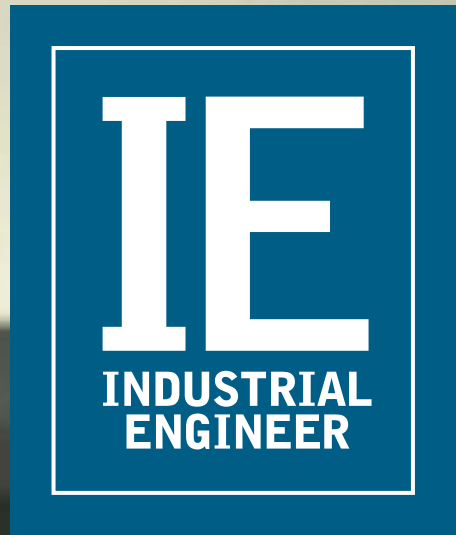


SPECIAL REPORT:
turning down the heat



Engineering & management solutions at work

A world gone green

IE methods can curb global warming effects

SPECIAL REPORT: turning down the heat



Twenty years ago, global warming was as real as Santa Claus to many people.

It simply wasn't a big deal. The discussion about it then seemed limited to scientists and never made a discernable impression on international policymakers. If extreme climate change was understood at all by the general public, then it was accepted as a popular myth — propaganda used by pro-environment groups to fuel an anti-corporate agenda in the final years of the Cold War. Skeptical lawmakers ruled global warming as a theory, one that was incapable of affecting national infrastructures including technology and the economy.

Gas emissions from manufacturing, vehicles, and homes destroying the air we breathe? Allowing the sun to burn

brighter and heat up the planet? Destroying nature in the warmest and coldest geographies? It seemed ridiculous.

In hindsight, many could argue, few people could have considered any risks outweighing the benefits of growing business and industry in a civilized — and now globalized — world. The Industrial Revolution that began in the United States at the start of the 20th century surely was the right movement at the time. The era gave birth to corporate manufacturing, production lines, and the modern means of meeting supply with demand, all of which spread around the world and dug deep into the cultures of democracies, republics, and communist states — facilitating industrialized agendas, including war. The same era also gave way to modern health care, transportation, and the use of industrial engineering.





Eventually, though, there was an underlying fear that was deftly associated with the myth: Civilization was slowly killing itself through chemical emissions, pollution, and unstable energy sources.

The public perception of global warming has altered over time, particularly in the past 20 years. Since then, Earth Day has been annually marked on calendars, recycling has grown into a common household practice, and business and industry are striving to become more eco-friendly.

One of the biggest drives to capture the international community's attention regarding global warming and climate change has been the critically acclaimed documentary "An Inconvenient Truth," based on a slideshow presentation created by Al Gore, the former vice president of the United States under President Bill Clinton. In the film, Gore discusses the effects of greenhouse gases and an absence of energy conservation on the environment worldwide.

These newly popular fears of a dying planet slowly evolved into what many people consider a doomsday scenario, now backed by facts and data. Mother Nature, it appears today, has revealed her cards. But the melting of polar ice caps, the

gradual rise in global temperatures, and the fierceness of the 2005 Atlantic hurricane season (which included the devastating Hurricane Katrina) are all backed by scientific data and estimates for the future.

R.K. Pachauri, Ph.D., chairman of the Intergovernmental Panel on Climate Change, said that the topic of climate change has evolved from the scientific curiosity it once was. Related events in the past few years, he adds, have been important in shaping public perception of related topics.

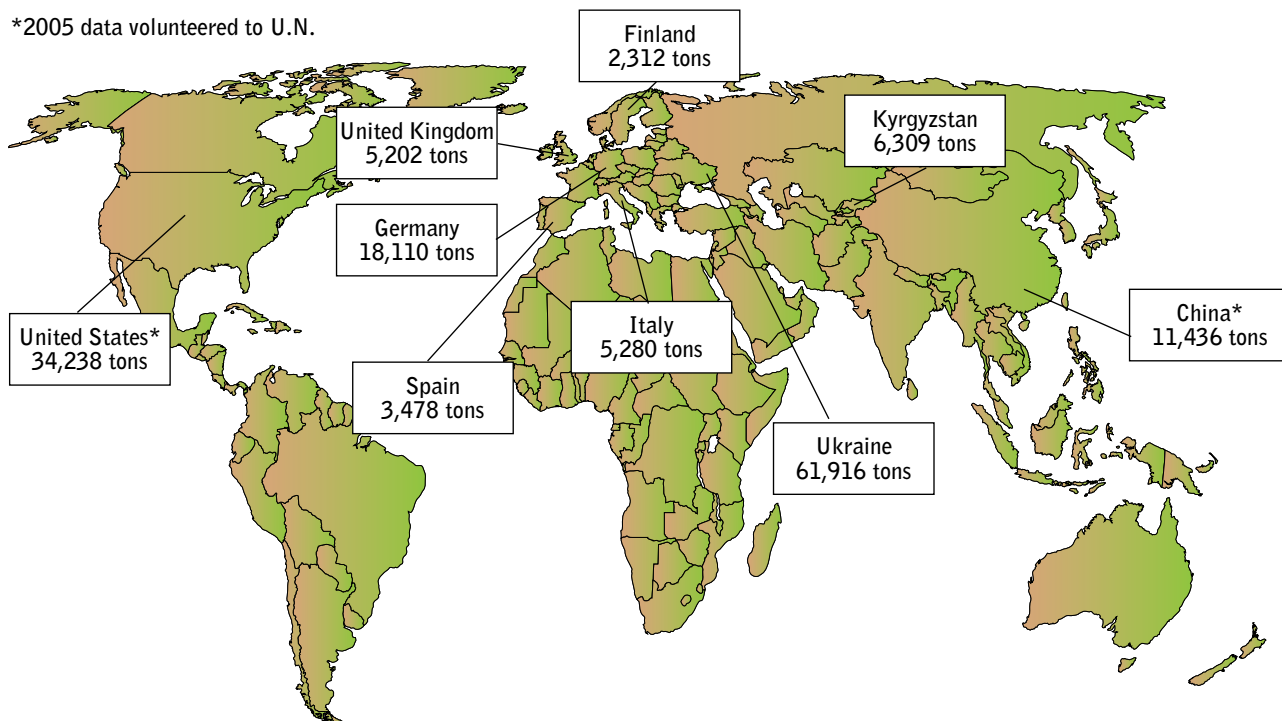
"Certainly, Vice President Gore's film had an impact," said Pachauri, who was trained as an industrial engineer. "But more recently, I think the reports of the IPCC that really had a major impact, as well. And the media has picked up the findings of the report and really disseminated them on a wide scale all over the world."

Something in the air

According to an IPCC report released in April, current trends of global climate are becoming more likely to cause permanent effects. Most land masses are experiencing warmer temperatures year after year, resulting in fewer cold days and nights and more

PRODUCTION WASTE AROUND THE WORLD

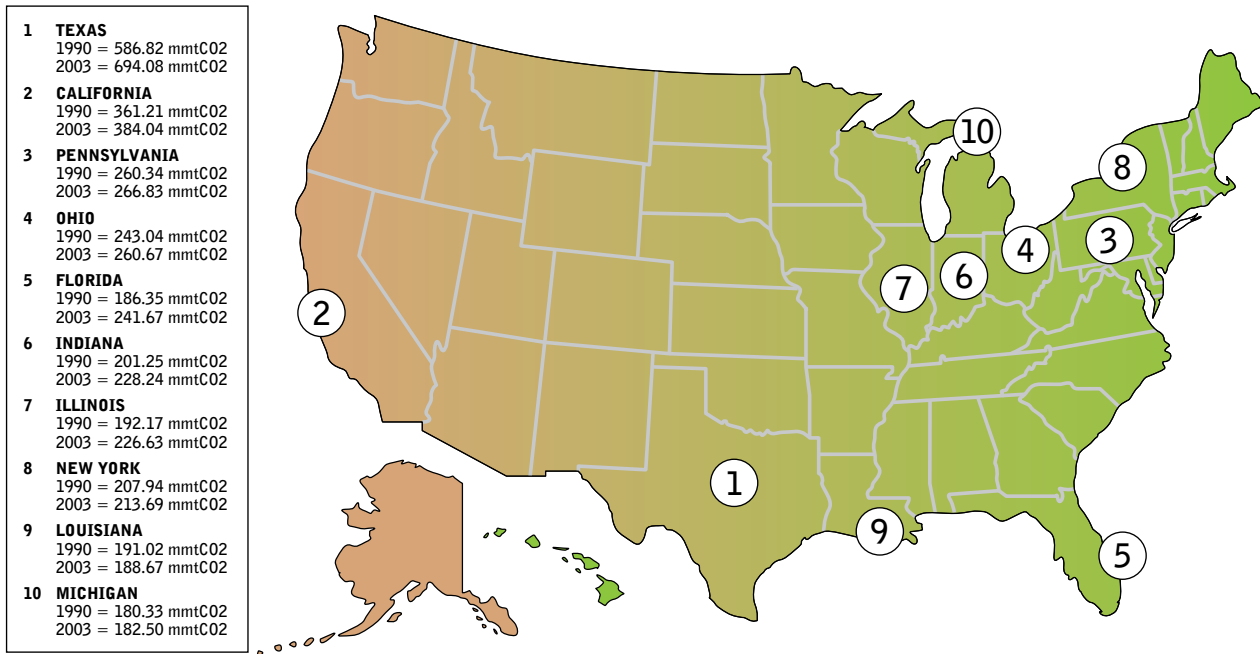
*2005 data volunteered to U.N.



The United Nations describes hazardous waste as materials containing toxic, infectious, radioactive, or flammable properties that pose an actual or potential hazard to the health of humans, other living organisms, or the environment. Although countries are asked to report annual data on hazardous waste totals, most countries are not able to do so every year. The totals shown here are the latest data from industrialized countries that reported data for 2004.

Source: United Nations

TOP TEN U.S. CARBON DIOXIDE EMISSIONS



Carbon dioxide emissions in the United States as of 2003-04, highlighting the 10 highest states. Between 1990 and 2003, the EPA says the release of carbon dioxide into the atmosphere from fossil fuel combustion by the United States rose by 17.4 percent, from 5,005.3 mmtC02 (million metric tons of carbon dioxide) in 1990 to 5,877.7 mmtC02 in 2003.

Source: EPA

frequent hot days and nights. These factors could give way to insect outbreaks, greater demand for cooling energy, lower air quality, and increased human mortality. According to the IPCC, the likelihood this trend will continue is greater than 99 percent.

“We’ve had an acceleration of warming trends because emissions of greenhouse gases have been going up,” Pachauri said. “The concentration has increased substantially. As a result, there’s been an escalation of changes in the climate in the past eight to nine years, or I would say even longer.”

The report foretells a growing number of areas affected by drought, which could cause crop damage, death to livestock, increased risks of wildfires, and shortages of food and water. Some geographic areas may experience more precipitation than suitable, resulting in soil erosion, water supply contamination, respiratory and skin diseases, and commerce and transportation disruptions.

The report also feeds ongoing fears of increased intensity among tropical cyclones and hurricanes. Destructive winds and flooding, power outages, water shortages, and increased risks of injury and death are stinging reminders of the 2005 damage path in the southeastern United States created by hurricanes Katrina, Rita, and Wilma. The three storms resulted in hundreds of deaths and billions in costs for recovery and rebuilding efforts that are still underway two years after the first storm made landfall. Rising sea levels, as high as 2,100 feet

above sea level along coastal regions and further inland, are considered a threatening possibility, according to the report.

“All of this has added to the perception of the public that something is happening [with respect to climate change],” Pachauri added.

With such catastrophic possibilities being considered, the question arises: How did it reach this point?

While blame is often tagged to various nations or industries by policy critics and environmental activists, global warming hasn’t always been humanity’s creation. The Earth’s evolution over millions of years — including eras of extreme cold and heat — has played a role in depositing carbon dioxide and similar gases into the atmosphere. But for more than 125 years, humans have been transforming fossil fuels (oil, natural gas, coal, etc.) and chemical vapors into operating energy. The resulting carbon dioxide emissions have increased temperatures at certain levels of the atmosphere, thickening the planet’s ozone layer and trapping heat delivered to the Earth by the sun that would otherwise leave the atmosphere in a single revolution.

One of the most significant policies in the worldwide reduction of carbon dioxide has been the Kyoto Protocol, a landmark agreement ratified in 1997 by dozens of industrialized countries to reduce greenhouse gases to 1990 level by 2012. While many nations have been working to honor the policy, others have tried instituting their own global warming reduction plans.

turning down the heat

Earlier this year, Germany proposed an agenda by which global atmospheric temperatures would not be allowed to increase by more than 2 degrees Celsius (3.6 degrees Fahrenheit) before being brought back down through conservation initiatives. Scientists say that such a plan would mean a carbon dioxide reduction of 50 percent below 1990 levels by 2050.

The United States — arguably the global leader in greenhouse gas emissions — has not ratified the Kyoto Protocol or any other international agreement for combating global warming. The cost to initiate such an agenda in the United States often fills the debate between those who believe the superpower country should ratify it and those who don't. Between 1990 and 2004, total greenhouse gas emissions rose 16 percent, according to the most recent data from the U.S. Environmental Protection Agency. The dominant gas emitted was carbon dioxide at 19.6 percent, but hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride increased by 58 percent. Methane emissions decreased by 10 percent and nitrous oxide emissions dropped by 2 percent.

Saving face

Regardless of a lack of global warming legislation, many American businesses are investing in green initiatives that shape overall business strategy, manufacturing processes, and energy use to comply with environmental standards. Doug Kiss, an energy kaizen expert with TBM Consulting Group, said that industries are paying attention to societal changes and reflecting the growing public popularity of pro-environment agendas. Moral lines such as eco-friendly business practices, he said, are playing a heavier role today in determining a company's bottom line.

"To be green means we're not wasting," Kiss said. "We're using our current assets. Right now is not a time when a lot of people are spending a lot of capital."

He added that green companies are also examining their own processes and expanding conservation of basic resources such as water and electricity so that they can curb the temptation to pass on costs to consumers. "It's about challenging the use that we currently have and finding out from our own folks within our own organizations — what is it we can do to reduce the consumption and the cost so that we don't have to pass on an increase to our customers?"

Globally, conservation and cost-cutting can be difficult to balance, but hazardous waste totals — which include production waste — have subsided in many countries. Data released in April by the United Nations shows that non-recyclable and hazardous

manufacturing, industrial site, and mining materials have steadily dropped between 1990 and 2005. Hazardous waste generation in the United States has dropped from 272,957 tons in 1990 to 34,238 tons in 2005. Under a new Waste Act signed into law in 1998, the Czech Republic dropped from 2,588 tons in 2000 to 1,350 tons in 2005. Ukraine saw a reduction from 127,596 tons in 1995 to 61,916 tons in 2004 (the latest data available).

Other nations, however, have seen a jump in hazardous waste generation. China has leapt from 8,168 tons in 2000 to 11,436 tons in 2005; Germany increased from 12,872 tons in 1990 to 18,110 tons in 2004; and the United Kingdom rose from 2,890 tons in 1990 to 5,201 tons in 2004.



Doug Kiss

A green-oriented image, Kiss said, is helpful to businesses and policymakers alike because it reflects a social consciousness. Consumers feel better when they are purchasing green products or from a company that incorporates eco-friendly business processes and operations, he said. More often today than 20 years ago, a company can find greater, more profitable success if it can build a reputation associated with such measures. But Kiss stressed that spiraling energy costs also motivate companies to look for ways to reduce loss rather than build profit expectations.

"For lack of better expression, this has been the land of milk and honey for cheap energy for a long time," he said. "The simple example would be the configuration of a hose nozzle. Did we ever look at gallons per minute when we bought this thing? The pattern and the pressure behind it, how we're using it? Our own history of being the land of plenty comes back to haunt us sometimes, I think."

IE moves

The IPCC has identified measures that can be implemented in commercial and industrial sectors to produce long-term, eco-friendly results. For example, though resistance may make such goals difficult to reach, the reduction of fossil fuel subsidies and taxes or carbon charges on fossil fuels could help conserve the global energy supply. Renewable energy technology could also contribute to conservation in markets where low emission mechanisms can be used. Local availability of low-cost fuel could also invigorate renewable energy incentives.

In goods distribution, parties could apply mandatory fuel economy, biofuel blending, and carbon dioxide standards for road transport, although partial coverage could limit a vehicle fleet's effectiveness. Countries developing new transportation systems could benefit from infrastructure planning and

investments in public and non-motorized transport stations. New industrial technologies could create opportunities for performance and energy benchmarking, standards, and tax credits, while voluntary agreements could provide success through clear targets, third-party design and monitoring, and close cooperation between government and industry.

The IPCC notes that government support through financial contributions, tax credits, standard setting, and market creation is important for effective technology development, innovation, and employment. But the expansion of globalization with respect to green technology largely depends on political agreements and financing. Pachauri, however, said he didn't believe politics was necessarily a dead end for green initiatives.

"I think, at the moment, what we really need to do is use existing technologies to improve energy efficiency," he said. "This applies to everything including automobiles — which should be made far more fuel efficient — homes that are overheated or overcooled, and all that can be done with existing technology and know-how."

He added that alternative fuels will need to be developed to stave off an energy crisis. Biomass, biofuels, solar, wind, and even tidal energy would need to be used on a much larger scale, he said, but none of those sources will be used without higher prices associated with high-carbon fuels. "It's those prices which will bring out technological innovation and dissemination of those technologies," Pachauri noted.

Kiss said that numerous industries are adopting green approaches to their manufacturing processes, especially in the aerospace and defense, food, and general process industries. The process industry, he said, tends to use more energy in large-scale plants, often with operations running around the clock seven days a week. But among industrial engineering methods, the biggest movement toward combating global warming emissions has been found in total production maintenance within energy kaizen, according to Kiss. For example, a piece of manufacturing equipment is generally made up of metal, hydraulic, and electronic components. A building or facility is similar — a large steel frame with heating and air ventilation, fire compression systems, and water supply.

"When we look at consumption, it's not only from a machine point of view but also from a facility point of view," Kiss said. "I think it's an idea that's paying back well for quite a few companies."

As the public debate over global warming has drastically become louder in the past five years, business and industry seem to be catching up with popular opinion. From the perspective

A STROKE OF LIGHTING

In October 2006, the IIE headquarters near Atlanta added a touch of green.

Overhead lights throughout the headquarter offices were re-lamped with full-spectrum bulbs, which create the makeup of natural light. The bulbs consume 80 percent less energy than incandescent bulbs for the amount of light they produce and last about five times longer.

"We had been using a mixture of various brands of cool white lamps, which are a phosphor mix that is not balanced to natural light," said Donna Calvert, IIE corporate operations manager.

Full-spectrum lighting can create better visual clarity, reduce eye strain and fatigue, and decrease glare from monitors and computer screens that may cause headaches in workers. Calvert said the reduction in even minor health risks driven by the new lighting has increased worker satisfaction and productivity in addition to other benefits. "We will realize fewer maintenance efforts and fairly substantial cost savings, as well."

of major corporations, a public face as a green enterprise is more necessary to compete in the marketplace. When it comes to books in a bookstore, the cover can only convince a reader so far as to how good the story is on the inside.

To stall the effects of global warming and possibly reverse the continuing trends, tomorrow's governments, manufacturers, and distribution fleets will have to answer the following question: Can we initiate a plan that lives up to our organization's green promise?

"Is it the primary concern of the company?" Kiss asked. "I guess it would require a judgment call on whether they even acknowledge global warming, wouldn't it?" ~

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