



# WATER RESOURCES AND CLIMATE CHANGE IN ANGOLA / SOUTHERN AFRICA

Naim HAIE, Ph.D., Associate Prof., Water Resources and Environment Group, Civil Engineering Department, University of Minho, Campus of Azurem, 4800-058 Guimarães Portugal, Email: [naim@civil.uminho.pt](mailto:naim@civil.uminho.pt)

## Long Summary

“Warming of the climate system is unequivocal”. (IPCCa, 2007) Climate change is gaining momentum and is (becoming) the most important issue for the governments and peoples of the world. In relation to Angola\* (IPCC, 2007), the following points (with focus on water) show the great risks ahead:

- “Droughts have mainly affected the Sahel, the Horn of Africa and southern Africa, particularly since the end of the 1960s”
- “Eastern and southern African countries are also characterised by water stress brought about by climate variability and wider governance issues “
- For southern Africa and with the A2 emissions scenario, it was “found for the 2080s a 3.7°C increase in summer (December to February) mean surface air temperature and a 4°C increase in winter (June to August).” (the actual values are less than 1/3)
- “... winter (June to August) rainfall will very probably decrease in much of southern Africa, especially in the extreme west (up to 40%)...” (Figure 1)
- “... almost all countries except South Africa will probably experience a significant reduction in stream flow.”
- “Northern and southern Africa, however, are expected to have [agricultural] losses of 0.4 to 1.3%”
- It is of note that at about 1.3 °C warming (Figure 2), the population under water stress jumps. Currently, we are very close to this point.

- Assessments of water availability, including water stress and water drainage, show that parts of southern Africa are highly vulnerable to climate variability and change. Possible heightened water stress in some river basins.”
- “Food security, already a humanitarian crisis in the region, is likely to be further aggravated by climate variability and change...”

Key words: water resources, climate change, Angola, southern Africa

\* IPCC studies consider Angola as part of southern Africa (from the equator to 45°S and from 5° to 55°E).

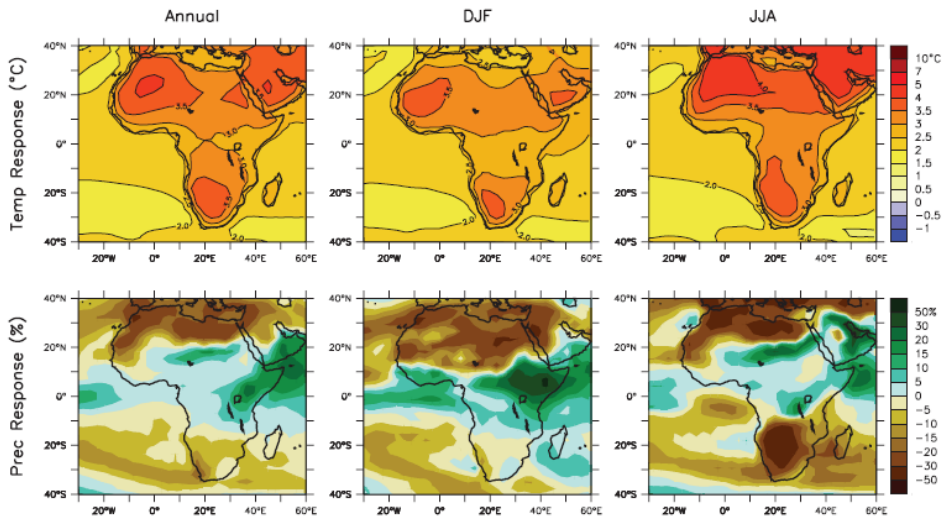


Figure 1: Temperature and precipitation in Africa

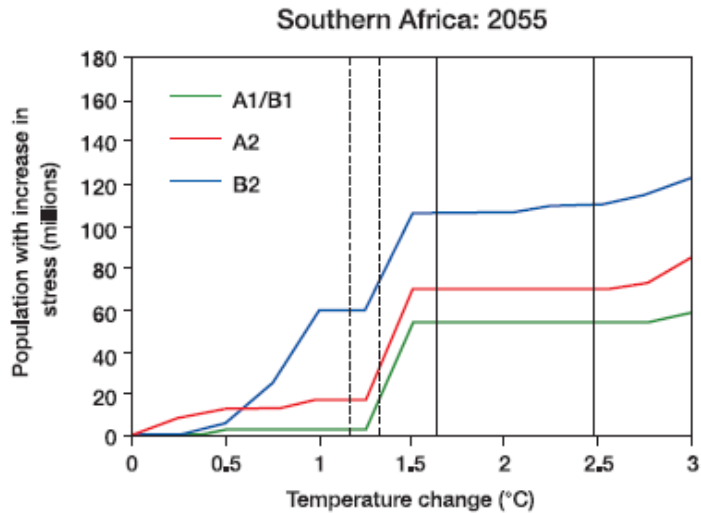


Figure 9.3. Number of people (millions) with an increase in water stress (Arnell, 2006b). Scenarios are all derived from HadCM3 and the red, green and blue lines relate to different population projections.

Figure 2: Population and water stress in southern Africa

In a world with climate change and global warming, problems related to water stress are going to increase in some areas of the globe. In Figure 3 (IPCC, 2007) we can see the predicted variation in water availability for the period 2090-99 relative to the period 1980-1999. From this figure we can observe that California, Mediterranean region (including Portugal), Austral Africa, and Western Australia are the most affected areas. Being Agriculture the main water demanding sector, irrigation becomes a critical issue.

### Projections and model consistency of relative changes in runoff by the end of the 21<sup>st</sup> century

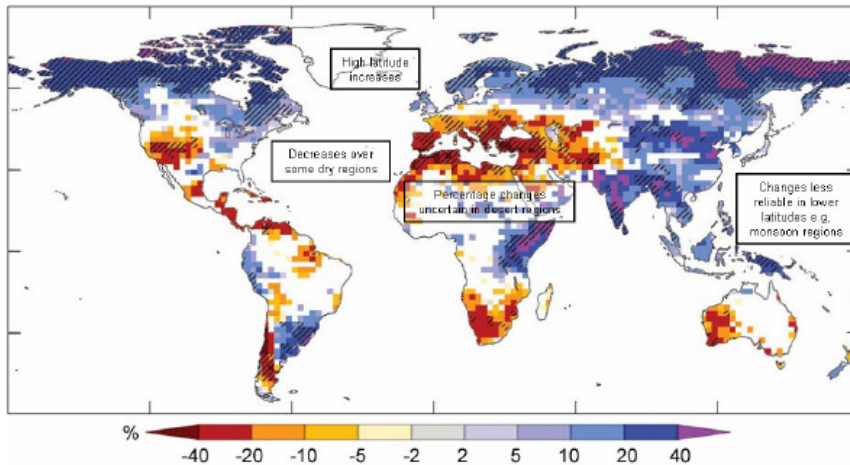


Figure 3: Water availability for the period 2090-99 relative to the period 1980-99

Africa is one of the most vulnerable continents to climate change and climate variability, a situation aggravated by the interaction of '**multiple stresses**', occurring at various levels, and low adaptive capacity (high confidence). (Figure 4) Africa's major economic sectors are vulnerable to current climate sensitivity, with huge economic impacts, and this vulnerability is exacerbated by existing developmental challenges such as endemic poverty, complex governance and institutional dimensions; limited access to capital, including markets, infrastructure and technology; ecosystem degradation; and complex disasters and conflicts. These in turn have contributed to Africa's weak adaptive capacity, increasing the continent's vulnerability to projected climate change. (Boko, et.al., 2007)

### Mt. Kilimanjaro

During the 20th century, the areal extent of Mt. Kilimanjaro's ice fields decreased by about 80%. It has been suggested that if current climatological conditions persist, the remaining

ice fields are likely to disappear between 2015 and 2020 for the first time in 11,000 years (Boko, et.al., 2007). (Figure 5)

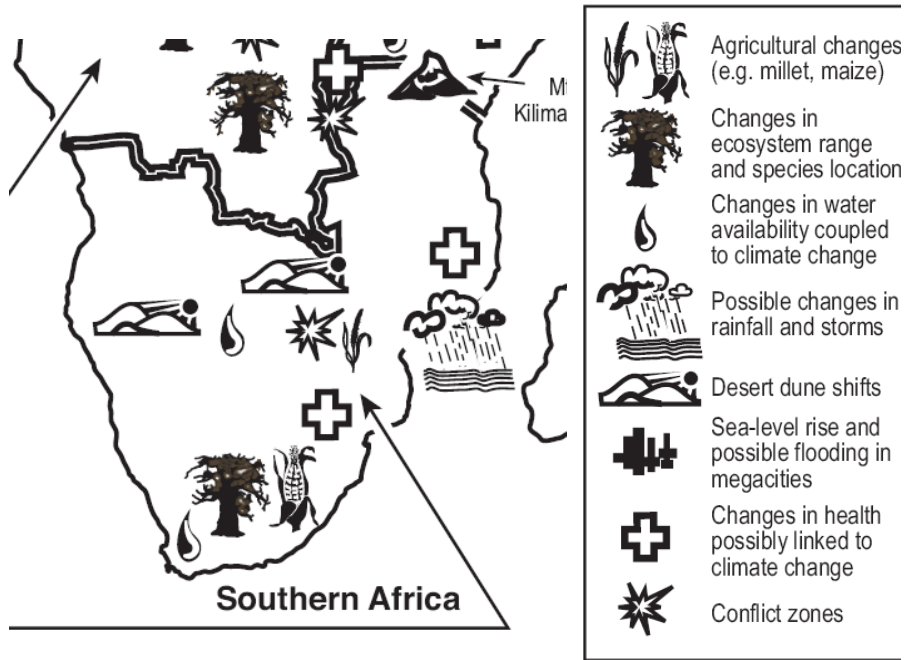


Figure 4: Examples of current and possible future impacts and vulnerabilities associated with climate variability and climate change for southern Africa

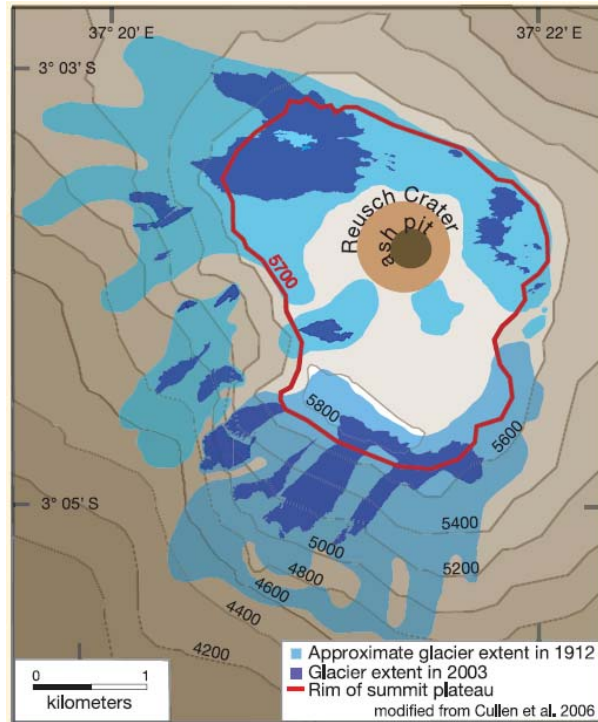


Figure 5: Glacier extent of Mt. Kilimanjaro from 1912 to 2003

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