



# A Statement on the Appropriate Role for Research and Development in Climate Policy

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**T**his statement is issued by a group of economists and scientists which met at Stanford University on October 18, 2008 to discuss the role of research and development (R&D) in developing effective policies for addressing the adverse potential consequences of climate change. We believe that climate change is a serious issue that governments need to address. We also believe that research

and development needs to be a central part of governments' strategies for responding to this challenge. Solutions to manage long-term risks will require the development and global deployment of a range of technologies for energy supply and end-use, land-use, agriculture and adaptation that are not currently commercial. A key potential benefit of focused scientific and technological research and development investment is that it could dramatically reduce

the cost of restricting greenhouse gas emissions by encouraging the development of more affordable, better performing technologies.

Broadly speaking, economists identify three ways in which government can constructively address climate change. One is by pricing the damages caused by emissions leading to climate change. Doing so would induce individuals and firms to take better account of these damages in their everyday decisions. A second

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is through government research and development policy aimed at stimulating the search for new knowledge that could lead to breakthroughs in greenhouse gas reducing technology. A third is by taking and encouraging actions that would reduce the damage caused by greenhouse gas emissions. Here too, R&D can contribute by addressing technological means of damage-mitigation, including adaptation and geo-engineering. However, governments' support for technology R&D should cease at the development stage or in select cases the pilot demonstration phase. Risks and rewards from commercial deployment should be left for markets to determine, including, of course, whatever additional price signals arise from market-based mitigation policies.

The group agreed to the following set of principles as a guide to the design of an effective research and development policy for addressing climate change.

#### **THE NEED FOR R&D POLICY IN ADDITION TO CAP AND TRADE, TAX, STANDARDS OR OTHER POLICIES TO REDUCE EMISSIONS**

- An effective strategy to deal with greenhouse gas emissions requires that individuals and

firms have incentives to take action to reduce their emissions. However, adequate control of greenhouse gas emissions almost certainly will require policies beyond pricing greenhouse gas emissions (or regulatory policies with the same end) and needs to include significant levels of direct and indirect support for basic and applied R&D.

- The payoff from effective R&D to reduce the cost of lowering greenhouse gas emissions could be very high.

#### **THE NEED FOR STABLE, LONG-TERM COMMITMENT TO R&D SUPPORT**

- Policy commitments must be stable over long periods of time. Climate change is a long-run problem and will not be solved by transitory programs aiming at harvesting available short-run improvements in energy efficiency or low-carbon energy. A much more stable commitment to funding and incentives for R&D is required to do better than the limited results of energy R&D efforts in the 1970s and 80s.
- Businesses and consumers must have credible and appropriate incentives for innovation if they are to develop new technologies

that will be needed to mitigate and adapt to climate change. Challenges include providing adequate funding for basic and fundamental research, encouraging risk-taking, and promoting open access to information.

- Stable long-term commitments to R&D funding and incentives will change the direction of R&D.
- Among the steps governments need to consider in addressing such a long-term challenge are not just those that apply existing capabilities to climate-related research today, but also those that build the fundamental capacity to perform research in the future. This could include steps to promote training of scientists and engineers, rejuvenate laboratory capabilities in universities, and to establish programs to disseminate research information for example through internships, post-doctoral fellowships and exchange programs both nationally and internationally.

#### **DESIGN OF R&D PROGRAMS**

- Government R&D policy should encourage more risk-taking and tolerate failures that could provide valuable information. This

can be accomplished by adopting parallel project funding and management strategies and by shifting the mix of R&D investment towards more “exploratory” R&D that is characterized by greater uncertainty in the distribution of project payoffs.

- The single greatest impediment to an R&D program that is directed at achieving a commercial objective is that it will be distorted to deliver subsidies to favored firms, industries, and other organized interests. The best institutional protections for minimizing these distortions are multi-year appropriations, agency independence in making grants, use of peer review with clear criteria for project selection, and payments based on progress and outputs rather than cost recovery.
- Technological progress requires both R&D and learning, so that R&D programs should not be planned in isolation from practical application. R&D can be required to make even a relatively well-developed technology suitable for particular applications, and attempts to make practical use of a technology can reveal points where additional R&D would be most productive.

- Climate change cannot be halted without technologies that are applicable to developing countries. Developing these technologies and facilitating their adoption will likely require engagement of R&D networks in developing countries.
- Research on how societies can better adapt to the effects of climate change and research on geoengineering as a measure to moderate temperature increases and climate impacts should be included in a complete research portfolio.

#### THE LIMITED ROLE OF TECHNOLOGY STANDARDS AND SUBSIDIES

- Mandates and subsidies aimed at supporting the deployment of relatively mature technologies are unlikely to be cost-effective tools for eliciting the major reductions of greenhouse gas emissions that now appear to be called for. In some cases, performance standards have proven effective in promoting engineering improvements and the wider adoption of existing techniques. Since the process of technology innovation and diffusion can require an extended period of time, performance standards with

shorter compliance periods cannot be expected to stimulate major breakthroughs.

- Technology-forcing performance standards have had a mixed record in inducing innovation. Regulators can find it difficult to obtain information about the status of technologies that is accurate enough to allow them to set standards that both can be achieved and will induce real innovation. Such standards may be effective when the path to a technological solution is reasonably clear, but are less likely to be effective in stimulating cost-effective and broad-based breakthrough technologies. This is especially relevant in dealing with a multi-decadal issue such as climate change, where the challenge is to evolve standards with time in light of new knowledge and experience.

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Letters commenting on this piece or others may be submitted at [submit.cgi?context=ev](http://submit.cgi?context=ev).

#### NOTES

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