

CLIMATE CHANGE

By: Drs. Robert R. Christian and Enrique Reyes

Summary

Global climate change is real! There are now many indications that the Earth's climate in the 21st century is not what it was in the 19th century, and that the 20th century was a time of significant change (IPCC 2007). Climate represents the patterns of meteorological phenomena, such as temperature, precipitation and wind. The increase in global temperature also known as "Global warming" is the aspect of climate change that has received the greatest public attention. Increases in temperature have linkages with accelerated rates of sea-level rise, melting and break-up of ice sheets and glaciers, coral bleaching, shrinkage and expansion in ranges of species, and altered community structure and ecosystem processes. As we begin to better understand climate linkages to global processes, other changes are becoming more or equally important. For example, less recognized, are the potential changes in precipitation and wind. Some regions of the world are becoming drier, while others are becoming wetter, with potentially tremendous changes in primary production (agriculture) and fire frequency. Whether climate change affects or will affect storminess is still under investigation, although some experts are concerned with increased frequency of intense storms, such as hurricanes. Interestingly, all of these alterations to climate appear to stem from one cause – increases in greenhouse gases, primarily carbon dioxide. It is recognized that the increases in greenhouse gases that occurred in the 20th century were largely caused by human activities, in particular the burning of fossil fuels. Therefore we have high certainty on the cause, and we are exploring the physical, chemical and biological consequences, but solutions remain extremely difficult when they include the human behavioral changes at the level of global community and its various social, economic and political structures.

Coastal and estuarine ecosystems are susceptible to climate change in numerous ways. Their geomorphology is the result of the interplay of physics and biology (Day et al. 2008). Physical factors (e.g., river flow, salinity regime and sedimentation) and biological factors (e.g., primary production, reproductive success, disease and migration) depend on patterns of temperature, precipitation and wind. As these patterns change, so will the interplay in both predictable and unpredictable ways. But these effects are not simply at the geomorphic scale. Organisms, populations, communities and ecosystems may all be altered by changes in climate (Peterson et al. 2008). For example, metabolism of organisms responds to temperature, and as a result, the success of their populations may be enhanced or inhibited depending on the degree and timing of temperature increases. In

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turn, a range of responses by different populations affects community structure and the ecosystem functions of trophic dynamics and nutrient cycling. There will be winners and losers as the effects play out. It is difficult to predict if results will be negative or positive, but one thing is certain: The condition of our coastal and estuarine systems will be different over the coming decades.

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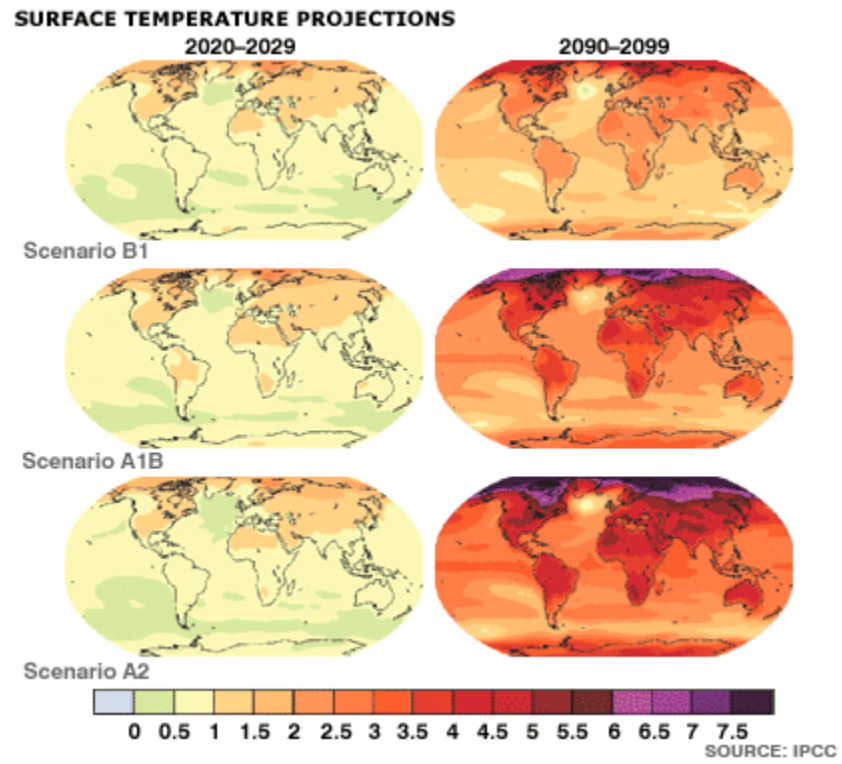
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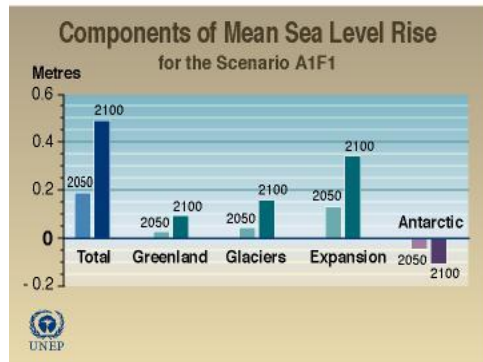
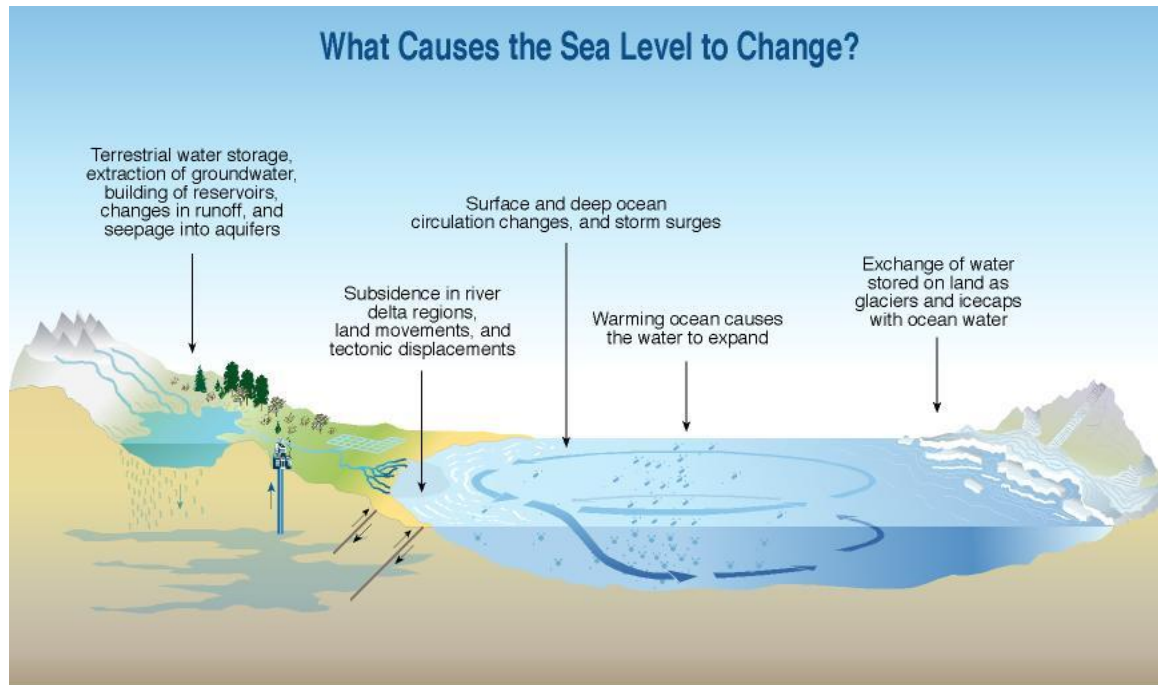
Web Resources

- US EPA Climate Change (<http://www.epa.gov/climatechange/>)
- Intergovernmental Panel on Climate Change (<http://www.ipcc.ch/>)
- NASA Climate Change (http://www.nasa.gov/worldbook/global_warming_worldbook.html)
- NOAA Climate (<http://www.noaa.gov/climate.html>)
- Pew Center on Global Climate Change (<http://www.pewclimate.org/>)
- United Nations Environment Programme Climate Change Theme (<http://www.unep.org/climatechange/>)
- Group on Earth Observations (<http://www.earthobservations.org/index.html>)
- US Integrated Ocean Observing System (<http://ioos.gov/>)
- Coastal Global Ocean Observing System (<http://www.ioc-goos.org/content/view/14/28/>)
- Coastal Global Terrestrial Observing System (<http://www.fao.org/gtos/c-gtos.html>)
- Delta Research and Global Observation Network (<http://deltas.usgs.gov/>)

Image Gallery



Climate change in graphics. (2007) IPCC through BBC News. Retrieved 09:45 June 24, 2009 on news.bbc.co.uk/2/hi/science/nature/6322083.stm

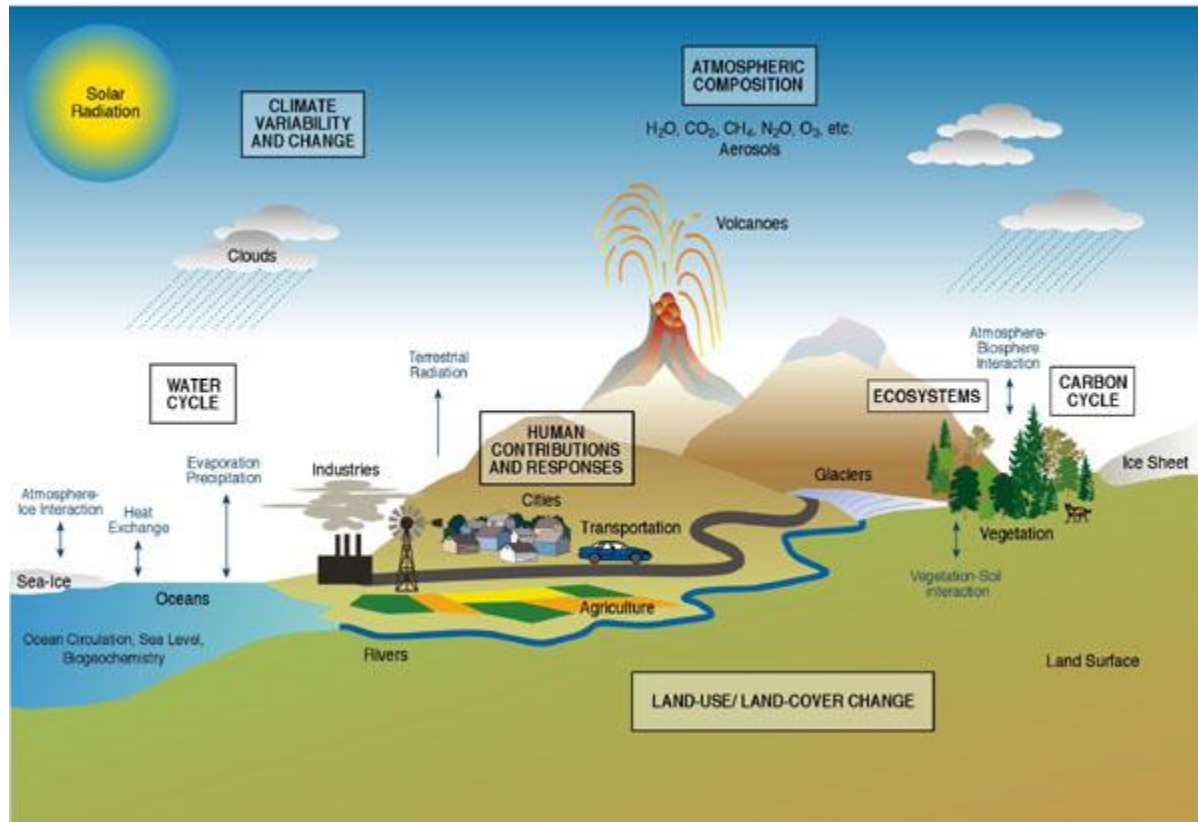


The A1 scenario family describes a future of rapid economic growth, a global population that peaks in the middle of the 21st century and then declines, and the rapid introduction of new and more efficient technologies. The major underlying themes are convergence among regions, capacity-building, and increased cultural and social interaction, with a substantial reduction in regional differences in per capita incomes. The A1 scenario family develops into three groups with alternative directions of technological change according to their energy systems: fossil intensive (A1F1), non-fossil energy sources (A1T), or a balance of both (A1B)

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Source: David Griggs, in *Climate Change 2001*, Synthesis report, Contribution of working groups I, II and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, 2001.

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