi. Copyright ©2005 Yale Center for Environmental Law and Policy
- MDG Task Force on Environmental Sustainability, 2005: Environment and human well-being: a practical strategy Final Report of the MDG Task Force on Environmental Sustainability, Millennium Project, United Nations, New York.
- MDG Task Force on Water and Sanitation, 2004, Achieving the Millennium Development Goals for Water and Sanitation: What Will It Take?, Final Report of the MDG Task Force on Water and Sanitation, New York: United Nations.
- Ministerial Declaration of the Hague Conference on Water Security in the 21st Century, 2000, Official Outcome of the Second World Water Conference, December 3-7, 2000, The Hague.
- UN Water/Africa, 2004: Outcomes and Recommendations of the Pan-African Implementation and Partnership Conference on Water (PANAFCON), UNECA, Addis Ababa.
- UN/ECA, 2002, Development Challenges of Water Resources Management In Africa: A Briefing Note, Addis Ababa: United Nations Economic Commission for Africa.
- UNDP: Monitoring Human Development: Enlarging People's Choices. World HDI Rankings, 2003.
- UNDP; Human Development Report 2001, New York - Oxford, Oxford University Press, 2001
- UNDP; Human Development Report 2004, New York - Oxford, Oxford University Press, 2004
- UNECA, 1999. Integrated Water Resources Management: Issues and Options in Selected African Countries.
- UNECA, 2001. Safeguarding Life & Development in Africa – A vision for Water Resources Management in the 21st Century. The Hague, The Netherlands, March 2000, First Edition.
- UNECA: Report of the First Consultative Meeting on the African Water Development Report, organised by IGWA at UNECA, Addis Ababa, 2002.
- UNEP GEO – 2000 Global Environment Outlook, UNEP, Nairobi, 1999.
- UNEP GEO-3 (2002): Global Environment Outlook 3, Past, present and future perspectives. United Nations Environment Programme, Nairobi, 2002
- UNEP, 2002, Vital Water Graphics: An Over-

view of the State of the World's Fresh and Marine Waters, Nairobi: United Nations Environment Programme.

UNESCO: United Nations World Water Development Report, UNESCO, Paris, 2003

VISION 21: A shared vision for hygiene, sanitation and water supply and a framework for action. Proceedings of the Second World Water Forum, The Hague, 17–22 March 2000. Geneva, Water Supply and Sanitation Collaborative Council, 2000.

World Resources Institute Website Natural Environment Research Council, Centre for Ecology and Hydrology. 2002, Wallingford.

World Resources Institute Website Natural Environment Research Council, Centre for Ecology and Hydrology. 2002, Wallingford.

WPI (2003): Water Supply and Sanitation Coverage Figures 2000/1, The Water Page – African water Page, Water Policy International Ltd, info@thewaterpage.com