INTERNATIONAL SYMPOSIUM

on

"ENHANCING WATER MANAGEMENT CAPACITY in a CHANGING WORLD"

Session 03

Sao Paulo, Brazil, June 25-28, 2012

Water Resources Availability and Sectorial Analysis for Sustainable Development in Africa

by Prof. S. Diop

THE AFRICA WATER VISION:

AN AFRICA WHERE THERE IS AN EQUITABLE AND SUSTAINABLE USE AND MANAGEMENT OF WATER RESOURCES FOR POVERTY ALLEVIATION, SOCIO-ECONOMIC DEVELOPMENT, REGIONAL COOPERATION, AND THE ENVIRONMENT






KEY FACTS

- Africa is the world's second-driest continent
- With 15 per cent of the global population, it has only 9 per cent of global renewable water resources
- Water is unevenly distributed and Africa's climate is characterized by an overall unreliability of rainfall
- Increases in access to improved drinking water sources and sanitation facilities are not keeping pace with population growth
- Water scarcity is not simply due to geography: population growth, rapid urbanization, poor planning and poverty are significant factors

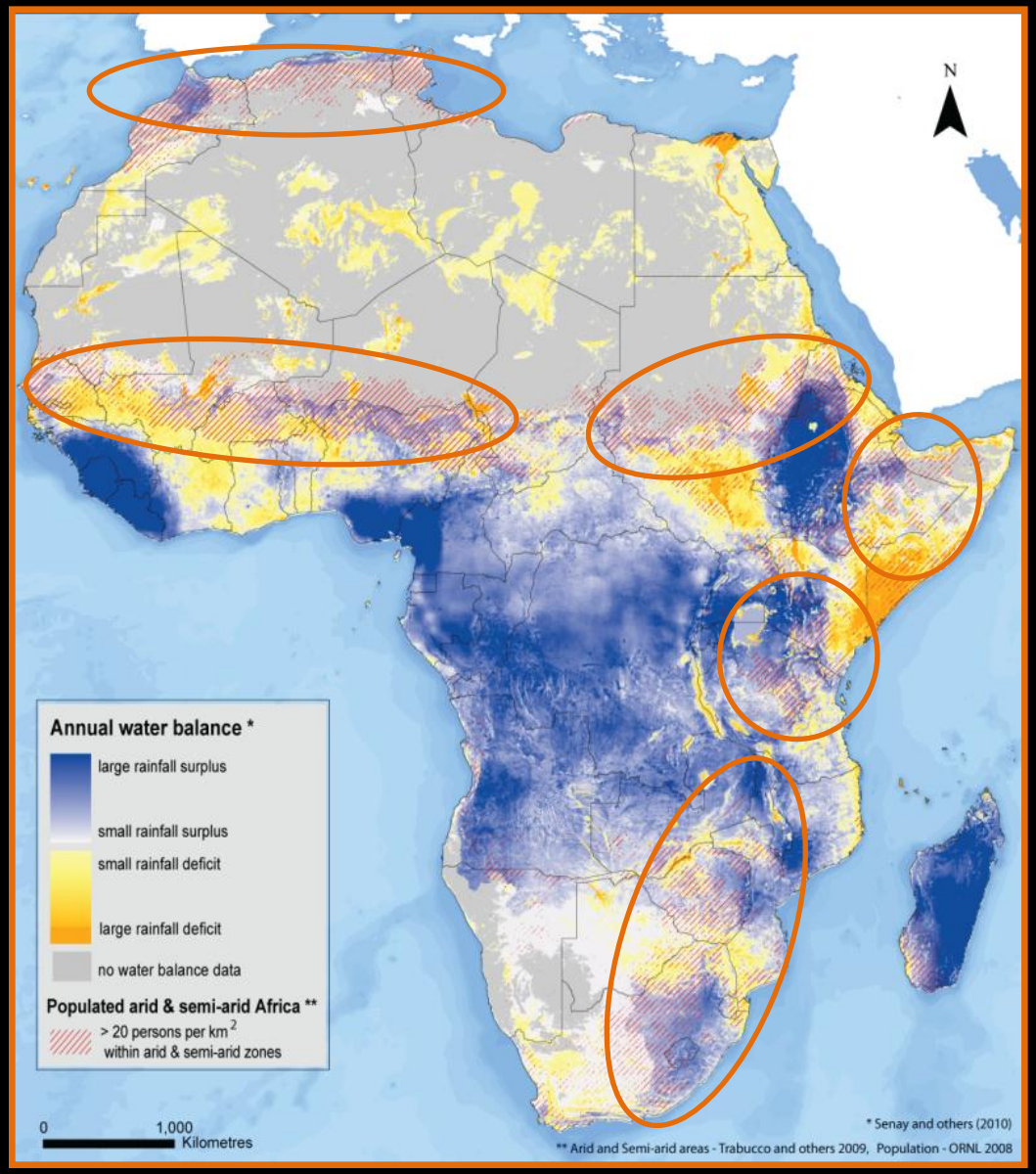
The nature of water issues in Africa is often contradictory:

- Surplus and scarcity
- Under-development and overexploitation
- Challenges and opportunities



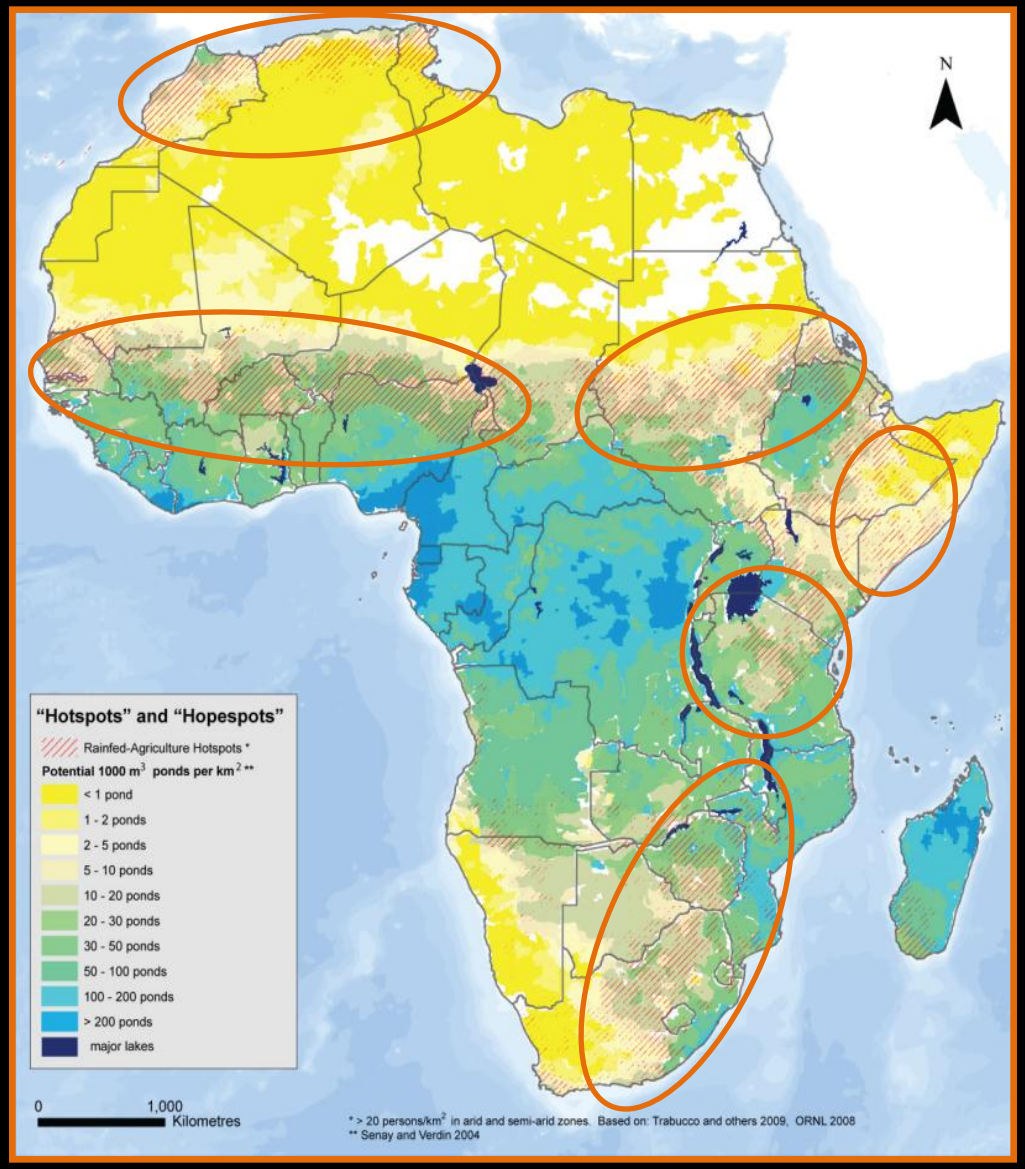


ANNUAL WATER BALANCE



Annual water balance is an estimate of the available runoff after evapotranspiration — water that is potentially available for harvesting

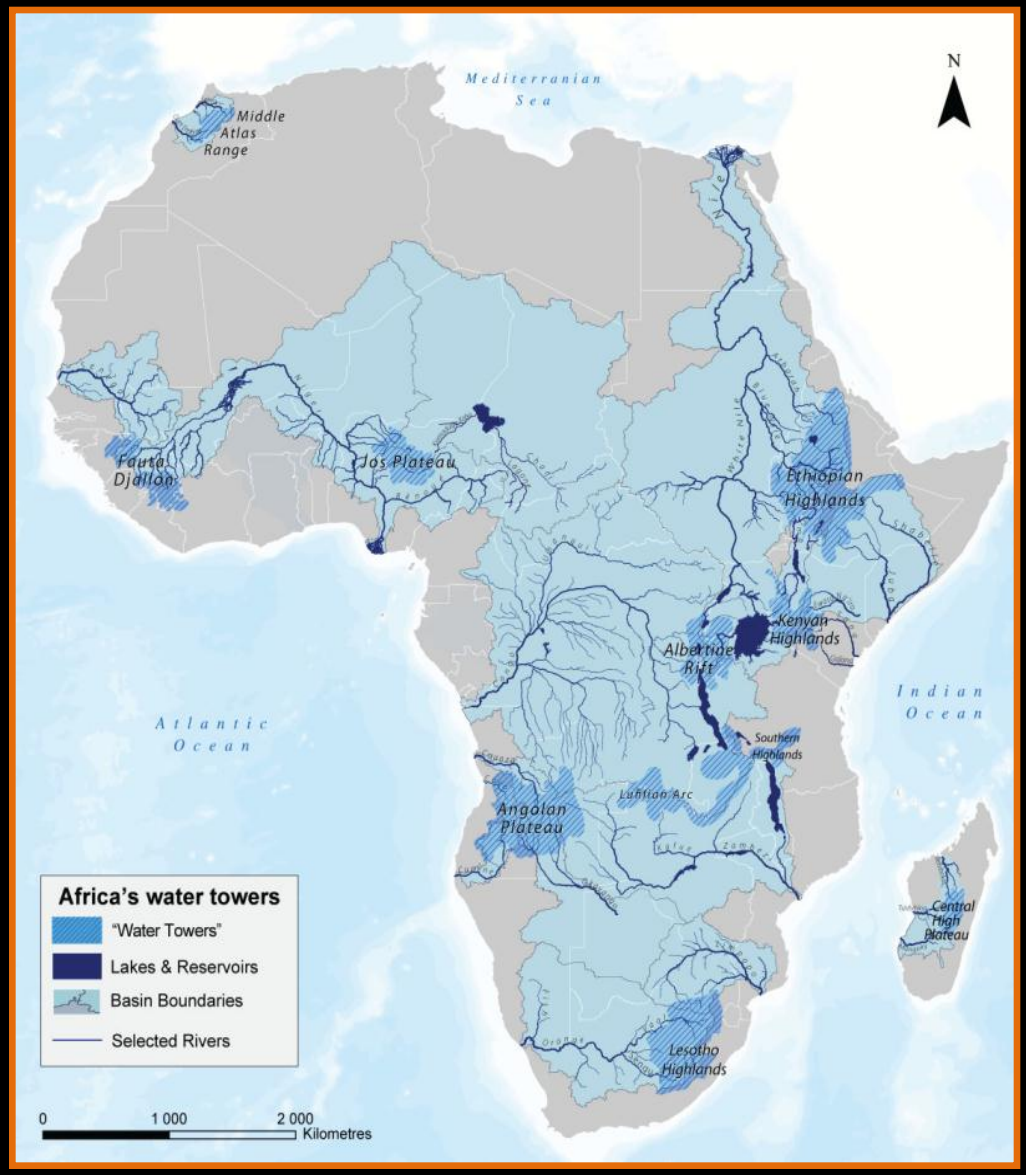
The red hatching overlaying the water balance map shows where population density >20 persons per km^2 coincides with areas defined as arid or semi-arid



Areas of population density >20 persons per km^2 that coincide with arid and semi-arid zones are potential hotspots of vulnerability for water-constrained rain-fed agriculture (red hatch marks)

Many of these areas have adequate runoff for filling small farm ponds, which can reduce vulnerability and improve food

WATER TOWERS OF AFRICA



These are areas identified by:-

- Relative elevation (generally 200–800 m above the surrounding area)
- Precipitation above 750 mm
- Runoff above 250 mm
- And the contribution they make to water resources for populations beyond their delineated boundaries

TOTAL RENEWABLE WATER RESOURCES



There are wide differences in natural water distribution within Africa's sub-regions and countries

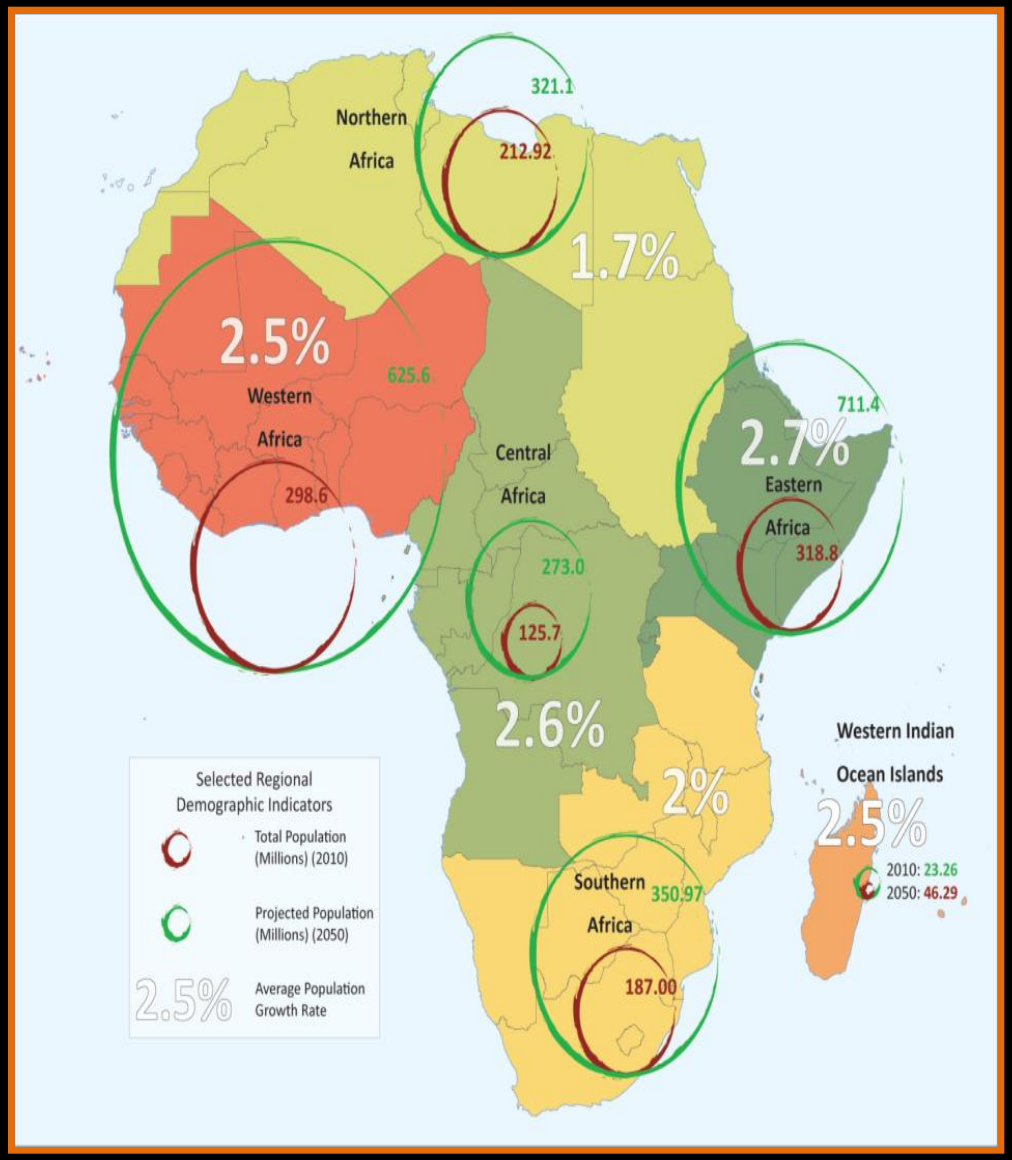
DISTRIBUTION OF DAMS



There is about one dam to every 683 000 persons in Africa, while the equivalent figure for the rest of the world is 168 000

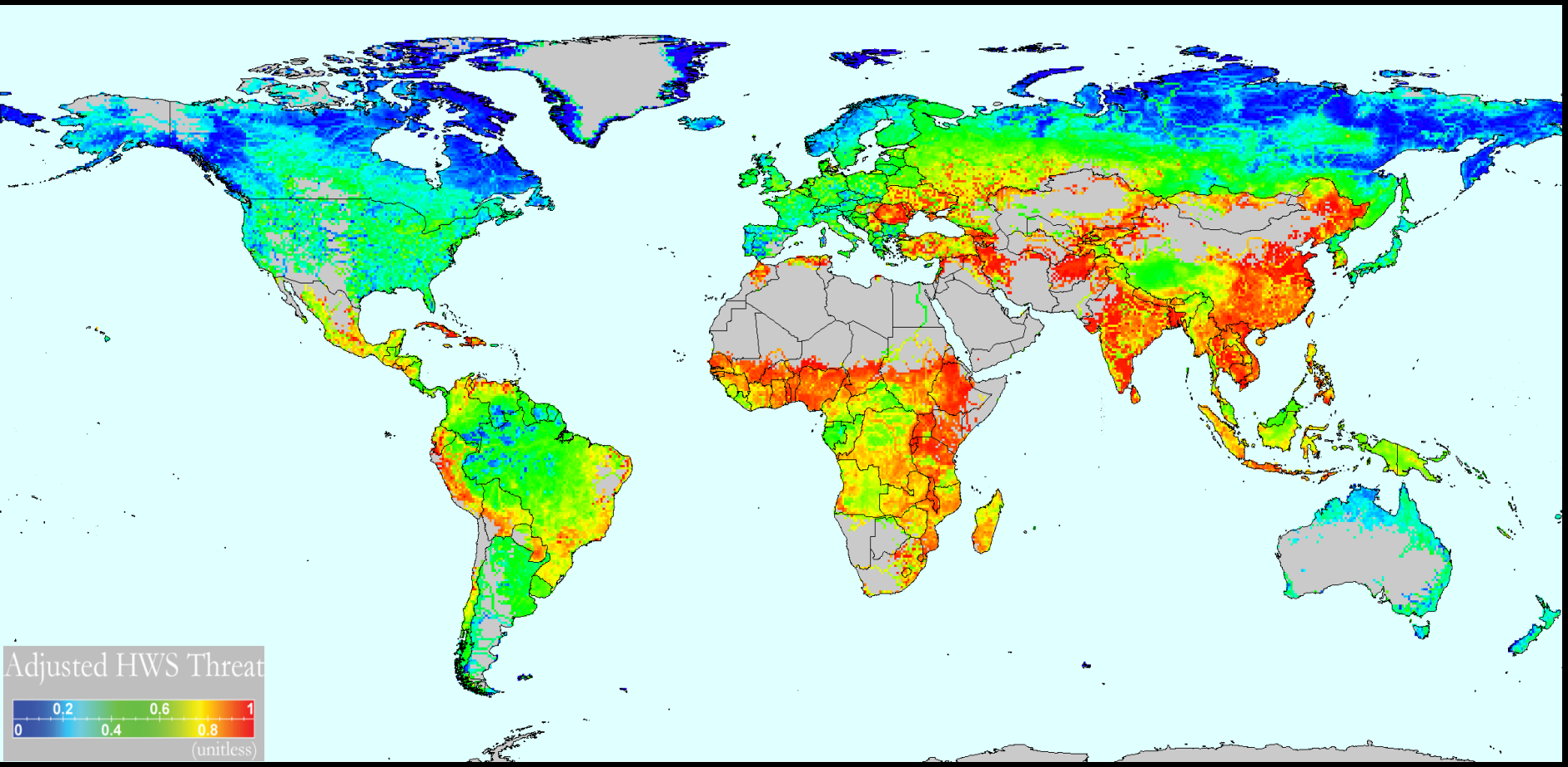
More than 1 270 dams have been built on rivers in Africa to store water and supply hydropower and irrigation water

SELECTED REGIONAL DEMOGRAPHIC INDICATORS



Countries with high population densities include Nigeria in West Africa, which is also the most populous nation on the continent with more than 150 million people (166 people per km^2) and the Central African nations of Rwanda (394 people per km^2) and Burundi (314 people per km^2). It is estimated that the West Africa sub-region will still be the most populous by the year 2050

The current level of water demand exceeds the sustainable water supply in many places, with serious long-term implications



TRANSBOUNDARY

WATER RESOURCES



SURFACE WATER

The continent's 63 international river basins

- Cover about 64 per cent of its land area
- Contain 93 per cent of its total surface water resources
- Are home to 77 per cent of Africa's population

GROUNDWATER

Groundwater is an important source of freshwater and it is essential to supplement the surface water resources in a region that is increasingly affected by recurrent drought

Africa is endowed with large and often under-utilized aquifer resources, predominantly in the large shared sub-regional sedimentary systems of the Sahara and Central and Southern Africa

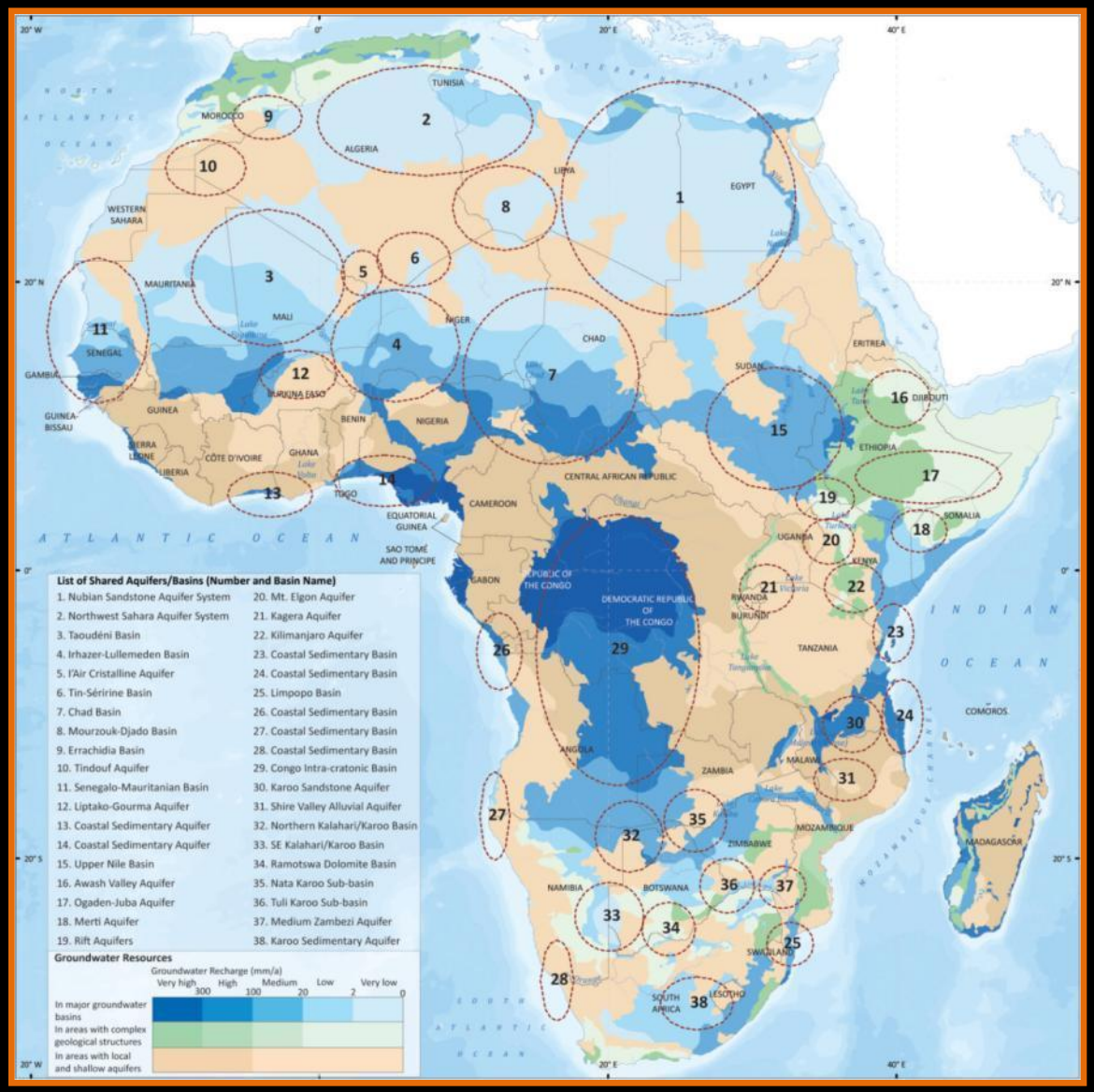


MAJOR TRANSBOUNDARY RIVER BASINS



The major transboundary basins of Africa present a variety of challenges and opportunities to the people and countries who share them

TRANSBOUNDARY AQUIFERS



Just as there are internationally shared river basins, there are also internationally shared, or transboundary, water resources and aquifers hidden underground

AFRICA'S WATER CHALLENGES





NINE WATER CHALLENGES

MORE THAN A CHALLENGE

The Challenge: *Attain the MDG water provision target: By 2015, reduce by half the proportion of the population without sustainable access to safe drinking water.*

The Situation: *Africa as a whole is not expected to meet this MDG drinking water target; of its 53 countries, only 26 are on track to meet it. The high incidence of water-related and waterborne diseases related to the lack of safe drinking water is a drain on human and financial resources.*

The Constraints: *Exploding peri-urban and slum areas; economic growth and higher demand; geographical isolation; dearth of public utilities and regulation; and high costs of water provision.*

The Opportunities: *Improve financing; encourage privatization through concessions; subsidize connections; target informal settlements; institute or improve regulation; target rural communities; and employ simple solutions.*

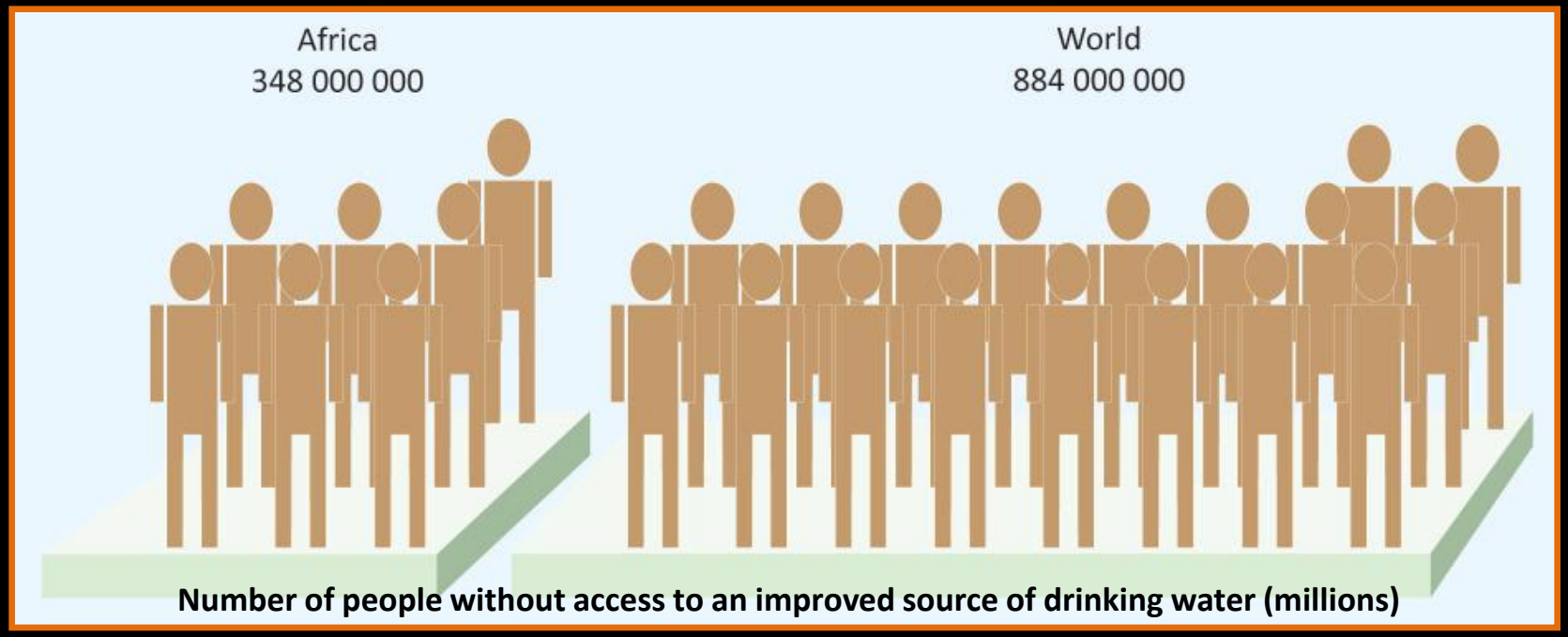
CHALLENGE

SITUATION

CONSTRAINTS

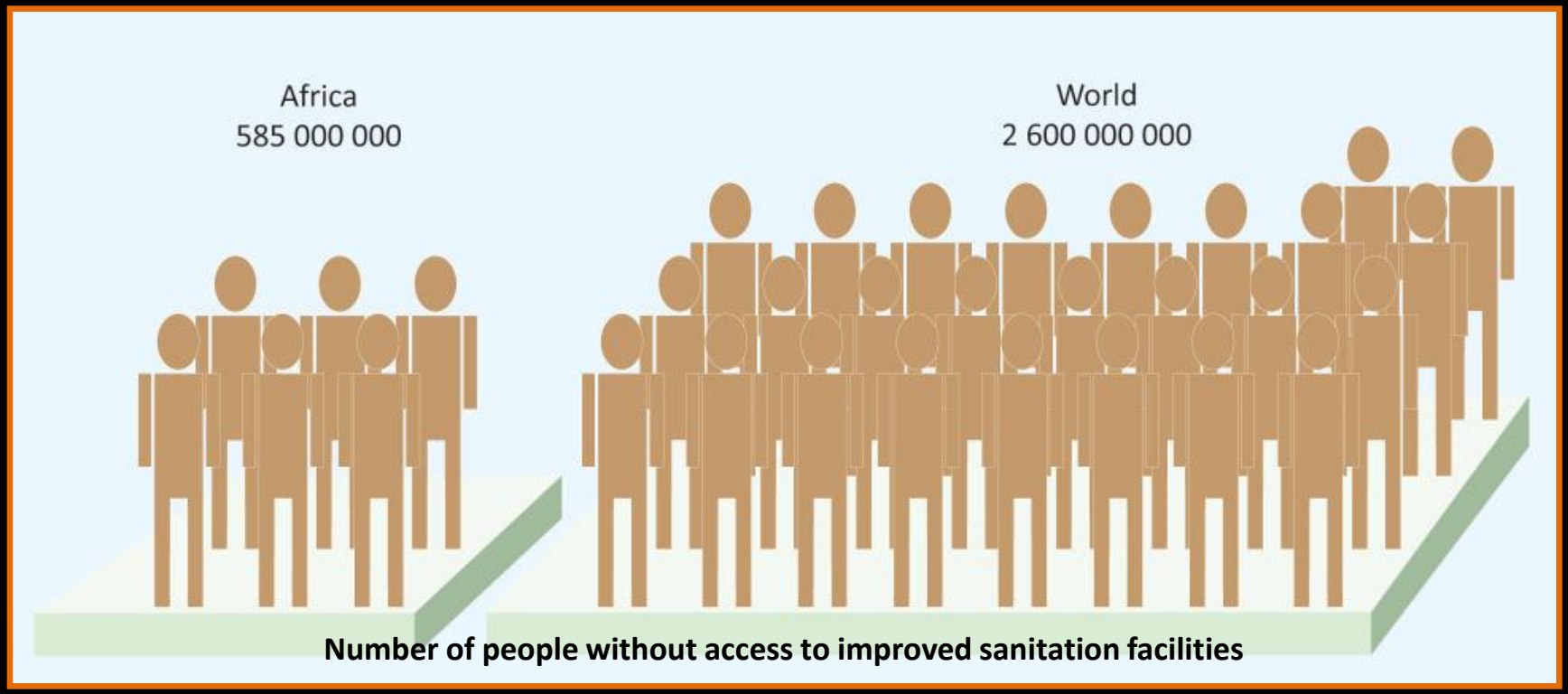
OPPORTUNITIES

CHALLENGE 1: *PROVIDE SAFE DRINKING WATER*



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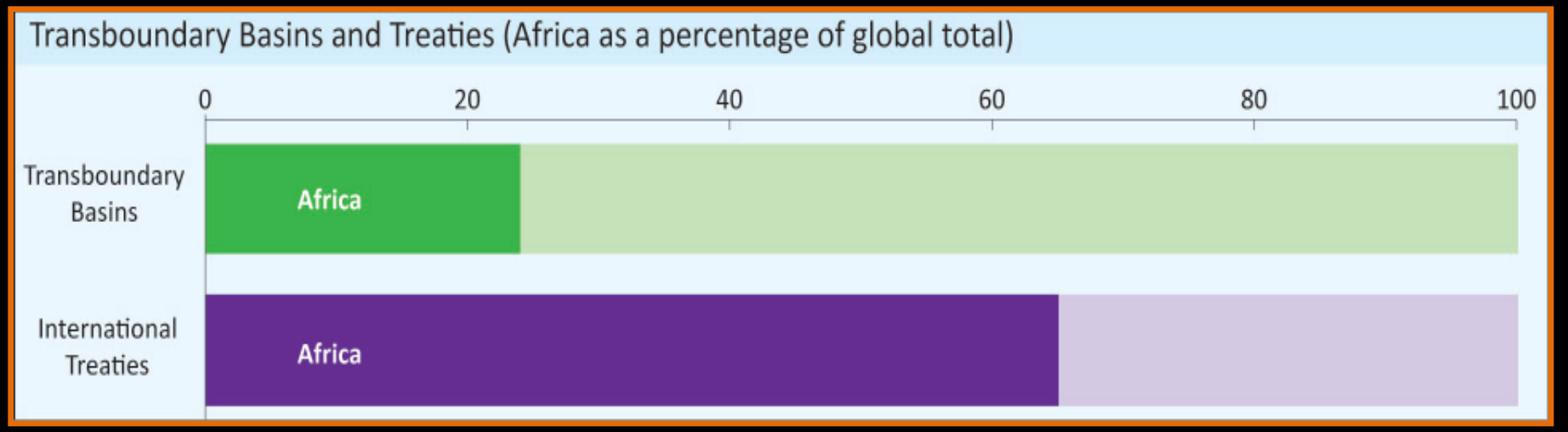
CHALLENGE 2: *ENSURE ACCESS TO ADEQUATE SANITATION*



Number of people without access to improved sanitation facilities

Exploding peri-urban and slum areas; economic growth and higher demand; geographical isolation; dearth of public utilities and regulation; and high costs of water provision.

CHALLENGE 3: *FOSTER COOPERATION IN TRANSBOUNDARY WATER BASINS*



Recognize and build on water as a binding factor between otherwise hostile states; and learn from successful transboundary cooperation efforts and agreements among African states.

CHALLENGE 4: *PROVIDE WATER FOR FOOD SECURITY*



Agricultural growth is the mainstay of most African economies; agriculture is the greatest user of water in Africa; there is inadequate water use for sustainable food production; Africa suffers from food insecurity and 30 per cent of the population lives with chronic hunger

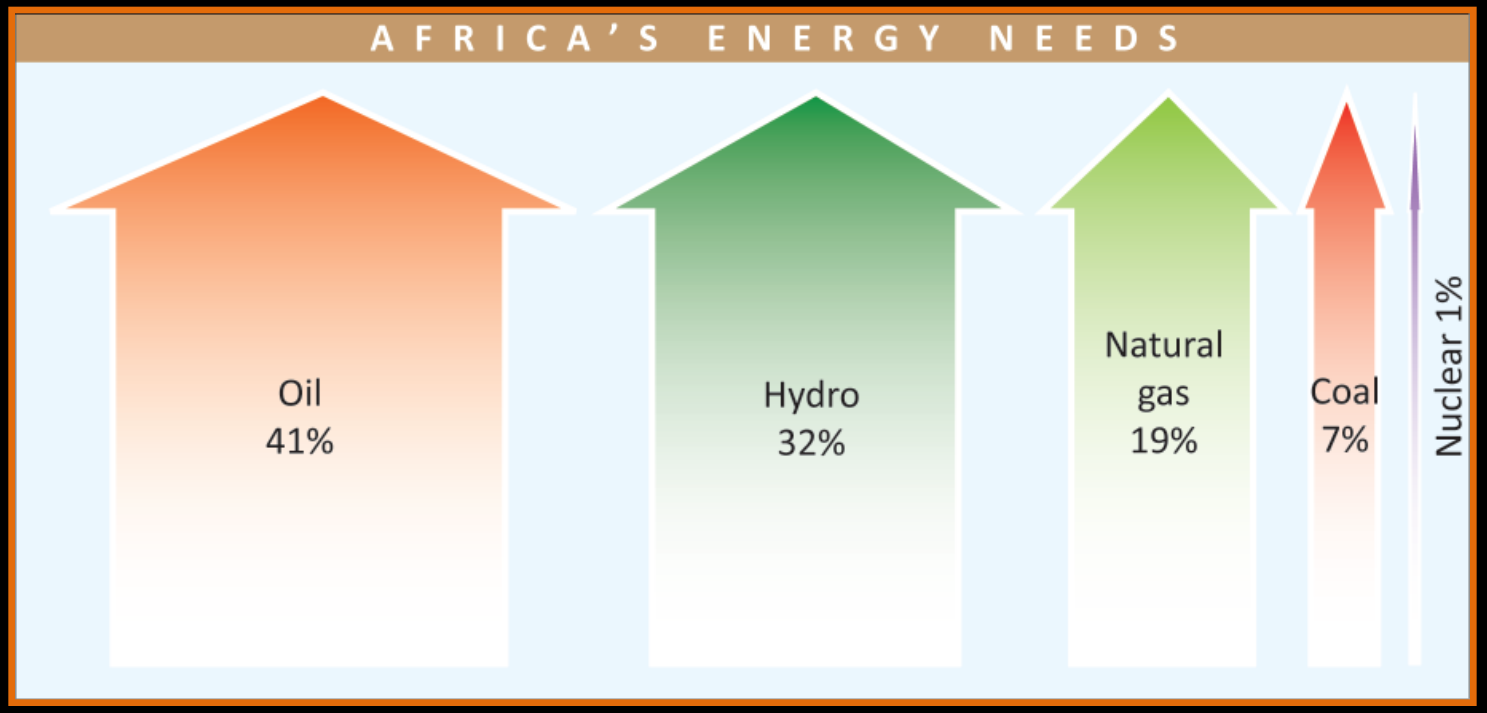
IRRIGATED AREAS



Two-thirds of sub-Saharan Africa's over six million hectares of irrigated land is found in only three countries:

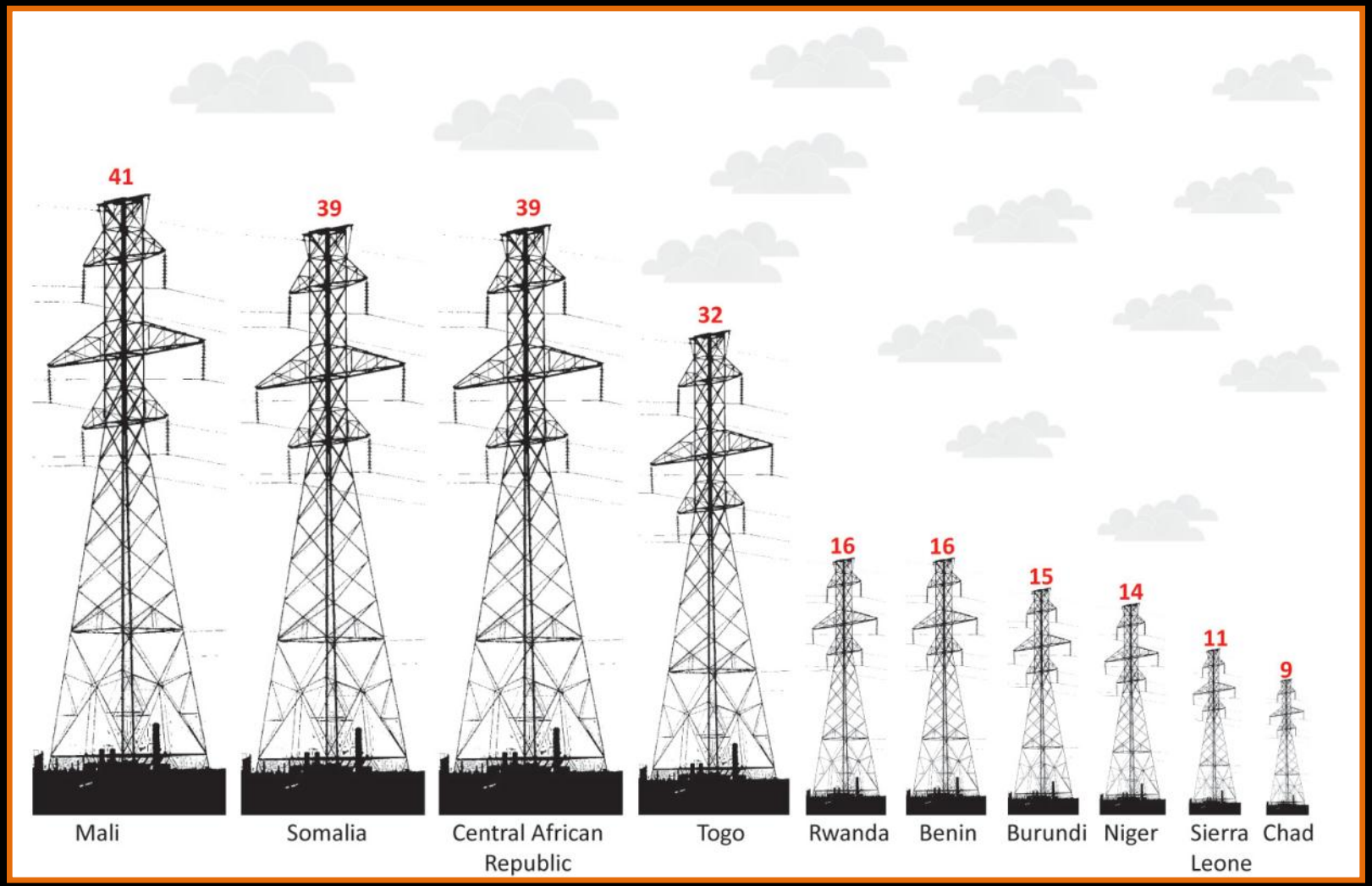
Madagascar, South Africa, and Sudan

CHALLENGE 5: *DEVELOP HYDROPOWER TO ENHANCE ENERGY SECURITY*



Hydro contribution to Africa's** primary **energy needs, 2002

The capacity to generate hydropower is unequal across the continent; climate change will exacerbate rainfall variability and hinder hydro potential; and hydro dams will need to avoid the environmental and social impacts historically characteristic of large dam developments



Many African nations have a per capita electricity consumption of less than 80 kWh/yr compared to 26 280 kWh/yr in Norway, 17 655 kWh/yr in Canada, and 13 800 kWh/yr in the United States

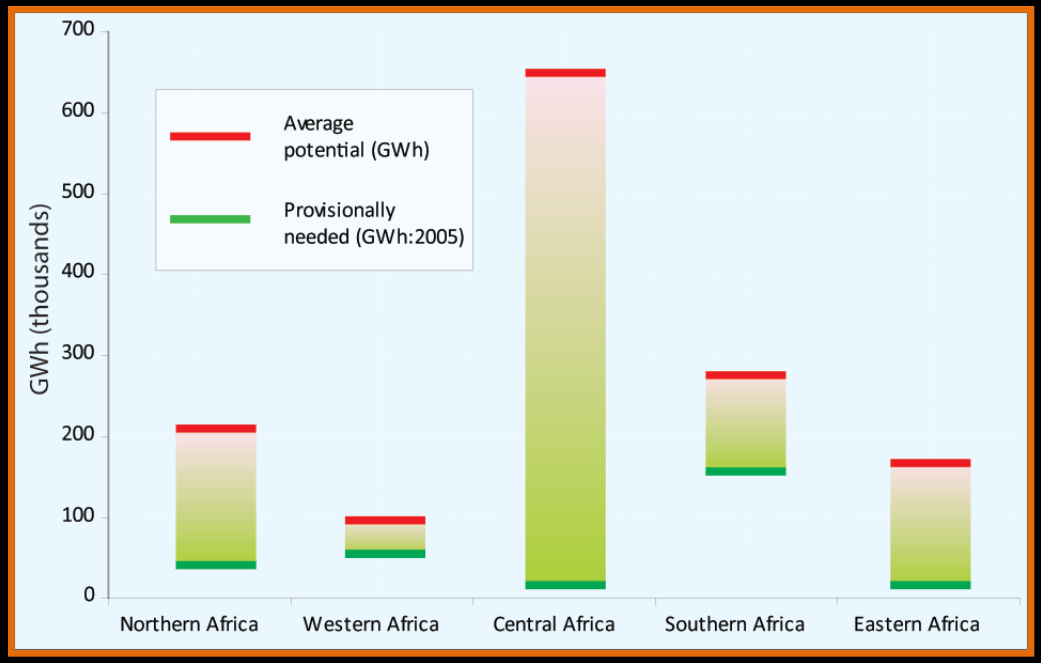
PROPOSED TRANSMISSION SYSTEM FROM THE GRAND INGA



Grand Inga would generate 44 000 MW of electricity—
enough to power the entire continent of Africa

DIFFERENT VIEWS: How much hydro potential has Africa developed?

Capacity Developed	Source
4 per cent	Bartle (2002); Blyden and Akiwumi (2008)
8 per cent	World Bank (2010a)
Less than 8 per cent	AfDB (2006)
4 per cent**	World Water Assessment Programme (2009)
7 per cent	AfDB (2006)



Regional development of economically feasible hydropower potential

CHALLENGE 6: *MEET GROWING WATER DEMAND*



Demand for water is increasing with population growth and economic development; development of water resources is inadequate; prices to access water are generally distorted; and water provision is highly inefficient

CHALLENGE 7: *PREVENT LAND DEGRADATION AND WATER POLLUTION*

Lack of valuing of ecosystem services; political instability and conflict within and between countries; poor agricultural practices and farming on marginal lands that affect water use or water resources; and lack of structured water monitoring and governance



CHALLENGE 8: *MANAGE WATER UNDER GLOBAL CLIMATE CHANGE*

Global warming and its human cause are undeniable; warming patterns in Africa are consistent with global ones; Africa is already subject to important spatial and temporal rainfall variability; drought in Africa is common and some regions are becoming drier; Africa's repeated drought cycles kill thousands of people each event; and floods also occur regularly with severe impacts on peoples' livelihoods



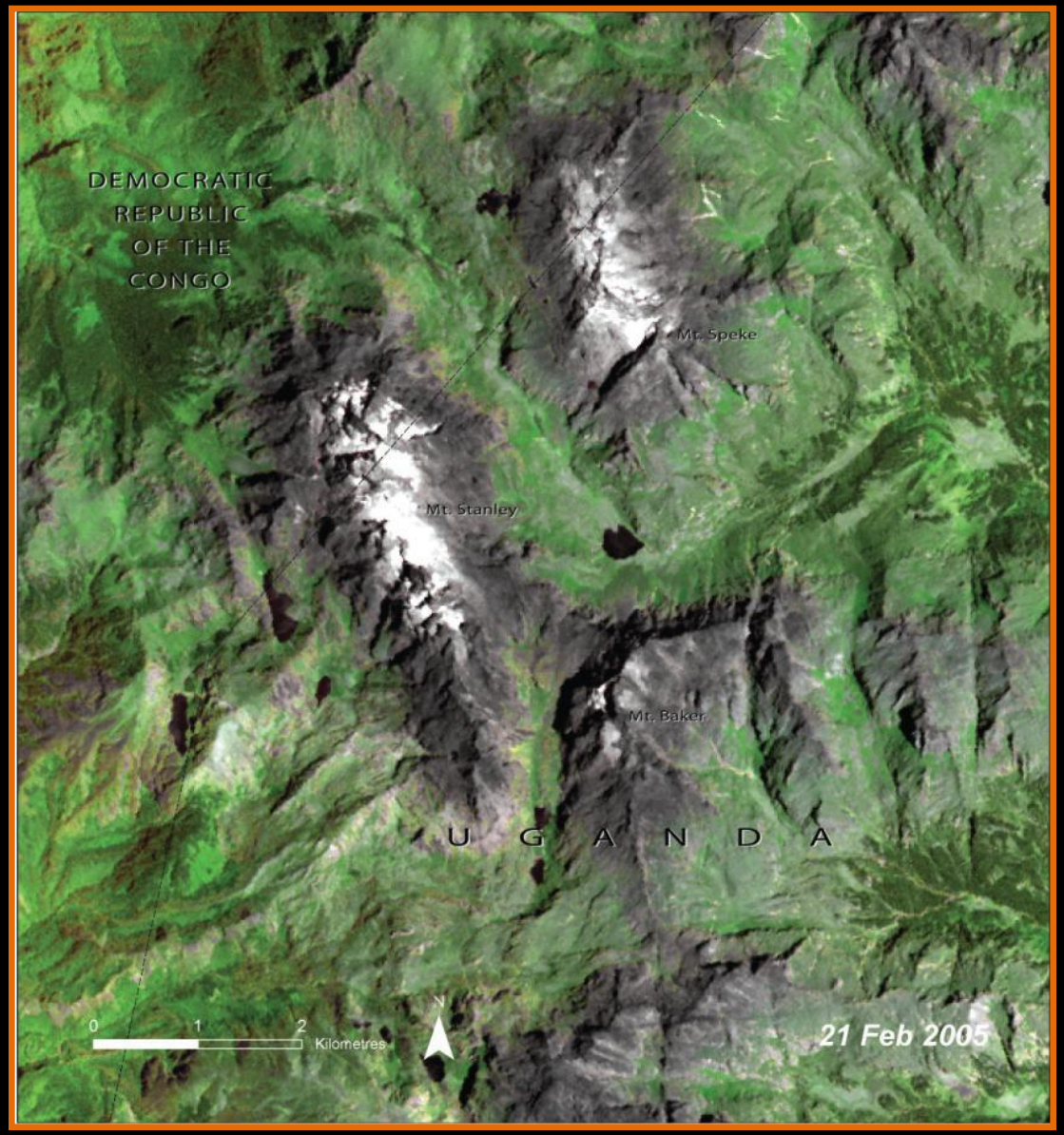
Mount Kilimanjaro's glaciers are melting

LATE 20TH CENTURY WARMING IN LAKE TANGANYIKA UNPRECEDENTED SINCE AD 500

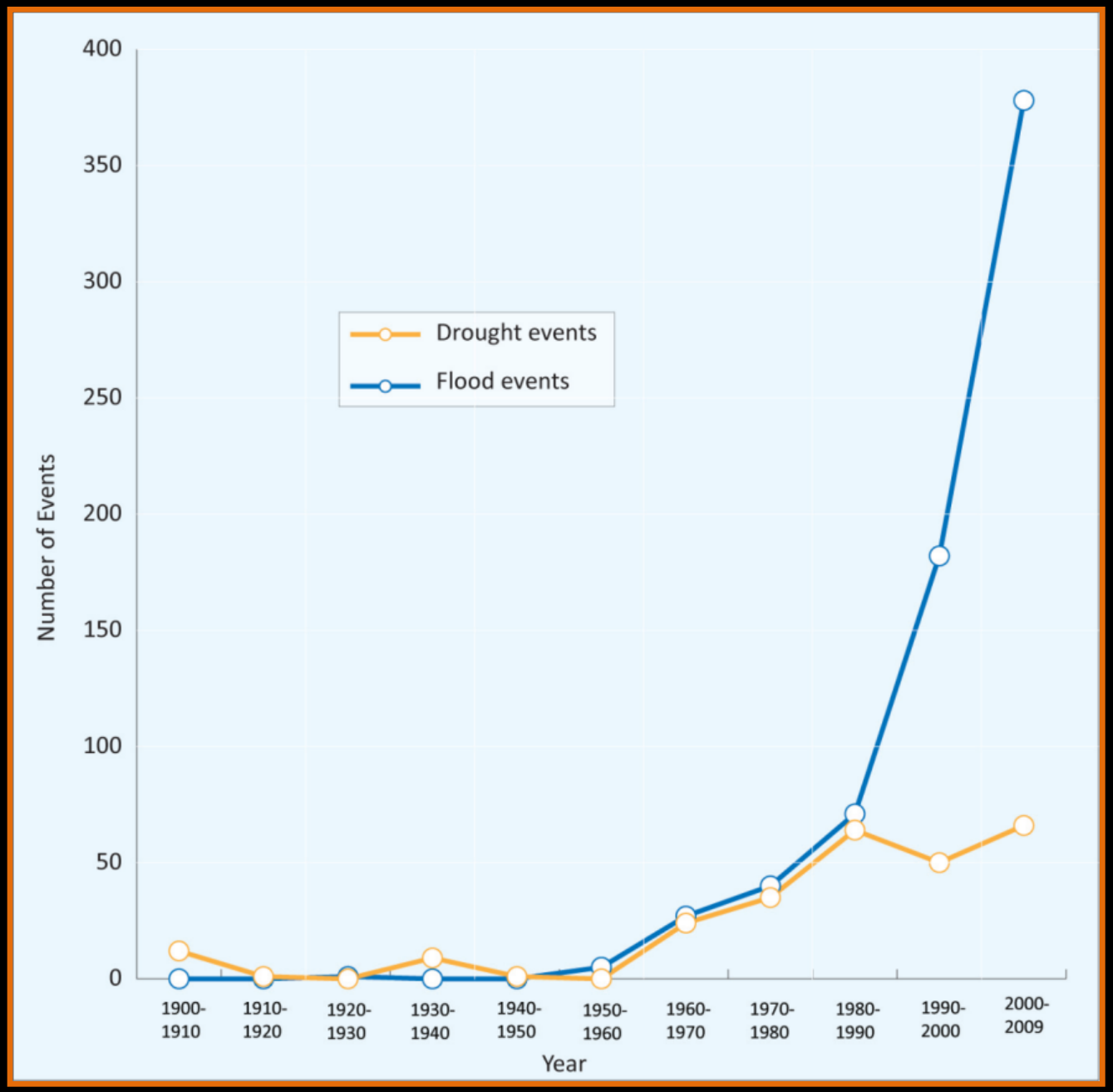


Lake Tanganyika, the world's second-largest (by volume) and second deepest lake after the Lake Baikal, has become warmer. Changes in the lake-surface temperature have affected its ecosystem, which heavily relies on nutrient recharge from the depths, the lake's base of the food chain

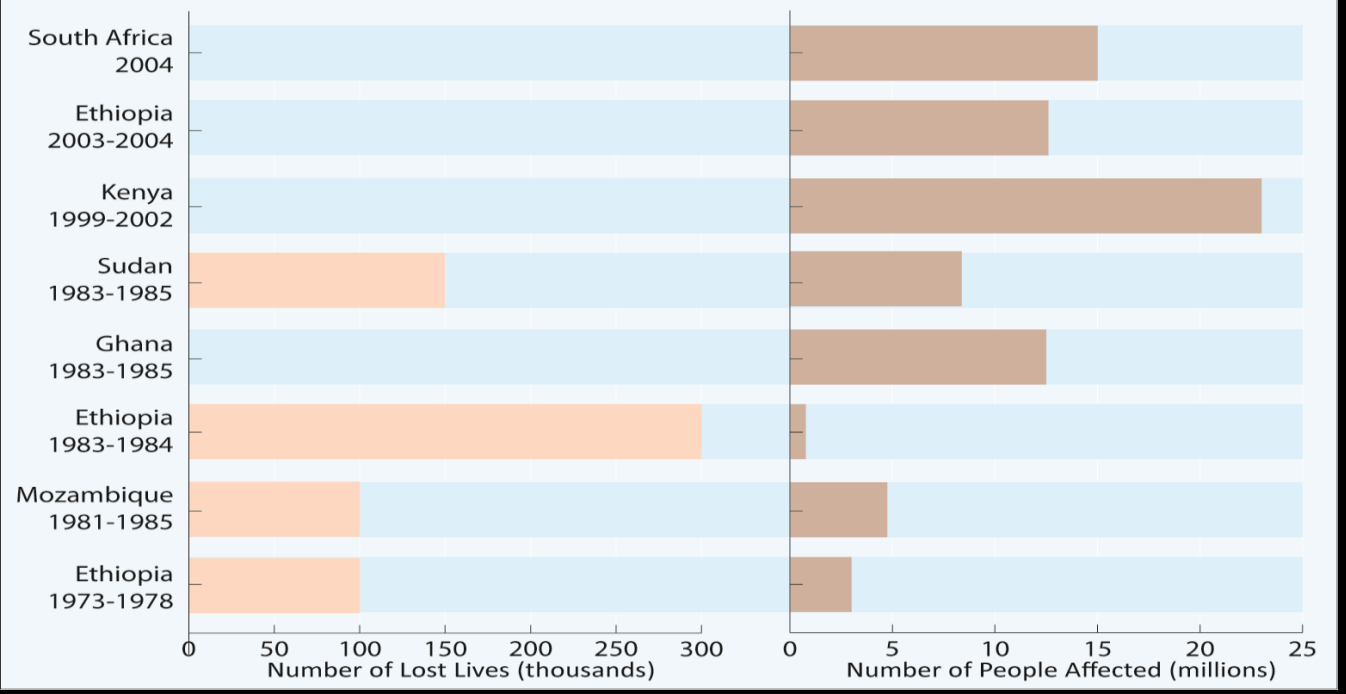
GLACIAL RECESSION IN THE RWENZORI MOUNTAINS



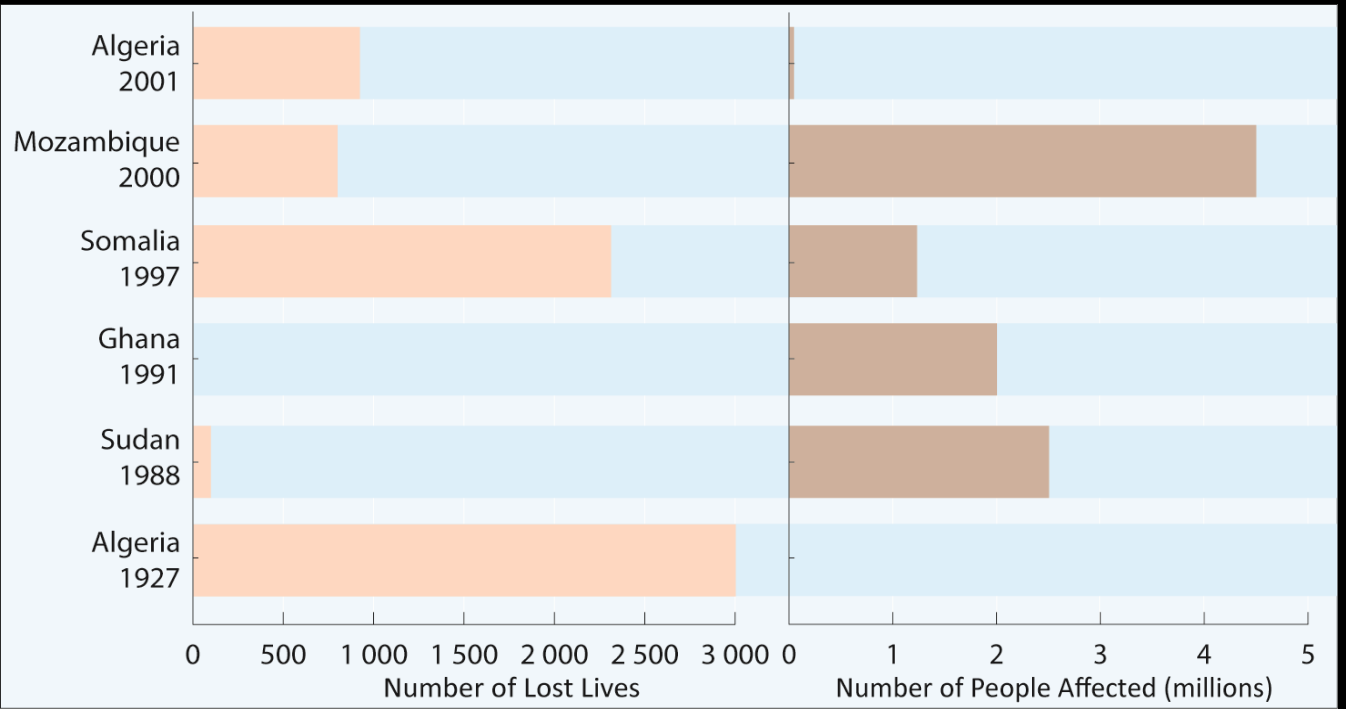
The glaciers declined by 50 per cent between 1987 and 2003. This glacial recession is generally attributed to increased air temperature and decreased snow accumulation during the 20th century.



Trend in the number of recorded flood and drought events in Africa



Number of people killed and affected by Africa's worst droughts



Number of people killed and affected by Africa's worst floods

CHALLENGE 9: *ENHANCE CAPACITY TO ADDRESS WATER CHALLENGES*

Africa faces a situation of economic water scarcity; and current institutional, financial and human capacities for managing water are lacking.Inadequate and unsustainable funding arrangements for water resources management; insufficient knowledge base; lack of an effective research and technology base; and weak institutional arrangements and legal frameworks for the ownership, allocation and management of water resources.

WATER PROFILE OF COUNTRIES



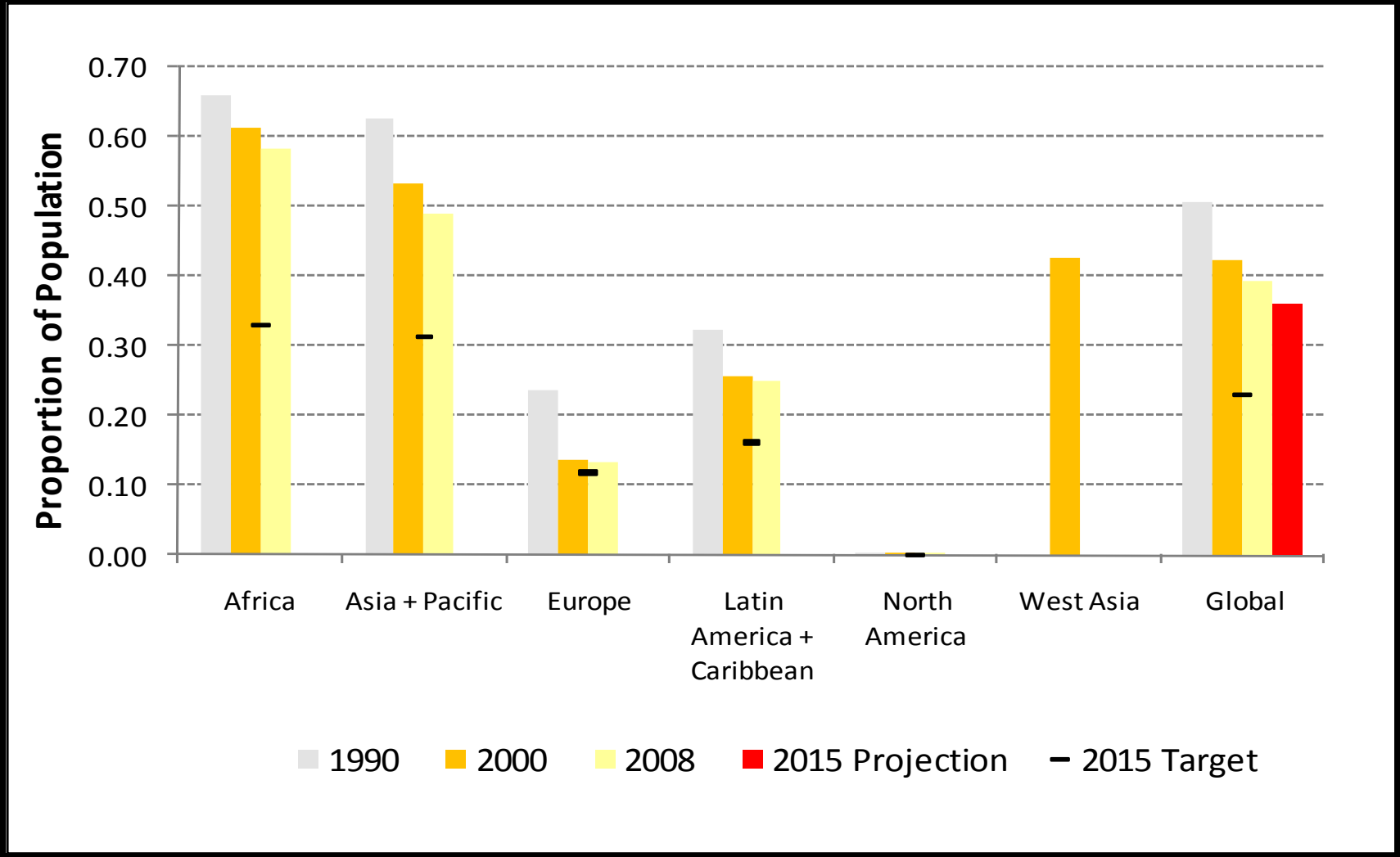
MDG GOAL 7

Tracking Progress Towards Environmental Sustainability

Goal 7 relates to environmental sustainability and includes targets to address the issue of water.

The targets are to halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation.

Percentage of Population without Access to Improved Sanitation, Compared to MDG Goal

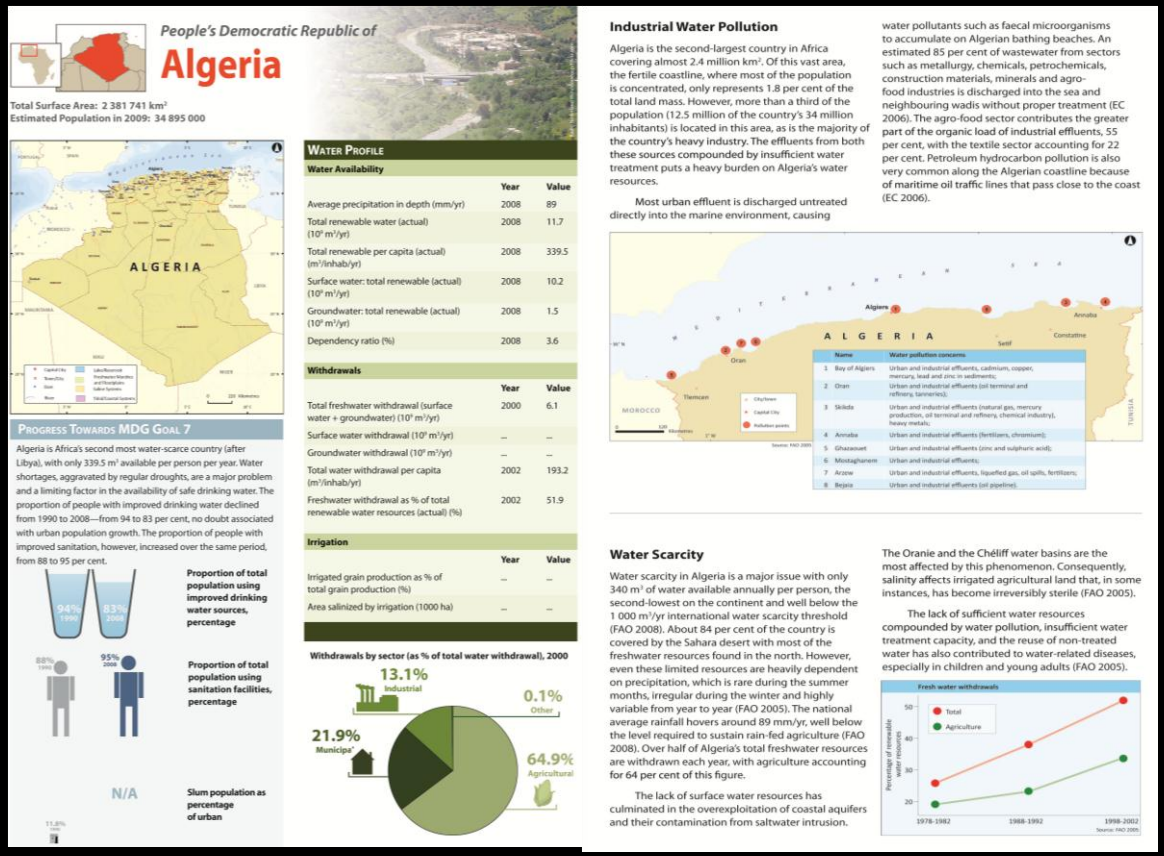


An improved drinking water source: is protected from outside contamination, in particular from contamination with faecal matter. For monitoring purposes, the use of improved drinking water sources has been equated to access to safe drinking water, but not all improved sources in actual fact provide drinking water that is safe.

An improved sanitation facility: hygienically separates human excreta from human contact.

COUNTRY WATER PROFILE

- PROGRESS TOWARDS MDG GOAL 7
- WATER PROFILE
  - Water availability
  - Withdrawal
  - Irrigation
- TWO MOST IMPORTANT WATER RELATED ISSUES



People's Democratic Republic of

Algeria

Total Surface Area: 2 381 741 km²
Estimated Population in 2009: 34 895 000

ALGERIA

Water Profile

Water Availability

	Year	Value
Average precipitation in depth (mm/yr)	2008	89
Total renewable water (actual) (10⁹ m³/yr)	2008	11.7
Total renewable per capita (actual) (m³/inhab/yr)	2008	339.5
Surface water: total renewable (actual) (10⁹ m³/yr)	2008	10.2
Groundwater: total renewable (actual) (10⁹ m³/yr)	2008	1.5
Dependency ratio (%)	2008	3.6

Withdrawals

	Year	Value
Total freshwater withdrawal (surface water + groundwater) (10⁹ m³/yr)	2000	6.1
Surface water withdrawal (10⁹ m³/yr)	..	..
Groundwater withdrawal (10⁹ m³/yr)	..	..
Total water withdrawal per capita (m³/inhab/yr)	2002	193.2
Freshwater withdrawal as % of total renewable water resources (actual) (%)	2002	51.9

Irrigation

	Year	Value
Irrigated grain production as % of total grain production (%)	..	..
Area salinized by irrigation (1000 ha)	..	..

Progress Towards MDG Goal 7

Algeria is Africa's second most water-scarce country (after Libya), with only 339.5 m³ available per person per year. Water shortages, aggravated by regular droughts, are a major problem and a limiting factor in the availability of safe drinking water. The proportion of people with improved drinking water declined from 1990 to 2008—from 94 to 83 per cent, no doubt associated with urban population growth. The proportion of people with improved sanitation, however, increased over the same period, from 88 to 95 per cent.

94% 1990 — 83% 2008 — **Proportion of total population using improved drinking water sources, percentage**

88% 1990 — 95% 2008 — **Proportion of total population using sanitation facilities, percentage**

N/A — **Slum population as percentage of urban**

Withdrawals by sector (as % of total water withdrawal), 2000

13.1% Industrial
0.1% Other
21.9% Municipal
64.9% Agricultural

Industrial Water Pollution

Algeria is the second-largest country in Africa covering almost 2.4 million km². Of this vast area, the fertile coastline, where most of the population is concentrated, only represents 1.8 per cent of the total land mass. However, more than a third of the population (12.5 million of the country's 34 million inhabitants) is located in this area, as is the majority of the country's heavy industry. The effluents from both these sources compounded by insufficient water treatment puts a heavy burden on Algeria's water resources.

Most urban effluent is discharged untreated directly into the marine environment, causing water pollutants such as faecal microorganisms to accumulate on Algerian bathing beaches. An estimated 85 per cent of wastewater from sectors such as metallurgy, chemicals, petrochemicals, construction materials, minerals and agro-food industries is discharged into the sea and neighbouring wadis without proper treatment (EC 2006). The agro-food sector contributes the greater part of the organic load of industrial effluents, 55 per cent, with the textile sector accounting for 22 per cent. Petroleum hydrocarbon pollution is also very common along the Algerian coastline because of maritime oil traffic lines that pass close to the coast (EC 2006).

ALGERIA — Algiers, Oran, Annaba, Skikda, Arzew, Bejaia, Tlemcen, Mostaganem, Ghazaouet, Constantine, Setif, MOROCCO

	Name	Water pollution concerns
1	Bay of Algiers	Urban and industrial effluents, cadmium, copper, mercury, lead and zinc in sediments;
2	Oran	Urban and industrial effluents (oil terminal and refinery, tanneries);
3	Skikda	Urban and industrial effluents (natural gas, mercury production, oil terminal and refinery, chemical industry), heavy metals;
4	Annaba	Urban and industrial effluents (fertilizers, chromium);
5	Ghazaouet	Urban and industrial effluents (zinc and sulphuric acid);
6	Mostaghanem	Urban and industrial effluents;
7	Arzew	Urban and industrial effluents, liquefied gas, oil spills, fertilizers;
8	Bejaia	Urban and industrial effluents (oil pipeline).

Water Scarcity

Water scarcity in Algeria is a major issue with only 340 m³ of water available annually per person, the second-lowest on the continent and well below the 1 000 m³/yr international water scarcity threshold (FAO 2008). About 84 per cent of the country is covered by the Sahara desert with most of the freshwater resources found in the north. However, even these limited resources are heavily dependent on precipitation, which is rare during the summer months, irregular during the winter and highly variable from year to year (FAO 2005). The national average rainfall hovers around 89 mm/yr, well below the level required to sustain rain-fed agriculture (FAO 2008). Over half of Algeria's total freshwater resources are withdrawn each year, with agriculture accounting for 64 per cent of this figure.

The lack of surface water resources has culminated in the overexploitation of coastal aquifers and their contamination from saltwater intrusion.

The Oranie and the Chéliff water basins are the most affected by this phenomenon. Consequently, salinity affects irrigated agricultural land that, in some instances, has become irreversibly sterile (FAO 2005).

The lack of sufficient water resources compounded by water pollution, insufficient water treatment capacity, and the reuse of non-treated water has also contributed to water-related diseases, especially in children and young adults (FAO 2005).

Fresh water withdrawals — Total, Agriculture — 1978-1982, 1988-1992, 1998-2002

PROGRESS TOWARDS MDG IMPROVED DRINKING WATER TARGET BY COUNTRY, 2008



Three hundred and fifty four million people of Africa had access to improved sanitation facilities in 2006. Coverage increased from 33% in 1990 to 38% in 2006

PROGRESS TOWARDS MDG SANITATION TARGET BY COUNTRY, 2008



To meet the MDG sanitation target, coverage needs to increase from 38 per cent in 2006 to 67 per cent in 2015

THANK YOU