

# CIERP Policy Brief

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## Achieving Decarbonization

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### SUMMARY

The current outlook for energy availability, population growth, and ecological impacts underscores the need for optimization of existing strategies. This policy brief highlights levers and strategies to decarbonize energy systems through a balancing of domestic strengths and learning. It derives from discussions organized by the Energy, Climate, and Innovation program of The Fletcher School's Center for International Environment and Resource Policy. For more information, see *Achieving Decarbonization: Transforming National Energy Systems*, June 2011.

### CHALLENGES OF THE ENERGY SYSTEM

Governments worldwide are weighing choices related to energy system change. Estimates of global energy demand indicate there will be a 47% increase by 2035, if current policies remain. This rise from 12,271 MTOE of primary energy use in 2008 to approximately 18,000 MTOE is expected to be accompanied by a 44% increase in fossil fuels use, should current trends continue. Yet the certainty of this path is brought into question by the sustainability of the energy supply, ecological impacts, geopolitical challenges, and economic risks.

Based on proven reserves and current production rates, the reserve-to-production ratio for fossil fuels is approximately 45-120 years.<sup>1</sup> This estimate doesn't account for accelerated population growth that is likely to enlarge current numbers from 6.7 to 9 billion people in a few decades. Nor does it account for economic growth or a decline in net energy returns.

The ecological carrying capacity of the biosphere is also showing signs of over-taxing from energy consumption. Air and water quality degradation associated with fossil fuel combustion is evident in numerous regions worldwide. In addition, the compounding effects of climate change, which are driven in part by fossil fuel use, amplify local and global reasons to actively move toward more sustainable energy paths.

Considered from the standpoint of energy and economic security, many forms of fossil fuel dependence carry large risk premiums associated with geopolitical instability, cartel activity and market flux.

As knowledge accrues on the need for energy system adaptations, decarbonization is now regularly raised as a strategy to pursue. In broadest energy terms, decarbonization is the reduction in carbon intensity or emitted carbon pollutants from energy that is used.

Often represented by the Kaya identity:

Impact (emissions) = Population x Affluence (GDP/cap) x Energy/GDP x Emissions/Energy,<sup>2</sup>  
decarbonization may be gauged in terms of carbon emissions per energy output, carbon emissions per gross domestic product, or carbon emissions per capita, among options.

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1 The R/P ratio gauges availability based on technically and economically viable forms of recovery of known reserves.

2 Kaya, Y. and Yokobori, K. (1993) *Environment, Energy, and Economy: Strategies for Sustainability*, United Nations University Press: Tokyo, Japan.

**Primary approaches to decarbonization may include:**

- Increasing the efficiency conversion of incumbent fossil fuels;
- Switching fuels (i.e. increasing nuclear or renewable energy);
- Suppressing emissions (carbon capture);
- Altering methods to manage or use energy; or
- Restructuring an economy or its infrastructure to be less energy-intensive.

**POLICY INSIGHTS**

- Reframe the energy discourse around local opportunities or needs, such as energy saving, security, jobs, or development.
- Begin with the ‘low-hanging fruit’ or ‘no regrets’ options, particularly in the absence of public consensus.
- Encourage local ownership of energy projects which can be instrumental for rapid and widespread acceptance.
- Take advantage of serendipitous events for communicating and providing springboards for innovation.
- Foster active learning by doing, through feedback, and with evaluation.
- Employ long-term, integrated planning and policies, such as price floors for petroleum, flexible feed-in tariffs and targets, if appropriate and monitored.
- Leverage opportunities for demand-side progress.
- Do not isolate decarbonization from wider change or consumption patterns.
- Consider pricing as a way to achieve goals, rather than to define them.
- Actively anchor long term, public goods aims with short term, local benefits.
- Re-envision framing from ‘whether to act’ to ‘how and how far to act’.
- Balance domestic strengths with broader system change by fusing learning and comparative advantage.

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