Environmental impacts of demand-side technologies and strategies for carbon mitigation

April 25 2016

As global leaders convened at the UN last week to sign on to the Paris climate agreement, they committed to a wide range of strategies to reduce greenhouse gas emissions (GHG). Expectations are particularly high for two of the most widely recognized solutions to climate change: energy efficiency and renewable energy. But how much do we know about the environmental impacts of a large-deployment of these technologies—including the benefits or costs from a life-cycle perspective? And by how much can the gains from energy efficient technologies be multiplied if GHG emissions from electricity production are also reduced?

In a special issue, Yale's *Journal of Industrial Ecology* aims to advance our understanding of life cycle environmental and natural resource implications of energy efficiency technologies. This special issue, "Environmental Impacts of Demand-Side Technologies and Strategies for Carbon Mitigation," was prepared in collaboration with the International Resource Panel (IRP) of the United Nations Environment Programme (UNEP). Several of the studies in this special issue will serve as technical appendices to a forthcoming report on life cycle implications of energy efficiency technologies by the IRP.

"If we are to meet climate change targets," said Peter Crane, dean of the Yale School of Forestry & Environmental Studies, "we need to dramatically decarbonize electricity generation and use technologies for

energy-efficiency on a very large scale. To do this effectively, we need to know not only the impact on greenhouse gas emissions, but also the environmental and natural resource implications of these changes."

Previous research on individual technologies use different assumptions and data or focus on one region making comparison difficult. The contributions to this special issue seek to overcome this problem by employing comparable scenarios, assumptions and data and by covering all nine global regions as much as possible.

"Research confirms that energy efficiency in general is great, but not without 'fine prints,'" said Sangwon Suh, an associate professor at the University of California, Santa Barbara and lead editor for the special issue. "Demand-side technologies reduce greenhouse gas emissions as well as many other environmental impacts. However, the magnitudes of those improvements vary widely among the technologies and regions. In some cases, demand-side technologies too may increase resource consumption and even increase GHG emissions. It is crucial to understand where, when, and to which technology the investment should be placed to maximize the benefits."

Contributions to this special issue cover a range of technologies—for both production and consumption of energy—including:

- lighting,
- building energy management,
- cogeneration,
- copper smelting,
- industrial symbiosis (by-product exchange and resource sharing), and
- transportation and logistics.

This special issue also addresses a number of key questions about the

impact of energy efficiency technologies, such as the rebound effect.

More information: onlinelibrary.wiley.com/doi/10 … .20.issue-2/issuetoc

Provided by Yale School of Forestry & Environmental Studies