The Oceans: Meeting Societal Goals

Global Observation Systems
Business Plans and Communications

POGO-8, Qingdao
19 January 2007

D. James Baker
How can 9 - 12 billion people live safely and happily on Earth?
• Eradicate extreme poverty and hunger
• Achieve universal primary education
• Promote gender equality; empower women
• Reduce child mortality
• Improve maternal health
• Combat HIV/AIDS, malaria, other diseases
• Ensure environmental sustainability
• Over the past 50 years, humans have changed and degraded ecosystems more extensively than in any period of human history
• There is a high risk of worse degradation and negative impacts of global climate change in the next 50 years
• Reversing the degradation of terrestrial and marine ecosystems will require significant changes from business as usual in policies, institutions, and practices
## Projected Impacts of Climate Change

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<th>Global temperature change (relative to pre-industrial)</th>
<th>0°C</th>
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<td>Falling crop yields in many areas, particularly developing regions</td>
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<td>Possible rising yields in some high latitude regions</td>
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<td><strong>Water</strong></td>
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<td>Small mountain glaciers disappear – water supplies threatened in several areas</td>
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<td>Significant decreases in water availability in many areas, including Mediterranean and Southern Africa</td>
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<td>Sea level rise threatens major cities</td>
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<td><strong>Ecosystems</strong></td>
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<td>Extensive Damage to Coral Reefs</td>
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<td>Rising number of species face extinction</td>
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<td><strong>Extreme Weather Events</strong></td>
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<td>Rising intensity of storms, forest fires, droughts, flooding and heat waves</td>
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<td><strong>Risk of Abrupt and Major Irreversible Changes</strong></td>
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<td>Increasing risk of dangerous feedbacks and abrupt, large-scale shifts in the climate system</td>
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Ocean Barriers to Societal Development Goals

- Floods/Storm Surge/tsunamis
- Climate variability/El Nino/decadal change
- Global warming/Sea level rise
- Habitat transformation/Coral Reefs
- Overfishing/Aquaculture
- Invasive species/Harmful Algal Blooms
- Pollution/Acid Ocean
Ocean community successes

• Better understanding of ocean processes
• Research programs beginning to encompass management needs
• First steps taken toward operational ocean observing – in situ and satellite
• Products and services provided for communities, industry, government
In situ Marine Observing Platforms
November 2006 JCOMM OPS
Global Ocean Observing System

• IOC Unesco, WMO, UNEP, ICSU all working together on a global system
• WMO and IOC have an initial operating framework under JCOMM and JCOMMOPS
• Substantial increase in government commitments needed to fill the gaps
• Commitments meeting in June 2007
El Nino-induced drought in India: tropical Pacific sea surface temperature impacts the Indian Monsoon
Global mean sea level trends 1995-2005
Global Earth Observing System of Systems

- Disasters
- Health
- Energy
- Weather and Climate
- Water
- Biodiversity and Ecosystems
- Agriculture
But - much remains to be done

- Inadequate warning and response to storm surge and sea level rise
- Fisheries catches continue to decline
- Ocean becoming more acidic
- Known science not applied to problems
- Basic observing systems not adequate
- Gaps in satellite and in situ coverage and data sharing issues loom
- Funding commitments are inadequate
- Public still not as aware of issues as necessary
The Future Oceans – Warming Up, Rising High, Turning Sour
Updated at: http://cires.colorado.edu/science/groups/steffen/greenland/melt2005/
Melting ice is a substantial contribution to sea level change.
Ocean acidification

- CO₂ dissolves in seawater to make carbonic acid
- Carbonic acid is corrosive to the shells and skeletons of many marine organisms

Calcitrophic plankton

![Calcitrophic plankton](http://www.biol.tsukuba.ac.jp/~inouye)

Corals

![Corals](Photo: Missouri Botanical Gardens)
A More Acid Ocean

• We are overwhelming the natural ability of the ocean to cope with changes in carbon chemistry

• Corals and molluscs will lose their ability to make shells and plates from calcium carbonate.

• The recovery of the ocean will take tens of thousands of years
Coverage of Coral Reefs by Marine Protected Areas

Conservation of MPAs. (Top) Status of the global network. Location and shape of all 980 MPAs are shown. Categorization of MPAs was based on the average of the attributes analyzed [5]. The percent of coral reefs per region covered by MPAs in those categories is shown on the bar charts. (Bottom) MPAs needed for an optimum coverage of the world’s coral reefs. Dots represent MPAs of 10 km² and spaced at 15 km from each other.
1990s vs 1960s
Tuna and Billfish
Census of Marine Life,
Worm 2005
ERS-1
ERS-2/RA
GFO

TOPEX/Poseidon

ERS-2/RA
ENVISAT/RA-2

GFO

IPY

ERS-2/RA
ENVISAT/RA-2

Data gap?

Data gap?

Data gap?

Data gap?

END OF LIFE

IN ORBIT

APPROVED

PLANNED/PENDING APPROVAL

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14

ERS-2/RA
ENVISAT/RA-2

TOPEX/Poseidon

ERS-1

GFO

IPY

NPOESS

Sentinel-3

ALTIIKA

Jason-2

CNES/EUMETSAT/NASA/NOAA signed Letter of Agreement for Jason-2

GODAE

"KNOWN" FUTURE ALTIMETRY MISSIONS

Jason-1

CNES/EUMETSAT/NASA/NOAA signed Letter of Agreement for Jason-2

IPY
Social Vulnerability

• Society unlikely to act unless it feels vulnerable
• Vulnerability science combines exposure with resilience
• Social science and natural science to build indicators and metrics
• Metrics can be used to communicate risk
Uneven Impact, Recovery Disparities

Challenge:
How to anticipate response to future risks?

Category 4 Hurricane
Landfall: Beaufort, SC
Factors: 1. Socioeconomic status; 2. Age (children); 3. density of development
78% variance explained
Building Support for the Future

• We have the foundation of observing, understanding, and forecasting to build support in the public, with private industry, and with government

• We need a “business case” for what we do showing costs and benefits

• We need a communications effort to stress urgency and heighten awareness on a scale well beyond what has been done before
The Business Case for Ocean Observations

- Systems established for societal benefit
- Provide useful and timely information to multiple users – e.g., Industry trials
- Cost-effective: investments will pay off in savings
- Regulatory and legal frameworks
- Funding commitments
Cost/Benefit: Insuring Against Risk

• The Stern Review estimates that if we don’t act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year.

• In contrast, the costs of action can be limited to around 1% of global GDP each year.
Global Ocean Observing System

• Operating Plan development for GOOS Regional Alliances
• Business Plan development for US RCOOS: Regional Coastal Observing Systems
• Call for a “UNESCO Convention on Ocean Observations”
Need to Act Now

• The actions that we take now in the next 10-20 years will have a profound effect on the ocean, climate and ecosystems in the second half of this century and in the next.

• The benefits of strong, early action on ecosystem degradation and climate change outweigh the costs
Web-based Information Source

- Status, trends, risks
- Easily accessible and available
- Up-to-date
- Wiki-like collaboration
- Google-like search
- Collaboration among many institutions
- Social Scientists and Indicators
Communicating Urgency and Risk

• We have a good start, but urgency of risk to society still not fully accepted – A “Stern Report” for the Oceans?

• Public attention still focused on disasters like tsunamis

• Communications strategy based on perception of risk needed
Public Awareness

- Reliable and easily accessible information
- Multi-media: internet, blogs, podcasts
- Print, film, books
- Video Games (FAO Food Force, Storm the High Seas)
Summit di scienziati per il Mediterraneo

Verranno discusse le ultime ricerche fatte sullo sfruttamento del mare e dei bacini

Giovanna Bellino
venezia@epolls.sm

Chioggia diventa la capitale mondiale del mare Nostrum, in occasione del workshop internazionale dedicato alla storia dell’ambiente del Mare Mediterraneo. Trenta esperti di fama planetaria provenienti dai paesi del Mediterraneo, dall’Europa del Nord e dai paesi extra-europei, si sono dati appuntamento per tre giorni nella sede dell’Università patavina di Biologia marina di Palazzo Grassi per confrontarsi e presentare le loro ultime ricerche sul mondo della pesca in diversi bacini del Mediterraneo.
Overfishing

Time to take strong action

Overfishing

Time. 11/13/06

OCEANS OF NOTHING

A study says overfishing will soon destroy the seafood supply

By Urvashi Rane

Pacific halibut, Pacific cod, hake, flatfish, and rockfish—cornerstones of the U.S. fishing industry—are in trouble. Researchers at the University of Washington say that overfishing will soon destroy the U.S. seafood supply if action isn’t taken soon.

"If we allow overfishing to continue, the Pacific Ocean will become nothing but a vast ocean soup," says Dale Sajola of the University of Washington.

The study predicts that overfishing will cause a 50% reduction in fish population by the year 2050. The researchers warn that this could lead to a catastrophic collapse of the Pacific Ocean ecosystem.

"We need to act now," says Sajola. "Otherwise, we will be faced with a situation where we have nothing left to fish."
The Dangers of Ocean Acidification

Much of the carbon dioxide given off from the burning of fossil fuels goes into the ocean, where it changes the acid balance of seawater. The repercussions for marine life may be enormous. 

BY SCOTT C. DONEY
**Global Ozone Reduction**

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**Stratospheric Climate Response**

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**Climate Change Index**

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COMPASS communicates with policymakers, the public, and the media.

A collaborative effort of SeaWeb, the Monterey Bay Aquarium's Center for the Future of the Oceans, and a group of academic scientists.
• Consensus Statements
• Media training
• News media outreach
• Translation of Science
• Convene meetings with journalists
• Track Legislation
• Science Communication and Marine Public Information – SCAMPI
• A self-governed network of ocean science communicators sharing best practices and opportunities for collaboration
• Members include communications, public information, and media relations professionals
• Promote greater collaboration among communications professionals
• Support efforts to unify research and education
• Develop joint media activities and other outreach programs to increase public support
• Support a unified U.S. communications strategy
• Develop communications strategy
• Implement communications
• Web-based information sources
• Partner with Fishing and Whaling Commissions – ICCAT, IWC, etc.
• Partner with Environmental Organizations – WWF, IUCN, etc.
• Overall, a massively increased communications effort
• Focus on societal vulnerability
• All in national efforts and international partnerships
Population and Energy on Earth
The earth—our beautiful home!