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Water Resources Country Cameo
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Water Management and Political Conflict in Sudan

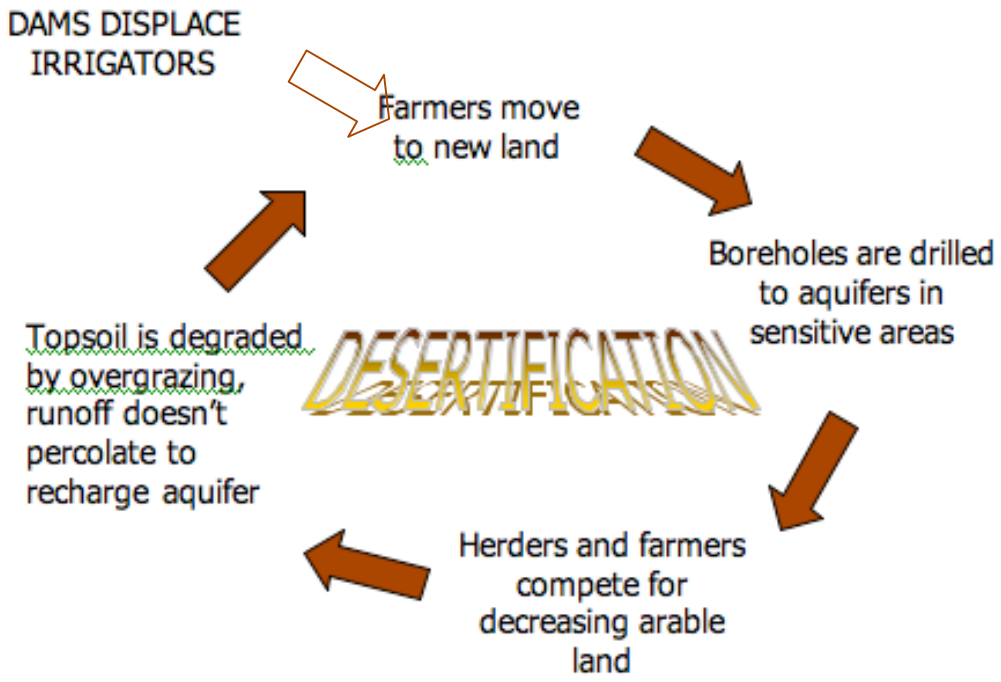
CIA Country Map , 2001

Sudan is a country at war. Marauding horsemen, smoking villages, lost children and uniformed men seated stiffly around tables are the public images of Sudan.
Sudan has relatively abundant natural resources which include forests, oil, water and ocean access.[1] Why is the misery and struggle so severe? Part of the answer lies in the Sudanese government's water policy.

The waterscape of Sudan is characterized by conflict at personal, community, regional and international scales.

- Sufficient clean drinking water exists but many people are thirsty
- More than half of the Nile watershed lies inside Sudan but it is exploited for agribusiness and exported hydropower
- Traditional Nile irrigators are displaced by hydropower dams
- Boreholes supply more water for local agriculture initiating a cycle of desertification and displacement
- The best aquifers are shared with other arid countries

Water administration prioritizes short-term benefit for the Arab ruling elite at the expense of indigenous populations and environmental sustainability. Conflict between government planners, their models and the working environment misalign natural resources with inhabitants and create untenable relationships with other governments and global corporations. Foreign investment is promoted that consolidates power in the ruling elite and drives an extraction economy. Sudan's government builds dams to gain currency through loans and exports of hydropower and cash crops. Desertification and civil war result.



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Pressure upon water resources is both a casualty of the political conflict and a contributor to it. In 2001 the IRWR index was estimated at 921 km3 per capita; an artificially low number given the actual available resources. reflecting water stress more as the result of management focus than actual aridity.
Admittedly assessment of resources and planning for usage is difficult without reliable, time-sequenced data. The lack of data is a by-product of more than 20 years of civil war and government suppression of journalism.
The Nile's waters have been managed as long as any water course on earth within successive political systems for millennia. Historically Meroe and Napata ruled most of Northern Africa including Egypt through central regulation of the Nile. Recent efforts have not been as productive. During colonial occupation cotton demand caused the fundamental transformation from flood-based irrigation to dam-based irrigation. This led to a cycle of indebtedness and pollution that influences Sudan's infrastructure today [Wolf, 1996]. Since independence from European colonial powers there has been conflict between three management models. They can be characterized as:

1. Water should be provided according to need as determined by administrators
2. Water should be provided to support economic development as determined by administrators and their hired experts
3. Water should be provided according to the capacity and resilience of the environment to support it

(Shepherd,et al, 1987)

Administrators have ranged between favoring Models 1 & 2. Though proposed Model 3 has not been seriously entertained. If policy were tempered by attention to sustainability there'd be occasion for hope that conditions would improve for all the stakeholders in Sudan's waterscape.[3]

While centralized planning of even abundant resources badly done is more of a curse than a blessing, a functional central management system informed by best practices offers a promising chance for the rapid response called for by the extremity of circumstances in contemporary Sudan.
Sudan has water to work with. Sources include the River Nile and its tributaries, the naturally variable rainfall characteristic of the Sahel region of Northern Africa[4] and its aquifers of disputed size and degraded quality.
The Nile courses through Sudan during 64% of its 4,000-mile journey from sources in the highlands of Ethiopia to its Mediterranean mouth. The Nile watershed, the Atbara, the Blue & the White Nile, supports a riparian corridor that has attracted human and animal life from pre-Paleolithic times to the present.[UN Sudan Information Gateway, 2008]
There are three precipitation patterns at work in Sudan. Along the Red Sea rain falls predominantly in the winter influenced by coastal regimes of wind and moisture. In the northern sahel, dust storms are more common than rain, 3 inches or less may fall annually. In the central and southern regions precipitation typically occurs during 7-8 months of summer totaling as much as 47 inches per year, enough to support forests[5] and swamps.
Groundwater reserves in the Nubian Sandstone Basin and the Umm Rwaba Basins vary in estimation [Encyclopaedia of Earth, Sudan, 2007]
Additional aquifers of varying quality and depth have been identified and sometimes disputed as to their existence, extent or quality.[6] Underlying the northwest, driest region of Sudan, the Nubian Aquifer contains fossil water deposited during the Tertiary-Pleistocene era, possibly meteoric in origin. It is one of the largest aquifers in the world containing $\sim$ 150 thousand km^3 .
Remote sensing technology has produced reports of an unexploited aquifer under Darfur in the west and southwest large enough to support 33 million people with 15 liters per day.[ ] This claim is disputed and it is unclear whether and to what extent these resources exist. However, withdrawals from previously identified reserves were occurring in 1995 at the unsustainable rate of 17.5 km^3 per year or 32.1% of total available. [International Waterfacts, Sudan 2003]
Today rural peoples and small farmers depend almost exclusively upon groundwater pumped from shallow boreholes for irrigation and drinking water. brackish from exposure since early 1900s to chemical fertilizers and irrigation. The sandstone Nubian Aquifer supplies better quality water from a deeper level. But in addition to Sudan, the Nubian Aquifer is under pumping pressure from Egypt, Libya & Chad and its recharge rate is estimated on a geologic time scale.

[ ] In 2001, 94% of withdrawals were for agriculture, 1% for industry and 5% for domestic uses. [International Waterfacts, Sudan, 2003]

The worst conditions in Sudan can occur in some of the richest regions. Although many of Sudan's problems could be addressed through more equable, sustainable water management some care must be exercised to ensure that strategies that look like solutions don't cause more problems than they relieve. Narrowly increased economic opportunity without a commitment to social justice and environmental stewardship is likely to exacerbate conflict regionally.

Solar stills in Red Sea state.
Renewable Energy for Development, Journal, JUN 2000

There are some good opportunities to convert conflict to benefit.

- Solar stills & wind power
- Dam Reductions
- Nubian Aquifer Cooperative Effort
- Ecotourism to Red Sea Coral Reefs & Antiquities
- Shariyaa Law & Environmental Justice

- Solar Stills & Wind Power

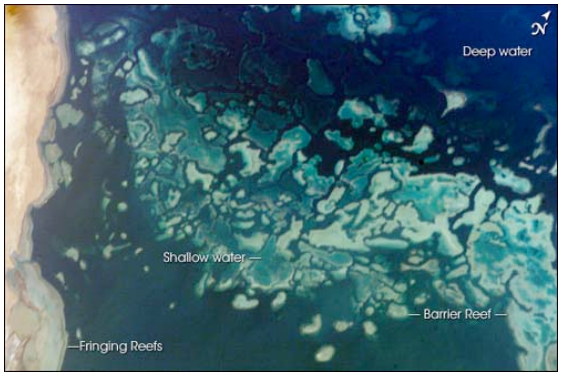
Working to relieve water scarcity at the smallest scale can have a large effect. Solar desalination stills can produce 1 gallon per sq m per day. Wind powered pumps can replace diesel bot god for areas with no power and little water. However wind pumps may have the effect of increasing withdrawals.

- Dam Reductions

Although conservation efforts could make more dams unnecessary, with willing foreign investors and limited sources of revenue there is little indication that Sudanese will do what developed countries haven't.

- Nubian Aquifer Cooperative

Ancient water deposits could support many types of development. One proposal uses it to create nuclear power which could then be used for desalinization and other production. In June 2005 the IAEA and the United Nations were awarded a $1,000,000 grant to use isotope hydrology for regional management of the Nubian Aquifer. Since this is one of the largest fresh water reserves in the world and it exists in an area that is one of the most arid there is tremendous opportunity for regional cooperation to produce a better quality of life for its human and animal inhabitants by relieving water pressure.



- Ecotourism to Red Sea Coral Reefs & Antiquities

Ecologically responsible travel to some of the world's best coral could rival revenues gained from fish factories slated for shores nearby. The factories threaten sensitive wetlands and the reefs. The Hamdab Dam will flood ancient Napata. The war-torn region is not appealing to visitors.

- Shariyaa Law & Environmental Justice

If Sudan's Islamic government saw its African and poor Arab populations as human Koranic law would prohibit their ill-treatment. Slowly, world religions have begun to recognize environmental stewardship as an article of faith. Both of these possibilities offer hope for Sudan, its people and its precious water.

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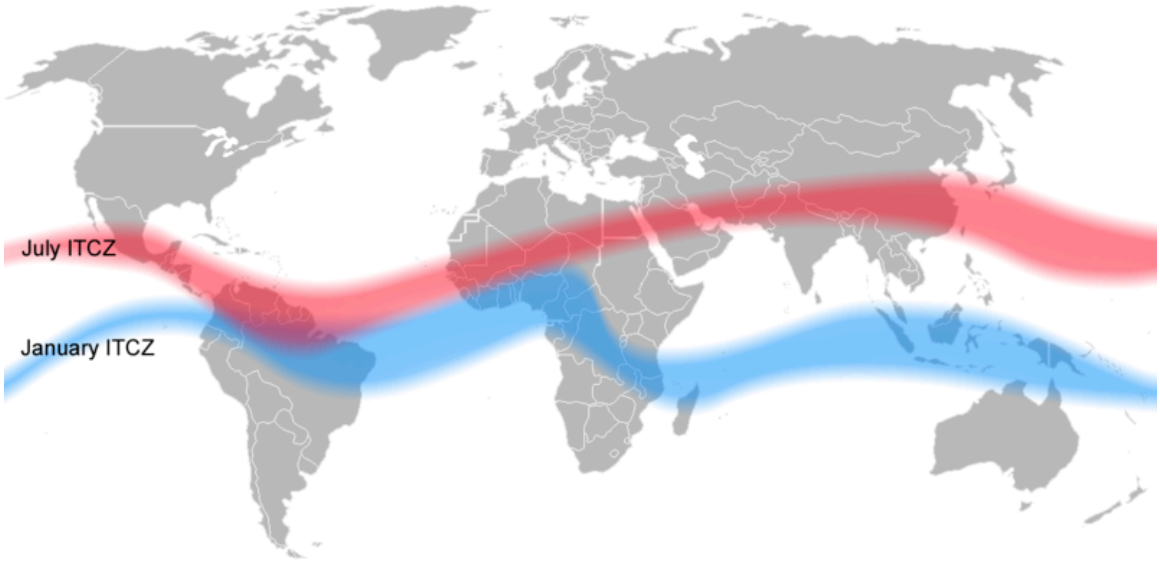
Notes

[1] Sudan is the largest African country, encompassing an area nearly equal to the land east of the Mississippi River in the United States, about 2.5 million sq km. Modern borders of Sudan were established in 1899 and reaffirmed in 1915 by the Anglo-Egyptian Agreement. Of the 34 million people living in Sudan some 64% live in urban areas and 40% are under the age of 15. Although there are more than 100 languages spoken, Arabic is the official language. Shaaria'a, Islamic clerical code, is the law of the land.

[2] The 'marauding horsemen' mentioned above, known as *janjoweet*, were originally drawn from northern herding tribes.

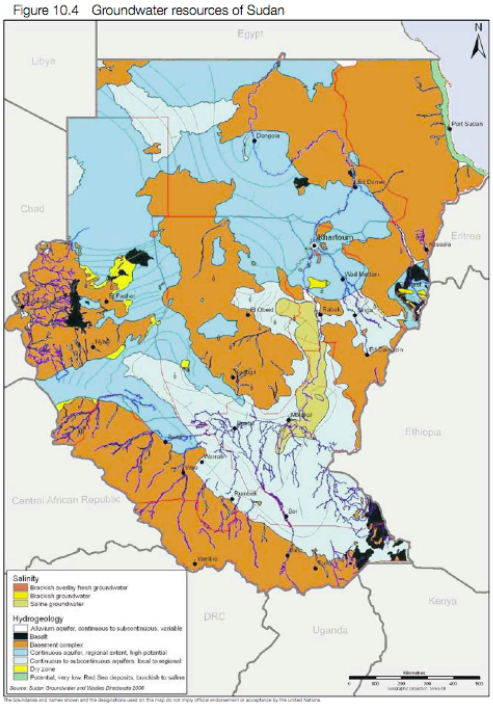
[3] More than 2 million people have been displaced. Between 500,000 – 800,000 people have been killed. The United Nations estimates life expectancy for adults as 42.6 (m) - 43.5 (f) years.

[4] The InterTropical Convergence Zone goes around Sudan most years. Wikipedia: ITCZ



[5] About 24% of Sudan is forested.

Figure 10.4 Groundwater resources of Sudan



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