

A Transition to Sustainability: Reconciling the Needs of People and the Planet in the 21st Century

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Pamela Matson

The major challenge of the 21st century is meeting the needs of people today and in the future and sustaining the life support systems of the planet.

Overall, the well-being of people has improved. However:

- 1 billion adults are illiterate;
- 2 billion lack adequate shelter;
- 1 to 2 billion have no access to clean water;
- 2 billion are without electricity; and
- 800 million are undernourished.

Peter Vitousek

The change in the composition of the atmosphere has increased a lot. Things were pretty stable before the Industrial Revolution. After that, there was a rapid increase in the amount of carbon dioxide in the atmosphere. The change in modern times is bigger and faster. Fossil fuel consumption and deforestation are largely responsible for that.

The increase in the amount of carbon dioxide has a substantial effect on various earth systems. It has helped agriculture a little bit. And different parts of the world have been affected differently because of changes in the atmosphere.

The global temperature has increased. This change in temperature is unevenly distributed on Earth: The temperature in the Arctic regions has changed more than others. There are many indicators of this temperature change, including glacier, permafrost and sea ice melt; sea level rise; and change in rainfall patterns. In other words, a climate change has happened.

The largest change in the world is on the land, as 50 percent of the ice-free land surface of Earth has been transformed by human activity.

We see global changes in the atmosphere, land, water, climate, ocean and biota as well as biogeochemical changes. They are not at all disasters; they are changes. Some of them are bad changes, of course.

We predicted decrease in snow pack, which increases warming. It will affect agricultural productivity. Research groups at Stanford are trying to solve these issues.

Pamela Matson

How can we reduce global environmental changes?

Today most of our energy comes from fossil fuels. It's getting harder and harder to produce oil (it's more expensive).

We need energy, so what should we do? The answer is to produce energy and use it in a clean way. The first approach is to develop clean energy resources. Carbon capture and storage from fossil fuel burning is one way to use fossil fuels cleanly. To do this, we need to find storage locations and predict the flow path of injected carbon dioxide.

A second approach is alternative energy, such as sunlight, wind, hydropower and biomass. Some people are working on solar cells. There's also nuclear, geothermal, fission and fusion energy.

We need a way to store the energy generated by these means. Researchers are working on them. It is not only a technology but also a research challenge.

A third approach is to reduce the energy demand: The new Jerry Yang and Akiko Yamazaki Environment and Energy (Y2E2) Building in Stanford is projected to use 56 percent less energy and 90 percent less potable water than a comparable structure built in a traditional fashion. Y2E2 building is a high-performance building—that's huge savings!

A final approach is to develop response capacity by adapting and reducing vulnerability to climate changes. For example, I have been involved in a project, Agricultural Sustainability in the Yaqui Valley in Mexico, where we've found that wheat is vulnerable to temperature. Therefore, they should find other crops for the new climate.

We can also use water allocation model tools to use water more effectively and in a right way.

The coastal zone is very vulnerable to changes as well. A research team is working with various kinds of managers to help develop decision tools. Too many things are going on.

A transition to sustainability will take:

- new knowledge, tools and approaches;
- linking knowledge to the action;
- educating leaders and the public;
- hope, inspiration and motivation;
- the will to change; and
- leadership by corporations, citizens, governments, universities and nonprofits.

Questions

Q: In your talk you said that population will level off. What is the evidence for it? Can you explain more about the impact of people?

A: Consumption and population are important issues. People are having fewer children. The reasons behind that are the education of women, access to contraception and health care. Those will affect total fertility rate. Results are very optimistic, according to the demographers. Therefore it makes sense to talk about sustainability.

Q: What about the oxygen ratio in the atmosphere?

A: There is research is going on. The oxygen level is going down in the atmosphere as well. But oxygen is not something we should worry about.

Q: Can you tell more about carbon dioxide sequestration?

A: It is part of the solution to reduce the carbon dioxide ratio in the atmosphere. It has also enhanced the production of oil.

Q: Can you give an example of nonprofit organizations working on these issues?

A: Stanford, industry and university partnerships.

Q: Can you give an example of what the Woods Institute for the Environment is doing?

The Woods Institute for the Environment provides venture funds that allow students and faculty work together developing strong environmental leaders for today and the future.