Envisioning and Creating the Future in Response to Global Climate Change

There are some who claim they can accurately predict the future. In reality, we can all predict the future, immediately before us and even centuries from today. If we are driving on a road, we know that in the next few seconds we will be at a point ahead of where we are now. We can also predict that the sun will set this evening and rise again tomorrow morning.

In the very long run, we can predict that the pattern of sunrise and sunset will occur again and again in the centuries ahead. It is unlikely that anyone would dispute this latter prediction. Some would say that it is trivial, since it has happened consistently in the centuries and millennia past. But it is only trivial from an anthropocentric point of view. Rather, on the global and universal scale, this prediction should be called "robust."

Within the continuum between the predictable immediate future and the long-term space–time domain lies a region of uncertainty where the issues of global climate change clearly lie—not immediate enough that we can predict it with certainty, but also not within the history or cycles of human experience in a way that we can call it "robust."

Along these lines, we can also make a distinction between "prediction" and "forecasting." In the article Six Rules for Effective Forecasting, published in the July 2007 issue of Harvard Business Review, Paul Saffo describes the difference as follows: "Prediction is concerned with future certainty; forecasting looks at how hidden currents in the present signal possible changes in direction for companies, societies, or the world at large." The difference between prediction and forecasting is partly semantics, but what is important is that forecasting enables us to make forward-thinking decisions and assume leadership in the face of uncertainty.

In this special issue of Leadership and Management in Engineering, several writers present visions of the future for which the engineering profession needs to respond and act. The papers discuss a range of issues that need to be considered in context of global climate change.

First, Mark Rodgers and Craig Olmsted present the prospect of generating power with zero carbon dioxide emissions through wind turbines located off the coast of Cape Cod, Massachusetts. Next we consider the reduction of energy consumption by buildings in the paper by Mir Ali, including a vision of buildings so efficient that they can possibly even contribute net energy back into the power grid. A paper by Tiffany Batac and Lewison Lem describes the strategies and policies that have to be developed for reducing the energy and carbon footprint of the transportation infrastructure in several of the Western United States.

But reducing the carbon footprint from power generation and more efficient energy and hydrocarbon fuel consumption may simply not be enough. Or these measures may be of a scale that may not be effective or able to be implemented in time. So we are impelled to consider the possible need for dikes, tidal, and wave protection structures for our coastal cities, as Douglas Hill presents the case for New York. But then there is the "other water problem," as discussed in an article by Jon Gertner, wherein the Southwest United States and other regions may run out of water as part of naturally occurring droughts potentially exacerbated by a manmade warmer world.

Alternative biofuels such as ethanol also hold a prospect of reducing humanity's carbon footprint. While the combustion of ethanol still generates greenhouse gases in the process of producing energy—in contrast to wind turbines that clearly do not—the equivalent level of generated greenhouse gases are negated by the crops (to produce the biofuel) that absorbed carbon dioxide in the process of photosynthesis. But that cycle of fuel delivery has important land-use-planning implications, which are discussed in the article by Xiadong Wang.

A paper by Dennis Avery presents a contrarian view to what has now become the generally accepted consensus that the present global warming is largely caused by mankind's activities. Avery acknowledges that global warming is, in fact, occurring, but he presents the case that it is a natural phenomenon, part of a 1,500-year cycle. Unlike the robust daily cycle of sunrise and sunset, this is a hypothesis that may or may not prove to be true.

Although Avery disagrees with the current consensus, he is still circumspect by virtue of advocacy of what he calls "no-regrets technology." These are the technologies and infrastructure solutions that are logical to pursue whether the world is warming due to natural or manmade causes. Regardless of why global temperatures are increasing, scientific consensus agrees that it is. To be leaders, engineers must appre-

ciate the ramifications of global warming and deal with the consequences.

Finally, as usual, Editor-in-Chief Brian Brenner provides an insightful personal View from the Bridge endpiece titled "Marina Bay in Winter," describing in a more literary and poetic fashion the call to our obligations as civil and environmental engineers to address the global warming future.

The future cannot wait—especially for engineering infrastructure solutions that may take years or decades of lead time to plan, permit, design, and construct. By the time the engineering infrastructure can be brought to bear for its intended purpose of mitigating climate change, the future will already have become the present. Thus, those who can envision the future—including the engineering profession that has an obligation to lead—are destined to create it.

—S.C. Liao, GUEST EDITOR

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