

Engineering a Sustainable Future 2007 College of Engineering Awards Banquet

This year, 2007, is a very special year for us at San José State University as we celebrate the university's 150th anniversary.

It is also a very special year for our college as we become the Charles W. Davidson College of Engineering. This historical occasion gives us an opportunity to reflect on the path we have taken and the new horizons awaiting us.

I'd like to use a single slide to show what has happened for the past 150 years.

The slide shows that carbon dioxide emissions have increased significantly since the second industrial revolution around 1850.

This was when engineers and inventors developed steam-powered ships, railroads, and later in the century, electrification, which was led by Edison, Tesla, and Westinghouse.

With this massive injection of carbon dioxide into the atmosphere, what we have seen is an increase of 1.3 Fahrenheit degree during this period of 150 years. And by the end of this century, it is projected to rise another 3.5 to 8 Fahrenheit degrees.

In other words, the earth has a fever, using Al Gore's description. Even if we start to stop producing carbon dioxide immediately, it will take the earth over 1000 years to work through the global warming contributed by past emissions.

What are the most serious consequences that we will face IF WE CHOOSE TO DO NOTHING ABOUT THE CURRENT CRISIS?

First, sea ice in both the Antarctic and Arctic will melt. And sea levels will rise.

For instance, the San Francisco Bay is predicted to rise as much as three feet in the coming decades, and low-lying areas will be under water.

I live in Foster City. Foster City is in a low-lying area, a landfill section east of Highway 101. The house my family and I have lived in for the past 21 years would be flooded.

Since I am not much of a water person, I cannot even snorkel, I'd better figure out other solutions to deal with this crisis.

In addition to "too much water," the second problem is that global warming will lead to "too little water," that is, water shortages. This is based on the 2007 report from IPCC, Intergovernmental Panel on Climate Change of the United Nations. Most serious are large river basins in South and East Asia, which would be impacted by glacier melt in the Tibetan and Himalayas region.

Specifically, Tibetan glacier is shrinking by about 1.2 meter per year – as shown in this slide – and this shrinking would impact freshwater supplies to four river basins in India, Bangladesh, and China.

These regions happen to be the most populous regions in the world, and the water shortage will adversely impact more than one billion people in the next forty years.

Let's think for a moment. If we think the competition for oil is intense, how about the competition for water? And the geopolitical tensions that this competition may bring about. This is a disturbing thought.

Given these catastrophic consequences, the message is loud and clear -- we need to reverse the trend of carbon dioxide emissions and take action now. The outcome of our inaction is a damaged earth, one that our children will one day inherit, unlike the paradise in the storybooks we read to them before bedtime.

Our children will inherit a feverish earth -- that their mothers and fathers, we all of us here, have neither the vision nor the will to cure.

It is a nightmare, a catastrophe that makes us shudder.

What are the concrete steps that we should take?

Tonight I offer two initial thoughts. The first has to do with the College of Engineering and the second with the larger communities.

Let me begin with the college of engineering in what I call energy engineering as a solution.

First, we need to focus on engineering programs that help us use our energy more efficiently. For instance, Professor Udeme Ndon of Civil and Environmental Engineering will teach students green construction to conserve energy in the process of building and ultimately in the use of new buildings.

Professor Harry Li of Computer Engineering has developed sensor networks that can monitor the electricity usage throughout a building and turn it off automatically, if not used.

We can build a zero emissions car that does not produce any carbon dioxide. We can power this car with a combination of electricity, human power, and solar power that can run up to 35 miles an hour. Sound too good to be true? No.

In fact, we do have such a car project, called zero emissions (ZEM) car, involving a team of 20 mechanical and electrical engineering students -- led by Mechanical Engineering Professors Tai-Ran Hsu, Raymond Yee, and Electrical Engineering Professor Thuy Le.

What I just mentioned are engineering projects that grow out of faculty and student research.

In addition to using existing energy more efficiently, the second engineering solution in addressing the global warming crisis is to develop clean and green energy sources -- such as wind, solar, and biofuels.

Among these possibilities, biofuels from energy crops stand out as the most promising in replacing oil to meet our energy needs. To realize this promise requires advances in bioengineering and enzyme technologies, and there has been extensive research done at the University of Illinois.

Here at San José State, we are far away from the feed stock fields in the Midwest. But we do have plenty of used vegetable oil, which can be recycled to become bio-diesel, if we have the right technology at the right cost. We have Chemical Engineering Professor Greg Young and his students working with industry partners in this area.

In addition to engineering solutions to the global warming crisis, we also need to reach out to the larger community -- to work out collective solutions. Here I am thinking about the collaboration between the College of Engineering and programs in other parts of the University. For instance, meteorology in the College of Science for developing climate models -- used for planning for water resources, or environmental studies in the College of Social Sciences for developing policy recommendations.

I am also thinking about encouraging younger people to join the solution team. Let us bring these projects to them in high schools and middle schools. We hope they will be inspired and motivated to be part of the mission to cure the earth.

As a matter of fact, President Don Kassing is leading a California State University effort of 13 engineering colleges throughout the state to undertake such an initiative.

Finally, whether it is to develop green programs at the University or outreach to high schools and middle schools, we cannot do it alone. We will need the help of the diverse brain trust of talented and resourceful individuals we have around us in Silicon Valley -- and in the global community.

We all know about global warming. But it has become a cliché. Somehow we do not feel its urgency, until we begin to think about its impact on water: too much water—flooding, or too little water, water shortages; and until we begin to think about our children. Between a paradise and a sick earth, it is our moral imperative, as parents and grandparents, to give our children a livable and sustainable future.

Tonight, I have offered a few thoughts on preliminary solutions, some in the College of Engineering and others in the larger community. As I mentioned earlier, we cannot do this alone. We will need the help -- from all of you -- in the days to come.