

MASIC
x
GC
1
.S65
no. 33

MSRC REFERENCE ROOM
FOR REFERENCE
Not to be taken from
REFERENCE ROOM

SUMMARY OF A SEA LEVEL FORUM

J.R. Schubel



Special Report # 33

Marine Sciences Research Center
State University of New York
Stony Brook, New York 11794-5000

SUMMARY OF A SEA LEVEL FORUM

J.R. Schubel

February 1989

Special Report 33
Reference 89-2

Approved for Distribution

A handwritten signature in black ink, appearing to read "J.R. Schubel", written over a horizontal line.

J.R. Schubel, Dean and Director

MASIC
x
GC
1
565
no. 33

SUMMARY OF A SEA LEVEL FORUM

J.R. Schubel
Provost of the University
and
Dean and Director
of the
Marine Sciences Research Center
State University of New York at Stony Brook

Introduction

On December 14, 1988, a forum was held to explore the regional implications of a rising sea associated with the Greenhouse Effect. The forum was co-sponsored by the State University of New York's Marine Sciences Research Center and the Port Authority of New York and New Jersey, and was held at the World Trade Institute. The agenda appears in Appendix A. A list of attendees is included in Appendix B.

In his opening remarks, J.R. Schubel stated that the objectives for the day were:

- (1) to briefly review some of the sea level scenarios associated with the Greenhouse Effect,
- (2) to select from among them the most probable sea level scenarios,

BBN 8846

32256335

4/3/95 RL

- (3) to identify the range of possible impacts of a rising sea on the region, i.e. to identify the issues which we should be concerned about,
- (4) to identify the data and information needed to develop and implement a plan for action,
- (5) to identify the general kinds of "studies" needed to meet these data and information needs,
- (6) to identify the key players (agencies) which should take leadership roles in developing a regional strategy to respond to a rising sea,
- (7) to outline several possible organizational models to ensure an appropriate response to a rising sea, and
- (8) to determine what the appropriate next steps are and who should take them.

**Sea Level Scenarios: The Range of
Probabilities, Some Conclusions
and Some Recommendations**

**Robert Dean, Chair
Department of Ocean Engineering
University of Florida**

**Summary of Highlights of Professor Dean's Presentation and
Subsequent Discussion**

- O Sea Level has been rising for approximately the past 20,000 years. From 20,000 years ago until about 7,000 years ago, the rate of rise averaged about 1m/century; 7,000 years ago the rate of rise decreased by an order of magnitude to 12 cm/century. Predictions are that within the next century, the average rate of rise will increase up to 1-3 meters per century.

- O The longest tide gage records extend back about 100 years; most records in the U.S. are much shorter. Most (>90%) of tide gage records longer than 40 years are from the Northern Hemisphere. Analysis of tide gage records indicates an average rise in sea level of about 12 cm/century. The signal is very noisy and fluctuations from one year to the next can exceed the general trend over several decades.

- O Regional variations in sea level change are large; in some cases, they even differ in sign. For example, regional sea level near Juneau, Alaska, is falling because of rebound of the land associated with the reduction of the load of glacial ice.

- O There is general agreement that sea level will rise in response to an increase in the Earth's mean temperature because of the Greenhouse Effect. The dispute is what the rate of rise will be.

- O Three of the most probable sea level scenarios in the year 2100 call for an increase in worldwide sea level of 0.5, 1.0 and 1.5m. The probabilities that sea level rise will exceed these levels are approximately 0.75, 0.50, 0.25 respectively; i.e. the probability is 0.5 that sea level in the year 2100 will be at least 1 meter higher than at present.

- O Within the next 20-40 years, we probably will not be able to unequivocally establish changes in sea level rise because of the noisy signal (the large year-to-year variations). Because the sea level curve probably will be concave upward, the rate of sea level rise will increase with time and detection will become easier.

- O The most complete and careful analysis of tide gage data has been made by Stacy Hicks. A recent article in *Shore and Beach* by Hicks and Hickman contained the following data.

Change in Sea Level

	1940-1962 (ft/yr)	1962-1986 (ft/yr)	Direction of Changes, 1984-86 Relative to 1940-62
East Coast of U.S. (25 Gages)	0.0110	0.0063	- *
Gulf of Mexico (4 Gages)	0.0089	0.0018	-
West Coast of U.S. (11 Gages)	0.0009	0.0037	+
Florida Coast (6 Gages)	0.0072	0.0044	-

*A negative sign indicates a SLOWING in the rate of rise of sea level; a positive sign indicates an ACCELERATION in the rate of rise.

From these data and others, Professor Dean concludes that we cannot establish that the rate of rise of sea level is increasing.

- O At latitudes above about 60°N, gages show a drop in sea level because of glacial rebound. In the Gulf of Mexico, the relatively high rate of rise of sea level is attributable to loading of the shelf by the Mississippi Delta and extraction of hydrocarbons from beneath the shelf and slope.
- O Many tide gages are located near ports of major cities. Many of these cities extract ground water causing subsidence which adds to a rise in local sea level. If gages are intended to reveal eustatic (global) sea level changes, special approaches are required in many cases. The Japanese have developed and employed a

simple system that eliminates some local effects; those associated with compaction. NOAA is now beginning to install units that achieve the same result. Satellite sensors offer exciting new possibilities for establishing sea level changes on a global scale.

Conclusions

- There is little that can be done in the short to intermediate term to reverse the Greenhouse Effect and associated worldwide rise in sea level.
- Global sea level is rising at a rate of about 0.12 m/century.
- Local effects can add to or subtract from global effects.
- Future rates of rise in sea level will be greater than those in the past. Because the sea level signal is noisy, and because the sea level curve is apparently concave upward, it may be several decades before an acceleration in the rate of rise can be documented unequivocally.
- An acceleration in the rate of rise of sea level will accelerate beach erosion, salt water intrusion into aquifers, and penetration of salt water into surface waters such as estuaries.

- As sea level continues to rise, society will have to develop and implement strategies to cope. The two extreme strategies are retreat and stand and fight with engineering structures.

Recommendations

- Don't panic. There is time to develop thoughtful plans to deal with a rising sea.
- As new, expensive facilities are planned for construction near the coast, a higher standard in sea level should be considered in conjunction with the anticipated cost and lifespan of the facility.
- Efforts should continue and be enhanced at a national level to reduce the level of uncertainty associated with the global rise in sea level.
- Thoughtful consideration should be given on a periodic basis to enhancing the regional sea level record. The national and regional sea level projections should be revisited and re-evaluated approximately every decade.
- On a regional basis, decision making methodologies should be established to deal with a rising sea.

- O There should be an increased research effort to quantify the physical responses to a rising sea and the associated environmental impacts. This can be justified with the present rate of rise of sea level; with an increase in the rate of rise of sea level it will become even more important.

- O Regional leaders should be sensitive to the problems of a rising sea and keep their options open.

- O Regional initiatives should be implemented to assess the potential effects of different sea level scenarios; effects on shore erosion, on sea salt intrusion into ground water and surface waters, on infrastructure -- storm drains, railroads, treatment plants, airports, etc. In other words, special efforts are needed to assess the impacts on natural resources and on manmade structures.

Action -- Next Steps

The group decided that the next appropriate step would be to form a small ad hoc working group to act as an informal regional-technical sea level committee. Representatives should be from academia and from agencies which should play important leadership roles in orchestrating a regional response to a rising sea. Dr. Schubel asked for volunteers and the following indicated interest in participating:

Henry J. Bokuniewicz
Paul Buckley
Victor Goldsmith
Fred Grimaldi
John Kalas
John Lawler
Richard Rosendahl
J.R. Schubel
Lou Thatcher
Edward Wilczynski

It was agreed that J.R. Schubel would prepare a draft charge for the group and would convene them sometime within the next few months.

One of the first tasks to be undertaken is to produce an inventory of how different rises in sea level will affect important existing infrastructures within the region and what the alternative responses are.

J.R. Schubel is to make contact with the New Jersey State sea level subcommittee and to try to forge a partnership with them.



3 1794 02299152 6

DUE DATE