Climate Change and the Oceans: Why You Should Care

Ellen Prager, PhD
President, Earth2Ocean, Inc.
Science Advisor, Aquarius Reef Base/UNCW
For 650,000 years, atmospheric CO₂ has never been above this line ... until now.
(a) Global average surface temperature

(b) Global average sea level

(c) Northern Hemisphere snow cover
Ocean Impacts

- Seawater Temperature
- Ocean Chemistry
- Sea Level Rise
- Air-Sea Interactions (Hurricanes)
- Marine Life
Sea Surface Temperatures

- Change in natural range of organisms
- Shutdown of upwelling systems
- Increase in dead zones

MODIS, NASA
Coral Reefs

- Potential areas of thermal stress for corals
- Disease susceptibility
Sea Surface pH Change (pre-industrial to 1990s)

Pacific Science Association, 2007
• Less CO3 available to make CaCO3
• Lower saturation of CaCO3
• May cause dissolution of CaCO3
Scenario for Great Barrier Reef

A  CRS-A
375 ppm  
+1° C

B  CRS-B
450-500 ppm  
+2° C

C  CRS-C
> 500 ppm  
> +3° C

Aquarius Reef Base, Key Largo, FL

Technology testbed:
Prototype underwater mass spectrometer
Why You Should Care

- Food: Important Source of Protein
- Human Health
- Jobs
- Economic Revenue
- Social and Political Stability
- Tourism, Recreation, and Quality of Life
- Culture and Tradition
- Life Support for the Planet
Fish Are Food and Big Business

- An important source of protein for billions
- U.S. Consumers spend more than $50 billion on seafood each year
- Worldwide 520 million employed by commercial fishing and aquaculture
- Lack of fishing can lead to social and political instability (Somali pirates), loss of traditional cultures and generational way of life
Coral Reefs: Need Bailout $$$

- $375 Billion worldwide in annual economic revenue!!!!!!
- Fisheries
- Protection from waves and storms
- Millions of jobs
Human Health

• Drugs from the sea - Bryostatin (marine invertebrate), Discodermolide (sponge), and Ecteinascindin (sea squirt)
• Molecular Probes
• Bioremediation
• Marine Models
• Marine Hazards
• Disease
Good news! At the current rate of global warming we should be able to just swim over there and eat him in under five years...
Flooding and Storm Damage

Potential impact of sea-level rise on Bangladesh

Today
Total population: 112 Million
Total land area: 134,000 km²

1.5 m - Impact
Total population affected: 17 Million (15%)
Total land area affected: 22,000 km² (16%)

Coastal Populations

Low lying coasts

Island nations

Source: UNEP/GRID-Geneva; University of Dacca; JRC Munich; The World Bank; World Resources Institute, Washington D.C.
Finding Solutions

- Investment
- Political will
- Public engagement
- Consider social aspects of problems
- Better decision making based on science
- Improved and adaptive management
- Management of people, not nature