Addressing environmental challenges

Innovation is increasingly perceived as crucial for tackling environmental challenges like dealing with climate change, limiting global greenhouse gas emissions, and maintaining biodiversity. Innovation can help address environmental challenges through the introduction of new technologies and also non-technological innovations. These non-technological innovations—in particular, organisation innovation—are needed to make environmental technological innovation effective. For example, evidence shows that innovation in climate change mitigation technologies is accelerating and that in recent years manufacturing companies have also been upgrading their efforts towards sustainable manufacturing, from introducing pollution prevention to designing integrated approaches that take into account product lifecycles and wider impacts. Public policy can foster this type of innovation by improving the access to finance for innovative businesses who address environmental challenges, combining supply- and demand-side policies (e.g. providing public funding of R&D addressing environmental challenges and introducing environmental criteria in public procurement procedures), improving the regulatory environment and adopting market-based instruments affecting price signals (e.g. through carbon pricing or cap and trade systems).

What are environmental challenges?

Environmental challenges include limiting global greenhouse gas emissions, dealing with the use and disposal of toxic products, improving the quality and availability of water supplies, and maintaining biodiversity. In recent years, governments have intensified efforts to find ways of protecting the quality of the environment on a long-term basis without compromising economic growth and while recognizing the importance of environmental sustainability.

Many environmental challenges are global challenges—e.g. regardless of origins, the effects of greenhouse gas (GHG) emissions are universal, and any solutions that reduce these emissions will benefit all countries. Solutions to these challenges require global action.

How does innovation help address environmental challenges?

Innovation can contribute to addressing environmental challenges through the **introduction of new technologies** (Figures 1 and 2). For instance, innovation can tackle climate change by shifting to energies that create less greenhouse gas. The International Energy Agency’s Energy Technology Perspectives (IEA, 2008) simulates a technological trajectory in which a 50% reduction in CO2 emissions is achieved through aggressive innovative activities across a range of areas, e.g. carbon capture and storage (CCS), nuclear energy, renewable energy, and end-use efficiency gains. This estimate is based on optimistic assumptions about the progress of key technologies.

There is evidence that **innovation in climate change mitigation technologies is accelerating.** A sharp increase in high-value patents (“claimed priorities”) for a number of climate change mitigation technologies since the late 1990s coincides approximately with the signing of the Kyoto Protocol, an international treaty which specifies obligations regarding the reduction of greenhouse gas emissions.

In addition to technological innovation, **non-technological innovation also contributes to addressing environmental challenges.** Technological innovations often need to be accompanied by non-technological innovation (e.g. organisational innovation) to be effective. **Eco-innovation** is new, or significantly improved, products, processes, marketing methods, organisational structures and institutional arrangements, which, with or without intent, lead to environmental improvements compared to relevant alternatives. By combining technological and non-technological changes, such eco-innovation can yield substantial environmental improvements.

In recent years, manufacturing companies have been upgrading their efforts towards**sustainable manufacturing**—from introducing pollution prevention to designing integrated approaches that

take into account product lifecycles and wider impacts. Empirical work on a sample of manufacturing facilities indicates that the introduction of organisational innovations, such as advanced environmental management practices (e.g. environmental accounting), can result in better environmental performance and complement technological innovations (OECD, 2008).

Figure 1.Number of PCT patents, climate change mitigation technologies related to energy generation, transmission or distribution

Figure 2. Number of PCT patents, climate change mitigation technologies related to buildings

What is specific to innovative entrepreneurship?

Entrepreneurs can play an important role in addressing social challenges due to their ability as **“actors of change”**, i.e. they often have greater freedom to experiment, take risks and develop more radical innovations than larger firms. While large firms are constrained by their existing products, technologies, skills and organization, new firms can more easily work outside dominant paradigms, as they are not subject to the same constraints (Baumol, 2002; Veugelers, 2009). This might also contribute to addressing environmental challenges.

Evidence on the contribution of innovative entrepreneurship addressing environmental challenges

Entrepreneurs in the environmental industry have been playing key roles over the past decade, although measuring their contribution is complex. A major challenge lies in delimiting and measuring the environmental industry. To overcome this issue, studies focus on core sectors of the environmental industry. The rates of birth in two core sectors of the environmental industry (sewage and refuse disposal, sanitation, and similar activities, and the collection, purification and distribution of water) (Figure 3) indicate significant differences across OECD countries. For instance, both New Zealand and Brazil display much higher rates of birth in those sectors than other countries.

Figure 3. Business birth rates in a selection of green sectors versus total manufacturing (2006 or latest data)

All employment size class. Employer Birth 2005 data for Czech Republic, Finland, Netherlands, and Slovak Republic.
Source: OECD Structural and Business Statistics (SDBS) Database. http://dx.doi.org/10.1787/888932384287

Other entrepreneurs whose primary business is not in environmental sectors may also contribute to addressing environmental challenges by pioneering innovative business practices and products that protect the environment. In Europe, a quarter of SMEs reported that between 10% and 29% of their innovation investments in the past five years were related to eco-innovation, defined as the introduction of any new or significantly improved product, process, organizational change or marketing solution that reduces the use of natural resources and decreases the release of harmful substances across the whole life-cycle (EU, 2011).

What is the role of policy in fostering innovation?

Public policy can foster innovation that addresses environmental challenges by introducing the following changes:

- **Improving access to finance.** Policy should be changed to improve the access to finance for innovative businesses that address environmental challenges; in particular, for actors pursuing green innovation, especially new entrants and start-ups, that usually have the most difficult time finding financing. It is indeed difficult to obtain funding at reasonable cost for an immature market with high capital intensity and relatively high risk. New policies can improve the supply of capital via equity, debt, venture capital or changes in capital markets. This could include the creation of fiscal incentives to attract investors, multiple forms of credit enhancement, seed funding programs, innovation funds dedicated to specific fields, risk-sharing arrangements between public and private organizations, and public-private co-investment partnerships. Prioritising the funding of projects addressing key environmental challenges has also become particularly important in today’s context of public spending reduction and economic crisis. However, although focused policies have the advantage of addressing precisely defined opportunities, there is a risk that too narrowly specified policies will not support potentially more radical and complementary innovations in related fields.

- **Complementary supply-side and demand-side policies.** While supply-side policies facilitate the creation of innovation (e.g. through public funding of R&D addressing environmental challenges), they do not provide incentives for their adoption and diffusion. Thus, supply-side policies need to be complementary to and linked to specific diffusion and demand-side policies. Policy makers, for instance, could introduce environmental criteria in public procurement procedures.

- **Improving the regulatory environment.** Adopting policies for the protection of the environment contributes to create favourable conditions for the growth of firms in environmental sectors and would stimulate, thereby, businesses in those sectors. This includes making procedures for business start-up, patent registration, etc. less burdensome. Instruments that directly affect price signals seem also necessary, though not always sufficient, condition for addressing environmental challenges. The main strength of market-based environmental policies (e.g. carbon pricing or cap and trade systems) is that they can make environmental inputs more expensive so that they internalise environmental externalities (e.g. pollution). Such price signals enhance firms' and consumers' incentives to adapt and develop green innovations.

References

- Baumol, W. (2002), The Free-Market Innovation Machine: Analyzing the Growth Miracle of Capitalism, Princeton University Press, Princeton, N.J.

- European Commission (2011), "Attitudes of European entrepreneurs towards eco-innovation. Analytical report", Brussels.

- IEA (International Energy Agency) (2008), Energy Technology Perspectives 2008: Scenarios and Strategies to 2050, IEA, Paris.

- OECD (2012), "Transitioning to green innovation and technology", in OECD Science, Technology and Industry Outlook 2012, OECD Publishing. doi: 10.1787/sti_outlook-2012-5-en

- OECD (2010a), "Addressing global and social challenges through innovation", in The OECD Innovation Strategy: Getting a Head Start on Tomorrow, OECD Publishing. doi: 10.1787/9789264083479-8-en

- OECD (2010b), Measuring Innovation: A New Perspective, OECD Publishing. doi: 10.1787/9789264059474-en

- OECD (2008), Environmental Policy, Technological Innovation and Patents, OECD Publishing, Paris.

- OECD (2007), Business and the Environment: Policy Incentives and Corporate Responses, OECD Publishing, Paris.

- OECD (n.d.), "Industry and globalization, Green growth and eco-innovation", Web page of OECD Directorate for Science, Technology and Industry. http://www.oecd.org/sti/ind/greengrowthandeco-innovation.htm [1]

- Veugelers, R. (2009), "A lifeline for Europe's young radical innovators", Bruegel Policy Brief, Issue 2009/01.

Source URL: https://www.innovationpolicyplatform.org/content/addressing-environmental-challenges

Links
[1] http://www.oecd.org/sti/ind/greengrowthandeco-innovation.htm