Examining the Environmental Impact of Demand-Side and Renewable Energy Technologies

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Limiting climate change to well below 2°C will involve unprecedented decarbonization of global electricity generation and deployment of demand-side low-carbon energy technologies in the coming decades. Moreover, meeting Sustainable Development Goal 7: *Ensure access to affordable, reliable, sustainable and modern energy for all*[1] will require substantially increasing the share of renewable energy in the global energy mix and doubling the global rate of improvement in energy efficiency by 2030. Achieving these targets will necessitate a profound transformation of how energy is supplied and used around the world. With this challenge comes the opportunity to design systems and select technologies that will minimize adverse impacts on the environment and climate, as well as address the additional pressure on natural resources.

Both energy efficiency and renewable energy are widely recognized as two of the most effective ways to greatly reduce the threat of climate change. But how much do we know about other environmental impacts of a large-scale deployment of these technologies? What are the benefits (or costs) from the life-cycle perspective? By how much can the gains from energy efficient technologies be multiplied if combined with decarbonization of electricity production?

Tasked with building and sharing knowledge on how to improve management of the world's resources, the International Resource Panel (IRP) of the United Nations Environment Programme[2]—which provides independent, coherent, and authoritative scientific assessments on the use of natural resources—turned its attention to understanding the impacts of such a transformation in energy production and use options, not only on greenhouse gas (GHG) emissions but also on the environment and natural resources.

As a result, over the past four years, the IRP's Working Group on Environmental Impacts has been working on the first comprehensive global-scale assessment of the life-cycle environmental and resource implications of a wide range of supply and demand-side low-carbon energy technologies. Data inputs on various energy saving demand-side technologies have been gathered from experts around the world, and the results of these analyses are presented in this special issue, *Environmental Impacts of Demand-Side Technologies and Strategies for Carbon Mitigation*.[3] Building upon these contributions, the IRP will publish a synthesis report[4] later this year, with these papers as a technical appendix. The synthesis report will inform policy makers about the benefits, risks, and trade-offs of energy efficiency technologies and their combined effects when deployed alongside low-carbon electricity supply technologies.

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Some preliminary results of the synthesis report show that many of the efficiency technologies available today bring environmental co-benefits beyond GHG mitigation, including reduced impacts on the environment and natural resources, with an exception for metals. The analysis also shows that it is important to understand the interactions between supply-side and demand-side low-carbon technologies, since without decarbonizing electricity supply, the benefits of some energy efficiency technologies cannot be realized.

Understanding the link between demand- and supply-side and looking at energy efficiency technologies from the life-cycle perspective is even more important for developing countries that through the Sustainable Energy for All Initiative (SE4All)[5] have demonstrated a commitment to ensuring universal access to affordable, reliable, and modern energy services by 2030, while increasing the share of renewable energy in the global energy mix.

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We believe that the upcoming report together with another IRP report, *Green Energy Choices: The Benefits, Risks and Trade-Offs of Low-Carbon Technologies for Electricity Production*,[6] can help to design policies for mitigating potential and unintended consequences of large-scale changes towards a low-carbon society.

We would like to thank International Resource Panel Members, Sangwon Suh, lead author of this report and this special issue, and Edgar Hertwich for their vision and leadership in coordinating this extremely important body of work.

Notes

1. https://sustainabledevelopment.un.org
2. The International Resource Panel (IRP) was established by the UNEP in 2007 to provide independent, coherent and authoritative scientific assessments on the use of natural resources and related environmental impacts over the full life cycle, and to contribute to a better understanding of how to decouple economic growth from environmental degradation. See http://www.unep.org/resourcepanel/
3. Editor's note: Additional papers, obtained through a global open call for papers are also included in this special issue.
4. United Nations Environment Programme (UNEP). 2016 (in preparation). *Energy Efficiency: the Benefits, Risks, and Trade-offs of Low Carbon Energy Technologies*. Report of the International Resource Panel. Suh, S., Bergesen, J., Gibon, T. J., Hertwich, E., Taptich M.
5. www.se4all.org
6. See http://www.unep.org/resourcepanel/KnowledgeResources/AssessmentAreasReports/EnvironmentalImpacts/tabid/133331/Default.aspx

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