

A submission in response to the Green Growth Advisory Group discussion paper

The Society welcomes the Green Growth Advisory Group's work and their exploration of the challenges faced by New Zealand in developing and delivering on green growth policies.

The Society has limited this response to commenting on Topic 2 in the discussion paper: "Smarter use of technology and innovation". To summarise this response: firm-level issues are important, but system-level issues are also critical and can determine the rate of progress towards innovative green growth. A broader approach to thinking about innovation is needed to deliver on the promise of green growth.

The Context

Innovation happens at all levels, from individual choices; through firm-level initiatives; aggregated changes at a sector-level; policy changes that alter the influences on sectors, firms, and individuals; and ultimately to high-level transitions in society and the economic structure of nations. These levels continually interact, thus all innovation is embedded in a context, and changes that context. The Advisory Group is right to consider that firms should align their business and environmental objectives, and that firms should be assisted in that alignment process. However, there are a myriad of factors beyond the firm level that strongly influence progress towards green growth. A more comprehensive approach to innovation thinking is needed that takes into account this wider context. In the attached paper the Society puts forward some recent thinking towards a bigger picture of innovation, which is summarised in the rest of this letter.

Global demands for green growth set the overall situation for this work. The drivers for green growth come not just from climate change but also from pressures on land, water, pollutants, excess nutrients, and loss of biodiversity increasingly at a national and international level. Despite these drivers, the rate of progress being looked for to deliver greener growth has not been happening rapidly enough. In response, the UN has called for a "technological revolution" and the OECD has called for eco-innovation to deliver "radical and systemic improvements".

Aligning the business and environmental incentives on firms is a necessary step for green growth, however, this will deliver incremental, rather than revolutionary, improvements to both business success and environmental performance. However, an impetus for change can come, not just the firm level, but also from changes to personal consumption decisions and deep structural changes to national economies. Even if innovation policy remains focused at the firm level, then this complex and interacting context should be considered. One model for thinking about this multi-level context is that of an ecosystem, where innovations try to find and/or create their niche in an ever-changing market, comprised of underlying land, labour, and capital, but also wider human capabilities, interactions with occupants of existing and new market niches, institutions, social norms, and cultural trends. Green technologies and innovations are characterised by higher technology levels and higher value products, are thus more highly interconnected with other technologies. The factors influencing the success of these innovations are also more complex..

Green innovation firms, like companies in other high tech areas, face an information problem – the explosion of possible niches and possible options for filling those niches. They also face a co-ordination problem – their higher degree of interconnection with other technologies means that co-ordination with other changes matters more than for other kinds of innovations. The myriad of interacting factors also implies that competition between innovations happens on a continuum of scales, from competing individual products to competing systems that are made up of interacting and self-reinforcing networks of knowledge, technologies, supply chains, institutions, policies, and cultural norms. The ease of transitions to superior innovations decreases as the complexity of the transition increases, for example it is easy to change from one kind of laptop battery technology to another, because nothing else needs to change except the battery. To change from one kind of car propulsion system is hard, because it is not just a case of replacing a petrol tank with a battery, it requires a corresponding redesign of motor and transmission, of networks of refuelling/charging infrastructure, of supply chains for liquid fuel against electricity, of policies and price signals, and of cultural beliefs and symbolisms. As the ease of transition decreases and the scale of the transition increases, markets are less likely to deliver those transitions without enabling action from Governments.

What is the best path for greener growth through the smarter use of technology and innovation by business? Where does it all begin?

Aligning the business and environmental incentives on firms is necessary. Given the small size and limited in-house capacity of most New Zealand firms to address issues outside of their core competencies, this warrants Government assistance. However, when there is increasing global pressure for systemic change, then Government should work with business to prepare for substantial and disruptive changes to the multi-level and interconnected networks of technology, social beliefs, and overseas institutional settings. There will be an advantage to New Zealand in being ahead of these systemic shifts, but also a risk in taking the wrong direction. This benefit and risk should be balanced, taking into account the potential for a small nation like New Zealand to act as an experiment when trialling technology with global application.

Government policies should aim to be supportive of new technologies but not prescriptive of any particular technology. This is a large requirement – innovation policy has a direct impact upon the process of innovation, but many other policies indirectly alter market conditions for competing technologies. Thus an on-going and emphasised part of all policy development should be to consider the indirect impacts on green growth.

What are the barriers to technology take-up and innovation? How can businesses become more responsive to drivers for innovation?

The barriers to innovation in green growth are similar to those for more general innovation but the higher value and more highly connected nature of green growth innovations places more emphasis on matters of information and co-ordination. The increasing complexity of technologies and innovations and the deep uncertainty over which will be successful in which markets, increases the need to help innovators create the information to answer those questions. Thus policies should aim to:

- reduce the up-front costs of research, development, and entrepreneurial discovery;

- help innovators access funding for higher-risk endeavours to enable ideas to be nurtured through the pre-commercial phase;
- explore and help bridge knowledge gaps.

Similarly, the increased uncertainty and volatility of the ecosystem where new innovations try to find or create their niche implies a need for more emphasis on co-ordinating policies. These tend to be industry specific but are characterised by the building of strategic collaborations between Government and industry with a special focus on supporting science to industry connections in the form of long-term partnerships. These collaborations should be transparent and their effectiveness should be openly and thoroughly evaluated to provide an evidence base to guide policy.

What types of policy action might encourage and support businesses to make the right types of investment in technology and innovation?

The global impetus for greener growth provides an overall direction to technology and innovation, but there inevitably remains deep and inherent uncertainty over which specific technologies and innovations will succeed. One implication from this is that Government can enable green growth through a focus on the fundamentals that support the innovation process – the human capability that is created through investment in health, education, and training, and the underlying capability of the national science and knowledge system.

The competitiveness of New Zealand firms overseas is often developed by their experiences competing in New Zealand. This suggests an economic justification for keeping New Zealand environmental policy and legislation synchronised with others overseas – if there is a substantial lag in our environmental business incentives then we may reduce costs in the short term at the cost of international competitiveness in the medium to long term. For instance, HaloIPT may have built their company on research carried out at the University of Auckland but they chose to register the company in the UK.¹ The UK's much stronger support for eco-innovation does not just mean that HaloIPT can access relevant R&D funding, but the policies create a ready market for the company's products, provide a deeper pool of expertise ready to be accessed, and make it easier to connect with relevant standard-setting bodies, all of which reduces the incentive for innovation and innovators to remain in New Zealand.

In summary, the UN makes quite clear the need for a shift in thinking about innovation policy:

“Building an innovative economy is not about overcoming price distortions or enforcing property rights. An innovative economy is based on interactive learning, information exchange, timely availability of finance and other resources, and coordination among firms, universities, research centres, policymakers and other actors.”²

¹ Mortimer & Stancu (2011). “The HaloIPT inductive wireless technology. Eco-innovation Business Case Study for the OECD project on Green Growth & Eco-Innovation” Landcare Research.

² [“World Economic and Social Survey 2011 - The Great Green Technological Transformation”](#), UN Department of Economic and Social Affairs, 2011

Attached

These policy recommendations and their theoretical background are covered in more detail in the attached paper “Green growth and Innovation Theory”.

Contributors and Reviewers

This document was produced by the External Affairs Team at the Royal Society of New Zealand, with contributions and reviews from:

Dr Garth Carnaby FRSNZ, Professor Dick Bellamy, Dr Shaun Hendy, Dr Ray Kelly, Jonathan King, Claire Mortimer, Dr Craig Stevens, Professor Steve Wratten, Peter Young