IU scientists: Climate change likely to continue: www.heraldtimesonline.com

Rate of carbon dioxide emissions increasing as Earth's temperature rises

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There is more carbon dioxide in the atmosphere today than at any period in the past 600,000 years, said Scott Robeson, chairman of Indiana University Department of Geography. That statement is based on Antarctic ice core samples, Robeson said at a Carbon Emissions and Climate Change forum Jan. 22 at Congregation Beth Shalom.

The amount of carbon in the atmosphere correlates closely with the average global temperature.

“We’re closing in on 400 parts per million (of carbon dioxide in the atmosphere), around 390,” Robeson said. “Over the last 600,000 years, we’re out of the historical range.”

Since 1960, measurements of atmospheric carbon dioxide show a steep upward trend.

“It’s not only increasing, but increasing at an increasing rate,” he said.

He noted that methane, another even more potent greenhouse gas, also has never been higher. Methane in the atmosphere has more than doubled in the past 50 to 100 years, he said.

The Earth’s atmosphere is profoundly different than it was even 50 years ago, Robeson said, and “that’s not debatable.”

Over the past 30 years, he said, the Earth has warmed 0.2 degrees Centigrade each decade. That’s .36 degrees Fahrenheit.

“That’s might not seem like a big temperature shift, but consider it over the entire planet. It takes a huge amount of energy to warm an entire planet,” including the oceans, he said.

Robeson said ocean warming is causing sea ice to melt. Land ice, such as on Greenland and Antarctica, is melting, too, and ocean levels are rising.

Other direct and indirect effects of the changing atmosphere, Robeson said, include changes in precipitation patterns globally, changes in storm frequency and intensity, and rising acid levels in the oceans.

Projecting current trends into the future, Robeson said climate scientists consider scenarios of atmospheric carbon dioxide levels that decline, stabilize and increase at low, medium and high rates. Each possibility has a different impact on global temperatures.

He showed a graphic established by Carbon Mitigation Initiative researchers at Princeton University that showed global carbon emissions over the past 50 years, and trending into the future. If carbon emissions were to instantly stabilize today, a wedge-shaped area results that can be thought of as an area of opportunity to stabilize atmospheric changes: an area between current levels and the path the planet is actually on.

The researchers have divided that wedge into smaller wedges that represent various methods of getting from where we are in terms of carbon emissions, to a path to stabilization. Four general categories to get us there are energy efficiency and conservation; fossil fuel strategies including carbon capture and storage; nuclear energy; and renewable energy.

Potential of sequestration

John Rupp, a fossil energy scientist and senior researcher for the Indiana Geological Survey who studies technologies for carbon sequestration, said Indiana’s carbon emissions are second-worst in the nation because of our coal-fired power plants.

Rupp described carbon sequestration as extracting carbon dioxide from the emissions of stationary sources, such as power plants, turning the carbon into a liquid, and pumping it underground into old gas and oil wells, coal mine seams and other landforms.

He said Indiana has the potential to store billions of metric tons of liquid carbon, but there are problems.

Indiana produces about 155 million metric tons of carbon dioxide emissions a year, he said, while the largest carbon capture and storage facilities in the world today sequester only 1 to 2 million metric tons of CO_2.

The Gibson power plant, west of Princeton, produces 22 million metric tons of carbon dioxide per year. Even the yet-unfinished Edwardsport, marketed as a “green” plant, will produce 4.5 million metric tons of CO_2 per year, he said.

Indiana would need 50 or more commercial-scale carbon sequestration projects to make a dent in its emissions, Rupp said. He said much more research is needed to determine whether sequestration technologies would contain the carbon permanently.

Michigan and Illinois have commercial-scale carbon capture and storage tests in progress, Rupp said, noting that his assessment of the technical component of carbon sequestration in the Midwest is promising.

Rupp also said the politics and economics of carbon sequestration make it challenging to implement.

There is no regulatory requirement for emission reductions in the United States at present, and the cost of carbon capture and storage would likely be borne by electricity rate payers.

Rupp noted that, as a piece of the carbon stabilization wedge, sequestration doesn’t provide a short-term solution.

No silver bullet

Both scientists agreed that there is no simple solution to climate change, and life forms on Earth will have to adapt to the changing atmosphere and its side effects.

No single strategy, Robeson said, will lead the planet on a path to carbon stabilization, and even collectively, big changes in policy, behavior and technology will be necessary.

“It’s a big job, and it’s not going to be easy,” he said.

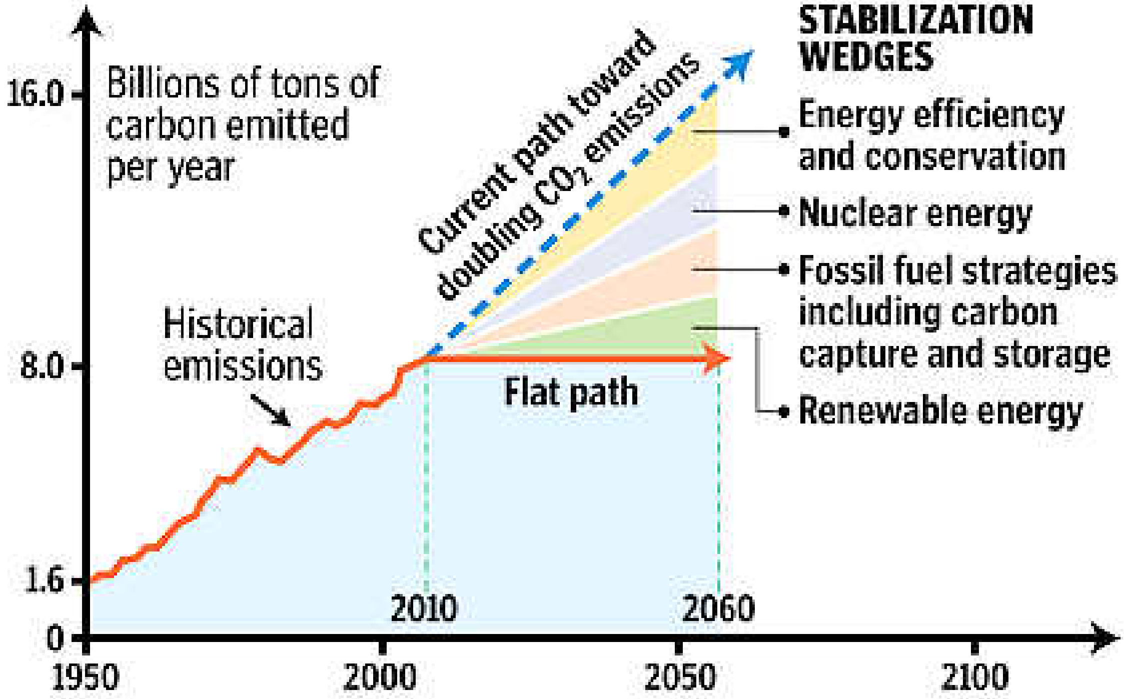
“How to adapt to it is really the key,” Robeson said.

More information on stabilization wedges

Princeton University’s Climate Mitigation Initiative offers a PowerPoint presentation on carbon stabilization wedges and a video update on its research on climate change at cmi.princeton.edu/about.

Reducing global carbon emissions

In efforts to stabilize carbon emissions, a wedge-shaped area can be envisioned that represents an opportunity to reduce atmospheric changes. That wedge can be divided into four general categories of methods to stabilize the amount of carbon emissions released in the atmosphere.



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Scott Robeson