

Climate Change Threatens Africa Coral Reefs Survival

Coral reefs make up ¼ of marine species; they play critical role in tourism; coastal protection; fisheries and other scenic beauty features. Their regulatory, provision, support and cultural values cannot be overstated. Majority of Africa coastal populations derive livelihood from coral reefs, food and enjoy coastal protection. Globally over 50% of coral reefs are under medium or high risk of degradation; Africa corals reefs face multiple threats. Previously coral reefs faced local stresses up to until 1980 when impacts of ocean warming began to emerge (IPCC 2014).

Acidification, ocean warming, rise in sea level, cyclones and intense rainfalls coupled with non-climate related drivers such release of high nutrient levels, coastal pollution, spills, agricultural externalities among other factors that affect water quality in Africa oceans.

State of Coral Reefs in Africa

- ✓ Rufiji delta ecosystem has approximately 3200 hectares of mangroves;
- ✓ Kenya, Tanzania and Mozambique coastlines form a single coral reef fringe which is one of the largest on earth;
- ✓ Basaruto national park supports vast coral reefs ecosystems and hosts endemic species (WWF)
- Coral reefs account for 20-25% of fish harvested (IPCC 2014);
- 55% of island countries exploit coral reefs fisheries unsustainably leading to degradation (Newton et al 2007).
- Island nations like Seychelles and Madagascar island heavily rely on land for protection against ocean storms



Coral reef biome is a separate entity from the ocean biome. Located in shallow clean ocean waters, coral reefs thrive in temperatures approximately 70 degrees. Mass coral bleaching is taking place as oceans warm. Coral mortality is also reported as global temperature rise (IPCC 2014).

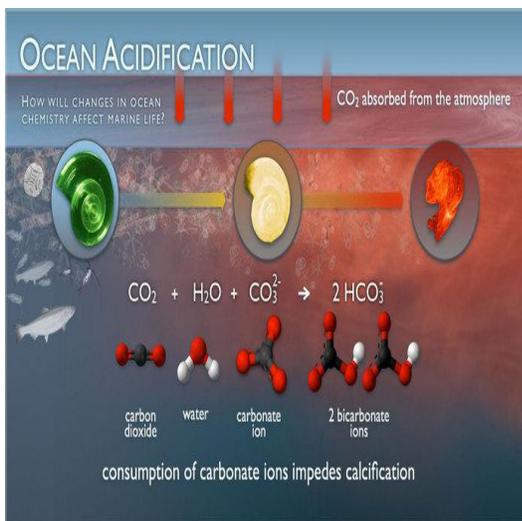
Coral reefs are highly vulnerable to global warming and acidification. Coral bleaching, acidification, and health of corals complex interactions has profound impacts on the coral reefs ecosystems in Africa. Coral cover and reduced species composition compounded by local stressors like sedimentation, over extraction of fish resources, spillage into oceans catalyze coral destruction in Africa. Despite their great ecological role, Africa corals are poorly studied neither considered into national development plans and coastal protection strategies.

Calcification and coral cover continue to decline globally largely to ocean warming rather than acidification (AR 5). IPCC predicts severe coral bleaching between 2090 and 2099 due to CO₂ levels. Decreased calcification, increase coral mortality, and weakened strength of calcified organisms as well as enhanced dissolution of skeletons increases as acidification and warming continues. Fifth report indicates that reefs will transition from net accretion to erosion. Increased warming and CO₂ would lead corals to critical aragonite saturation state whereby coral cover will significantly be reduced and reef framework weakened [(Feely et al., 2004; Orr et al., 2005; Kleyvas et al., 2001; Guinotte et al., 2003);}cited in IPCC].

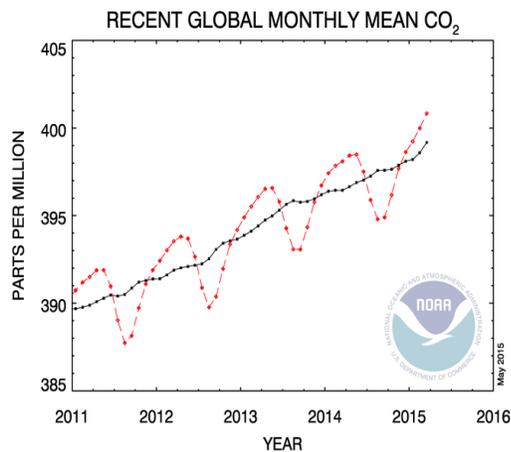
Global emissions threat to Africa coral reefs

Coastal ecosystems in Africa face threats that range from deforestation and degradation of mangroves, agriculture, overfishing; additionally use of unsustainable fishing practices compounds threats to coastal resources in the region, conflicts and terror groups like pirates and Al Shabaab open the area to exploitation and illegal extraction of marine ecosystems in the region.

Noting that coral reefs are highly intolerable to temperature increases thriving between 25-29 degrees; while their salinity tolerance is between 32-36 ppm (IPCC). IPCC notes that corals only bleach when seasonal maximum temperature fluctuations is exceeded; it is critical that local stressors to coral reefs ecosystems in Africa be handles as well as global carbon emissions halted for the survival of such magnificent ecosystems. Recent NOAA observations show a persistent increase in monthly CO₂ emissions globally 2015 March emissions are highest.



Source NOAA (2015)



Source NOAA 2015

Sea water pH is crucial for coral reefs survival. Increase in carbon dioxide in the atmosphere, and its subsequent absorption into the water bodies lowering PH. Current co₂ levels exceed 400 PPM a month (NOAA 2015). This has profound effect on the ocean PH and coral reefs ecosystem health. Oceans absorb about ¼ of total atmospheric carbon therefore increase in co₂g in the atmosphere leads to proportional increase in the ocean waters. This is leading to dangerous levels of ocean acidification (NOAA 2015). Carbon dioxide gas reacts with water hydrogen molecules forming carbonic acid. Additionally coastal oceans experience higher carbon influx owing to human activities on the coastal areas.

Decreasing pH levels in ocean waters is limiting the ability of corals to form skeletons and increases the ability of bioeroding organisms to destroy corals (Woods Hole Oceanographic Institution, 2015). Acidification and bioeroders combined significantly reduces coral reefs growth resulting into degraded coral reefs. Increased nitrification and low PH increases bioerosion ten times according to the study. The study concludes that if surface runoff from coastal areas, farm spills and other pollutants might give coral reefs a fighting chance under acidification and sea warming as bioerosion does not increase significantly when nutrient levels in ocean water are kept lower.

Mangrove forests play critical role in protecting coral reefs primarily by providing shade to high solar radiation; keep acidity levels low by bio-chemical and physical processes; and prevents bleaching by providing shade (United States Geological Survey 2014). However, degradation of mangrove forests is leaving coral reefs in Africa exposed and vulnerable to climate shocks while local stressors exacerbate the risks further.

Conclusion

“Ocean warming is the primary cause of mass coral bleaching and mortality (very high confidence), which, together with ocean acidification, deteriorates the balance between coral reef construction and erosion (high confidence). The magnitude of these effects depends on future rates of warming and acidification (very high confidence), with a limited moderating role owing to biological acclimation and adaptation (medium confidence)” IPCC 2014.

References

Woods Hole Oceanographic Institution. (2015, January 7). Coral reefs threatened by a deadly combination of changing ocean conditions. *ScienceDaily*. Retrieved May 19, 2015 from www.sciencedaily.com/releases/2015/01/150107123138.htm

United States Geological Survey. (2014, October 8). Mangroves protecting corals from climate change. *ScienceDaily*. Retrieved May 20, 2015 from www.sciencedaily.com/releases/2014/10/141008131601.htm

University of Colorado at Boulder. (2014, November 10). Conflict risk in sub-Saharan Africa tied to climate change, economics, geography. *ScienceDaily*. Retrieved May 20, 2015 from www.sciencedaily.com/releases/2014/11/141110161200.htm

University of California - Berkeley. (2009, November 24). Climate change could boost incidence of civil war in Africa. *ScienceDaily*. Retrieved May 20, 2015 from www.sciencedaily.com/releases/2009/11/091123152224.htm

IPCC (2013) IPCC WGII AR5 Cross-Chapter Boxes, https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/drafts/fd/WGIIAR5-CCbox-Compendium_FGD.pdf