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Commentary

Global Warming Will Lower Sea Levels

But Will Gore Listen?
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Appearing in a film in which a melting iceberg spoils a transatlantic cruise has apparently transformed its star, rookie ABC News journalist Leonardo DiCaprio, into an expert on global warming. Somewhat less credible is a claim made by Vice President Al Gore in a new and scary foreword of his 1992 book Earth in the Balance.

Warning of "a catastrophic mutation in our physical and human geography," Gore claims that unless climate changes are halted, sea levels could rise high enough to cause an "inundation of major areas of coastal cities such as Miami, New York, and Los Angeles." Trouble is that his science is all wet, inundated with fantasies.

Driving the seemingly unending climate-treaty negotiations, the most widely feared consequence of global warming appears to be a catastrophic rise in sea level. Environmental advocacy groups are filling television's air waves with lurid images of flooding of Bangladesh and Pacific islands, and raising the specter of hundreds of millions of environmental refugees demanding care and compensation. Even some sober scientists, although not endorsing such obvious scare stories, predict an acceleration of the ongoing global rise, which a system of tidal gauges places at about 18 cm (7 inches) per century. The 1996 report of the IPCC, the U.N. science advisory group, projects a "best-value" rise by 2100 of about 50 cm (20 inches).

But recent observations and new analyses of existing data suggest an opposite outcome: A climate warming should slow down sea level rise, not accelerate it. To understand this counterintuitive result, one must first get rid of false leads -- just like in a detective story. The misleading argument here is the oft-quoted statement that the climate warmed by 1 F (0.6 C) in the last 100 years AND that the sea level rose by 18 cm. Both parts of the statement are true; but the second part does not necessarily follow from the first.

The first clue that there might be something amiss with the logic is hidden in the IPCC report itself. According to its compilation of data, the contribution to the sea level rise of the past century comes mainly from three sources: first, thermal expansion of the warming ocean contributed about 4 cm; and second, the melting of continental glaciers about 3.5 cm. The third source, however, polar regions, produced a net lowering of the sea level, with most of this coming from the Antarctic. (The mechanism is intuitively easy to understand but difficult to calculate: A warming ocean evaporates more water, and some of it rains out in the polar regions, thus transferring water from the ocean to the polar ice caps.) The surprising result: When one simply adds up all these contributions listed in the IPCC report (neglecting the large uncertainties), they account for only about 20 percent of the observed rise of 18 cm. Therefore, the climate warming since 1900 cannot be the cause of the sea level rise; something is missing here.

The second clue comes from geological observations that the sea level has been rising for past centuries at about the same rate as in the last 100 years. In other words, the sea level was rising even during the cold Little Ice Age, from about 1400 to 1850. This provides further support for the hypothesis that the observed global sea level rise since 1900 is reasonably independent of this century's temperature rise.

The explanation for this riddle had been suspected for some time, based on historic data of sea level rise derived independently from measurements of coral growth and from isotope determinations of global ice volume. But the picture was filled in only recently through published estimates of the rate of melting of the West Antarctic Ice Sheet (WAIS), by tracing its shrinkage since the end of the last ice age.

We can therefore describe the broad scenario as follows: The strong temperature increase that followed the peak of the last ice age about 18,000 years ago has melted enough ice to raise the global sea level by 120 meters (360 feet). The rate of rise was quite high at first, controlled by the rapid melting away of the ice sheets covering North America and the Eurasian land mass. These disappeared about 8000 years ago; but then, as the sea level rose, the WAIS continued to melt, albeit at a lower rate -- and it is still melting at about this rate today.

The principal conclusion is that this melting of the WAIS will continue for another 7000 years or so, unless another ice age takes over before then. And there is nothing that we can do to stop this future sea level rise! It is as inevitable as the ocean tides. Fortunately, coral reefs will continue to grow, as they have in the past, to keep up with the sea level rise. The rest of us will just have to adapt, as our ancestors did some 10,000 years ago. At least we are better equipped to deal with environmental changes.

A final note: What about the effects of human-induced global warming on the sea level rise? Will it really increase the rate above its natural value, as predicted by the IPCC? We do have a handle on this question by observing what actually happened when the climate warmed sharply between 1900 and 1940, before cooling between 1940 and 1975. The answer is quite surprising and could not have been derived from theory or from mathematical models. The data clearly show that the sea level rise slowed down when the climate warmed and accelerated when the climate cooled. Evidently, ocean-water thermal expansion and mountain-glacier melting were less important than ice accumulation on the Antarctic continent (which lowers the sea level).

By analogy, a hypothetical future warming produced by an increase in greenhouse gases would give the same result: i.e., reduce the rate of rise of sea level. This is not a recommendation to burn more coal in order to save Venice from drowning. It is a modest appeal that we all take note of new scientific developments and recognize that the drastic limits on energy use called for by climate-treaty negotiators will not stop the rising seas.

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