Policy learning for green innovation

STI strategies as sources of intelligence

Although few national strategies/plans for green technology and innovation take a whole-of-government approach, they serve to catalyse and focus efforts around common goals and visions. They also help to diffuse strategic information among stakeholders and improve policy co-operation and co-ordination.

Finland has various sectoral strategies in place and has recently started to develop a more coherent approach and national strategy, including a road-map, for green growth. Norway's Energi21 strategy was launched by the Ministry of Petroleum and Energy and designed by a range of policy stakeholders; implementation and funding have been ensured by the Research Council and Innovation Norway with the close co-operation of state companies (Enova, Transnova and Gassnova). Germany's Masterplan for Environmental Technologies, which is derived from the High-Tech Strategy, is co-ordinated and implemented by the Federal Ministry for Education and Research (BMBF) and by the Federal Ministry for the Environment (BMU). Yet another example is Australia's Clean Energy Future Plan, which is administered and co-ordinated by the Department of Climate Change and Energy Efficiency, but was developed by the Government following the work undertaken by the Multi-Party Climate Change Committee to develop the Clean Energy Agreement.

Government R&D funding is an important means of steering and shaping green innovation systems. At first glance, much of the available public support for green technologies is still based on R&D investments. Indeed, R&D policies form the largest part of the green innovation policy mix. Apart from technology adoption policies, such as feed-in tariffs for renewable energies, policies for articulating demand for green technologies are gaining ground, from regulation and standardisation to labelling and consumer policies.

However, several policy considerations are important too. First, a policy-induced increase in R&D, which results in higher demand for S&T personnel, will not necessarily result in more innovation. If too few qualified researchers are available to undertake the necessary research it may even have negative side effects (e.g. an increase in research salaries) (Goolsbee, 1998). Second, the impact of a rapid increase in public R&D spending will depend on the quality of research proposed and on the ability of the innovation system to turn that spending into innovation. Third, there is some concern that increased R&D expenditure on green technology may reduce or crowd out R&D expenditures in nonenvironmental and non-energy areas such as health and result in an ambiguous outcome in terms of overall welfare. In Finland, for example, the share of public R&D funding is expected to decrease to 1.0% of GDP in 2012. As energy is one of the key focus areas, public R&D funding has increased from 4.3% in 2001 to 11.1% in 2012.

A major challenge for providing strategic advice on linking demand- and supply-side policies for green innovation is the lack of indicators for understanding the baseline and plotting future targets. Indeed, the lack of clear definitions of what constitutes green technologies and innovations can hamper benchmarking and policy learning. Measuring investment in green R&D on the supply side, for example, is limited to a range of research fields or technologies such as renewable energy or environmental technologies even though research in areas ranging from the physical to the social sciences contributes to the development of such technologies.

Moreover, there is little empirical evidence about the factors affecting supply of and demand for green technologies and especially about the role and importance of public policy. In fact, most R&D programme evaluations in the energy area are affected by the fact that the main classical global energy systems model technology change as an exogenous variable: future technology costs are entered by the modeller and are not affected by abatement or carbon price assumptions in different control scenarios. This is equivalent to “supply-push” and contrasts with accumulating evidence of market-based technology learning (Grubb, 2005). Empirical evidence on the way in which demand dynamics can affect R&D incentives is also lacking.

Dealing with technology-specific policies

Governments are also struggling with the notion of technological neutrality (Azar and Sanden, 2011), often following unfortunate experiences with “picking winner technologies”. For first-generation biofuels, for example, long-term government support, whether R&D investments or deployment policies, has not resulted in large-scale market adoption. In practice, technology neutrality for a greener system is difficult given technology convergence and the different stages of technological development. For creating new technology trajectories, technology-specific policies will be needed to complement technology-neutral policies and to address specific barriers in certain green technology fields. In the earlier stages of technology development, technology-specific supply-side measures are essential and governments cannot avoid setting priorities. However, at the later stages, progressively technology-neutral demand-side measures may be necessary (e.g. through performance-based procurement), in particular to move technologies closer to market readiness. The allocation of funding is not and should not be technology-neutral and governments do make choices about what type of research and applications to fund.

Appropriate targeted measures and incentives may depend on the context of the technology. The types of R&D investments or technologies may be predetermined, to some extent, by existing industrial structures, research capabilities and specialisation or other supporting framework conditions. However, it is important for the design of technology-targeted policies to ensure that they meet policy and performance objectives efficiently. The issue is when and how to provide technology-specific policies. Policy makers therefore face a complex challenge for monitoring technological and commercial developments across a wide range of technology fields.

From an operational viewpoint, this process requires mechanisms such as the use of “strategic policy intelligence” based on technology roadmapping, foresight exercises, benchmarking and ex post and ex ante evaluation of research to define and co-ordinate research priorities for funding and performance more effectively. However, to make full use of them, organisations must be able to process and make sense of the available data in a realistic and detailed manner. Considering the dynamics of technological change, this can be only understood in symbiosis with social changes and social innovation at both consumer and producer levels.

To ensure legitimacy, the priority-setting process also needs to be based on a broad political consensus, especially in terms of the concentration of resources and the prioritisation of relevant research areas. Multi-year budgeting can help develop a longterm vision for innovation and signal the stability required to secure private investment in R&D. Performance budgeting can help position policy goals and costs of innovation with respect to other policy goals.

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