

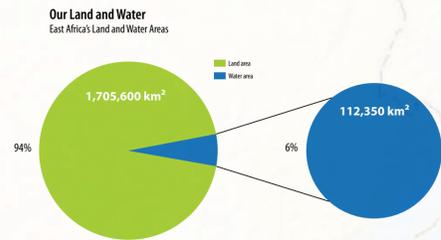
Natures Gift

Humanity emerged from East Africa and populated the planet. Unlike many other parts of the world, humanity in East Africa has co-evolved with the rest of the natural world, allowing a large variety of species to survive. By the early 21st century, the region was home to 1,348 species of animals or 29% of the world's species of mammals (excluding marine mammals), 3,839 species of birds (38% of the world total) and 23,702 species of plants (9% of the world total).

Over a million people visit as business and leisure tourists each year, eager to experience the region's unique landscapes, flora and fauna. The Great Wildlife Migration between the Masai Mara in Kenya and the Serengeti in Tanzania is one of the wonders of nature. However, the populations of many species have been declining in recent years thanks to the pressures of population and development. The IUCN reports that the number of threatened species of mammals, birds, reptiles, amphibians, fish, molluscs, invertebrates and plants in East Africa had reached 1,159 by 2008.

Nature Under Pressure

Today, more than 125 million people call East Africa home. This number has doubled since 1980, and it is expected to grow by 63% to reach 190 million by 2030.



What is the future of fisheries and other livelihoods around Lake Victoria?

People in Tanzania and Burundi have seen their daily calorie intake fall between 1990 and 2003. The energy intake by the Rwandans and Kenyans has improved, but Ugandans enjoy the highest daily intake of kilocalories per person in East Africa.

Might this fact be contributing to Uganda's rapid population growth?

Food production seems to be falling behind the pace of population growth. The number of under-nourished East Africans increased by 8.8 million between 1993 and 2003. Tanzania recorded a 73% increase in hungry people and accounted for 42% of hungry East Africans, up from 34% a decade earlier. Kenya Uganda and Rwanda all reduced their share of hungry people in East Africa.

Given abundant arable land and significant water resources, why is Tanzania exhibiting the poorest nutritional status in East Africa?

East Africa has the potential to produce almost 91,000 Gigawatt hours per year (GWh/year) of electricity over the next four decades. Energy sources are hydro (41%), coal (28%), natural gas (17%) and geothermal (13%). Tanzania's energy resources of hydro, coal and gas are 30% higher than the other East African countries combined.

Given our dependence on hydro as a source of energy, what impact might the erratic rainfall caused by climate change have on power generation?

Electricity consumption rose from 6,600 GWh in 1999 to 7,900 GWh in 2005. It is expected to increase to 17,000GWh in 2010 and almost double to 30,000 GWh in 2020.

Kenya consumes the most electricity in the region. While there is sufficient energy potential to meet the projected regional demand to 2020, Kenya will have to import even more power, having run out of domestic energy sources to meet its demand by then.

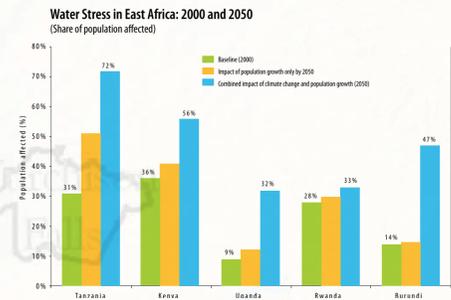
Impact of Climate Change in East Africa

A review of the scientific literature on the impact of climate change states that 'climate change impacts have the potential to undermine and even to undo progress made in improving the well-being of East Africans.' There has been an observed increase in temperature of 0.05°C per decade for Africa during the

East Africa's total area of 1.8 million km² is 94% land and 6% water (112,350 km²). The planet as a whole is just 30% land and 70% water. The 21 river basins in East Africa are in Tanzania (9), Kenya (5) and Uganda (7). There are also 32 lakes in the region, 8 of which are shared across boundaries with other neighbouring countries. Kenya has 10 internal lakes, followed by Tanzania (10), Uganda (5) and one each for Rwanda and Burundi. Lake Victoria is the world's second largest freshwater lake and the visible decline in its level is cause for concern.

Renewable water represents the main water resource available to society. This is the water that is continuously recharged in the hydrological cycle. We have 215 km³ of renewable water each year distributed as follows: Tanzania (45%), Kenya (14%), Uganda (31%), Rwanda (4.7%) and Burundi (5.8%).

Rainfall is the largest source of renewable water. Like many other tropical countries, the pattern of rainfall in East African can be highly variable – both in space and in time. Tanzania's large size and significant rainfall (1,071mm/year) gives it the most renewable water resource by volume. Despite their higher rainfall levels, Uganda,



20th Century. This is projected to increase to between 0.2°C (low scenario) and 0.5°C (high scenario) per decade during the 21st Century. As a result, the research points to the following selection of impacts on our region:

- Water Availability**
 - Warm sea surface temperatures may lead to increased droughts in equatorial and subtropical Eastern Africa (Funk et al., 2005)
 - 5-20% increase in rain in December – February (wet months) and 5-10% decrease in rain in June – August (dry months) (Hulme et al., 2001, IPCC, 2001)
 - Annual flow reductions of 6-9% in the Pangani and Ruwu rivers (Tanzania) (VPO-URT, 2003)

- Food Security**
 - Decline in long-cycle crops and rainfall between March and May (observed 1996-2003) (Funk et al., 2005)
 - El Nino events produce abnormally high amounts of precipitation in parts of equatorial East Africa and can result in flooding and decreased agricultural yields (IPCC, 2001)
 - Warmer temperatures lead to faster depletion of oxygen supply negatively affecting fisheries (Fick et al., 2005)

- Human Health**
 - Climate change resulting in warm and rainy days can lead to incidences of malaria events (Craig et al., 2004)
 - Rift Valley fever outbreaks are positively correlated with El Nino events (Patz et al., 2005)

- Biodiversity**
 - Climate change has the potential to alter migratory routes and timings of species, increasing conflicts between people and large mammals (Thirgood et al., 2004)
 - A change in the intensity or duration of the rainy season could change relative breeding rates, and hence genetic structures in these populations (Poole, 1989; Rubenstein, 1992)

Conclusion

This snapshot challenges the assumption of an inexhaustible natural abundance in East Africa and invites us to:

- Pay attention to the signals that nature is giving us about our impact on it.
- Understand the dynamics between our human activity and nature's response
- Acknowledge the regional character of the environmental challenges we face.
- Review our assumptions and adapt our livelihood strategies to the changing reality.

Rwanda and Burundi's comparatively smaller size results in a smaller volume of renewable water. Kenya has the least amount of annual rainfall, while Burundi enjoys the most annual rainfall levels.

We withdraw 4% (or 8.7 km³) of the region's annual renewable water supply for agricultural, industrial and domestic purposes. Kenya, with the lowest level of rainfall in the region, withdraws the highest share of its renewable water (9%), most of it for agriculture (7%). While this may seem like a small percentage of the total, most of the region's renewable water supply supports the wider ecosystems on which we depend.

Does Kenya's world class horticulture industry represent an export of its scarce resource: the water contained in the cut flowers and fresh vegetables?

Tanzanians and Ugandans enjoy the most renewable water per person in East Africa with over 6,600 m³ each. For different reasons, people in Kenya and Rwanda have the least amount of renewable water per person (2,300m³ – 2,500m³); Kenya due to the low rainfall levels and Rwanda because of the high population density in a small country. Citizens of both countries are close to experiencing water stress (1,700 m³/person/year).

Recent analysis of rainfall and population density estimated the potential impact of climate change on water stress in Africa. It found that in Kenya in 2000, had the highest share of its population (36%) living under water-stressed conditions, followed by Tanzania (31%) and Rwanda (28%).

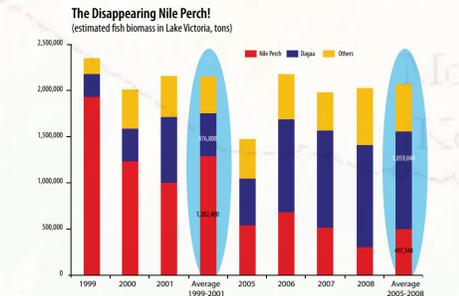
Population growth alone is likely to increase the share of water-stressed populations to 50% in Tanzania and 40% in Kenya by 2050. It is probable that the historical variability of rainfall in the region will become even more erratic with climate change. Some research suggests that 72% of Tanzanians and 56% of Kenyans will be living under conditions of water stress by 2050.

How will we deal with the increasing scarcity of water?

26.2 million hectares of trees have been cut down in the 15 years between 1990 and 2005. This is an area the size of Rwanda. Ironically, Rwanda is the only country to have increased its forest cover during this period.

Tanzania accounts for 90% of the deforestation in East Africa and its share of the region's forested land dropped sharply from 58% to 47% in the 15 years to 2005.

Does this extent of deforestation explain the significant increase in the extent of potential future scarcity of water in Tanzania?



Between 1999-2001 and 2006-08, the estimated volume of Nile Perch in Lake Victoria collapsed by 60% from 1.2 million tons to less than 500,000 tons. Nile Perch is being replaced by the much smaller species of dagaa which increased in volume by 123% from 476,000 tons to over 1.0 million tons during the same period. Two main reasons account for this: over-fishing and the use of illegal fishing gear.

- Between 2004 and 2008, the number of fishers increased by 30% from 155,066 to 199,242.
- Hook sizes which target premature Nile perch increased by 77%.
- The number of monofilament nets (the most destructive fishing nets) increased by almost 10 times in two years; from 2,293 in 2006 to 20,194 in 2008.

Of the 35 fish processing factories on the shores of the lake, 10 have closed and 25 are operating below installed capacity.



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Additional data is also from;
 • Food Balance sheet-<http://www.ratin.net/documents.asp?id=1&clD=6>
 • Food Production-<http://www.ratin.net/production.asp>
 • Production of Cereals-http://www.fao.org/ES/ess/yearbook/vol_1_1/pdf/b01.pdf
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Maps
 Our thanks to Grant Wheeler and David Williams, African Wildlife Foundation and http://visibleearth.nasa.gov/view_detail.php?id=19352

