The Institute for Governance and Policy Studies, School of Government at Victoria University of Wellington

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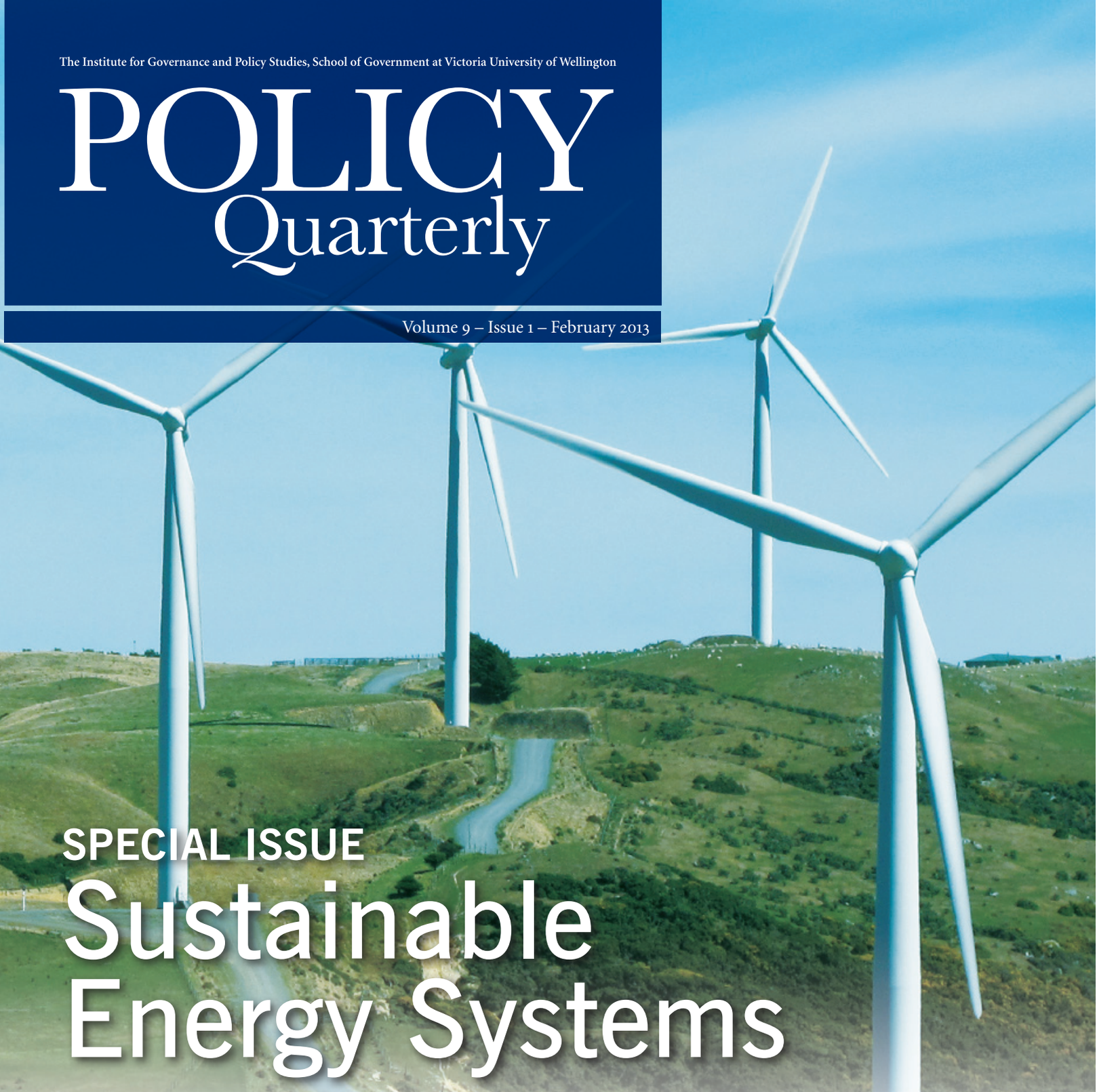

## SPECIAL ISSUE

# Sustainable Energy Systems

The Institute for Governance and Policy Studies, School of Government at Victoria University of Wellington

POLICY Quarterly

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# Editorial Note

Energy systems play a crucial role in the well-being and prosperity of societies. Fossil fuels have allowed humankind to progress from agrarian to industrialized societies. They have been the blood of our economies for more than two centuries and have shaped our most fundamental infrastructures, the way we live, travel and engage in productive activities. But our reliance on fossil fuels has come at a high cost: the destruction of ecosystems, environmental pollution, health impacts, climate change through the emission of greenhouse gases, and conflicts related to resource access. Most critically, population growth and the intensification of individual demands for energy services have led to a rate of extraction of fossil fuels that cannot be sustained in the long term.

Worldwide coal reserves are higher, especially in China where dirty, low energy content lignite might be available for up to 5000 years. But what would be the impacts on the global climate system of burning all coal reserves of the planet? Oil and natural gas reserves are being depleted at a fast rate and production costs are expected to rise steeply. As non-renewable resources, their application for human needs can be prolonged only through energy efficient technologies, products and buildings, and energy conservation behaviours. A lower consumption rate of fossil fuels would also help address the climate change problem within the next 50 years or so.

In the long-term, however, a transition to renewable energy resources is the only option able to address both problems of resource depletability and climate change. We are responsible to look ahead for hundreds and thousands of years: what natural resources are we leaving to future generations? How do our energy choices affect their chances to tackle development challenges in the ecological-climatic contexts they will inherit? This special edition of *Policy Quarterly* draws readers into this fundamental discussion: how do we move towards more sustainable energy systems? What is the role of policy and governance in facilitating sustainable consumption patterns and the transition of the supply side of energy systems towards new, renewable fuels and energy technologies?

In the first paper, Barton makes the case for prioritizing energy efficiency and conservation policies in New Zealand, as they offer faster and cheaper options for the reduction of greenhouse gas emissions. He argues that in New Zealand, where three quarters of electricity supply comes from renewables, the supply-side policies are over-developed and quantitative, while the demand-side strategy is under-developed and unambitious. The critical analysis offered of the 2011 National Energy Efficiency and Conservation Strategy suggests a rather symbolic policy document: essential targets for energy efficiency improvement are missing; many objectives are "not specific and numeric", while policy actions are vague or not mentioned at all.

In The Netherlands, demand-side energy policies are more specific and have been integrated with comprehensive climate mitigation policies. Hoppe et al., explore the design and implementation of four policy instruments aiming to reduce greenhouse gas emissions from the residential sector, looking at both old and new dwellings. The authors show how governmental actions may compromise the prospects for improved energy efficiency, especially when policy instruments are complex and the implementation processes are too technocratic, thereby excluding end-users. The legislative framework may also be an obstacle for innovative technology experiments, suggesting that ambitious sustainable energy policies require harmonization with a range of legal and policy frameworks.

This is a point made also in Dinica's paper, who makes the case for increasing the role of bio-electricity in national energy systems, given the high biomass resource potentials and a wide range of benefits that other renewables cannot replicate. The challenge is that bio-electricity is the only renewable technology that has a supply-side, as resources need to be collected, processed and transported to power plants. This adds to production costs making governmental financial support essential for its diffusion, even when commercially mature technologies are used. Another pre-condition is the creation of reliable biomass resource markets. Dinica explores how the policies implemented in Spain since 1990 failed to address the diffusion obstacles at both the supply-side and demand-side of bio-electricity production. This case-study offers important policy lessons for New Zealand, where the biomass potential can cover up to seven times the country's electricity consumption.

The last paper on energy issues focuses on the public support for renewables. Stephenson and Lawson challenge the "widespread assumption that there is a silent majority of people who support proposals" for renewable energy projects, but who chose not to make submissions when such projects are proposed in their vicinity. Their interviews with non-submitters living around two recently approved wind energy projects do not support this assumption. Non-submitters have a wide range of views on wind energy, but their views are less extreme compared to submitters. They recommend diversifying the methods of public engagement used in processes for the approval of renewable energy systems.

The last three papers in this issue of *Policy Quarterly* are focused on other matters. The Right Honourable Helen Clark, ex-Prime Minister of New Zealand and now the Administrator of the United Nations Development Programme provides the text of an address she gave to the Institute for Governance and Policy Studies, Tuesday 13 November 2012. In it Clark addresses the topic of improving global governance, discussing in particular whether global institutions are fit-for-purpose in the 21st century. Peace and security, economic governance, sustainable development and climate change are her specific focus, arguing for change to ensure their continued effectiveness, legitimacy and accountability.

Washington and Groves examine some recent examples of innovation in the New Zealand state sector in terms of the design and growth of innovation capability, major changes in that direction already achieved by some organisations and the seismic shift required more generally in the future. Noting the lack of innovation capability and risk aversion by ministers and officials recorded in the recent Better Public Services Advisory Group Report, the authors look at some innovative public sector responses to the Christchurch earthquake. The Canterbury District Health Board and Inland Revenue both created new initiatives or ramped up existing developments to improve their internal functioning and service delivery. Both organisations provide striking lessons for the future in building an 'innovation infrastructure' for the state services.

Innovation is also the starting point for the last paper in this issue. Written by Malcolm Menzies, it focuses on recent and future attempts to harness science for business. He argues against the mental model maintained in many quarters that sees "science and business existing in inherently different realms populated by people with separate and mutually exclusive sets of attributes". Instead he argues there are certain behavioural similarities in being a scientist and an entrepreneur, such that 'scientific entrepreneur' is not an internally contradictory notion – Sir Paul Callaghan stood as only one example. In fact, argues Menzies, such people should be recognised and given opportunities to lead the commercialisation process.

Valentina Dinica (guest editor on energy issues)
and Bill Ryan (co-editor)

Barry Barton

# The Denominator Problem
# Energy Demand in a Sustainable Energy Policy

Often when people think of policy for long-term sustainability they think of energy supply and not energy demand. What comes to mind often are new sources of supply on the very edge of technology, such as shale gas and deep-sea oil resources; or it may be renewable energy sources, such as hydro, wind, solar, geothermal and biofuels. But if people focus exclusively or excessively on supply, they are overlooking the demand side. How much energy must we produce in order to meet our human and economic needs? What assumptions are we making about future energy demand? In regard to a particular energy project going through an environmental impact assessment process, how do we evaluate whether the project is necessary?

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I have two simple, related points to make about these complex matters, without for a moment professing to have a full answer to them. The first is that the energy demand side is where we should put more of our effort for energy sustainability because, compared to supply, the demand side, including energy efficiency, offers better, quicker and cheaper policy options for reducing greenhouse gas emissions, for reducing the environmental impact of new supplies of energy, and for improving human well-being generally. The demand side calls for more law and policy attention because it involves human behaviour, not only engineering. The second point is that we need to put more effort into connecting our policies for demand and for supply. I will explain these matters briefly in their international context, then more specifically in New Zealand and in relation to electricity policy in particular.

### The role of energy efficiency

The demand side points us straight to energy efficiency. The importance and potency of energy efficiency is shown

by two different analyses of the way forward on a global scale in order to address climate change. The first is the latest annual *World Energy Outlook* from the International Energy Agency (IEA, 2012).[1] The *World Energy Outlook 2012* offers projections of energy trends to 2035 and insights into what they may mean. To do so it presents several different scenarios, differentiated mainly by their assumptions about government policies globally. The 'new policies' scenario takes into account, in a cautious way, broad policy commitments and plans that have already been implemented or have been announced. The current policies scenario embodies the effects of only those policies that had been adopted at mid-2012. The 450 scenario, in contrast, selects a pathway for actions that have a 50% chance of meeting the goal of limiting the global increase in average temperature to 2°C. Energy efficiency accounts for about 70% of the reduction in projected global energy demand from the current policies scenario to the new policies scenario by 2035, and 74% moving from there to the 450 scenario by 2035. In the abatement of energy-related carbon dioxide emissions, from the new policies scenario to the 450 scenario energy efficiency is projected to provide much the greatest component: 42% of the total abatement by 2035. By contrast, the contribution of renewables to the abatement by that date is 23%, of biofuels 4%, nuclear 8% and carbon capture and storage 17%. It is striking how large a contribution the IEA thinks that energy efficiency measures will make globally.

The second analysis is what has become known as the McKinsey Curve (Enkvist, Dinkel and Lin, 2010): an estimation of the cost and effect of different methods of reducing greenhouse gas emissions. It ranks different technologies in accordance with the cost of abatement per ton of carbon dioxide equivalent, and it assesses the amount of abatement in tons that each one could make beyond 'business as usual' by 2030. The most expensive options include carbon capture and storage, with concentrated solar, photovoltaic solar, wind and nuclear, each costing progressively less. But below them is a group of abatement measures and technologies that cost even less: fuel efficiency in vehicles, water heating, air conditioning, appliances, lighting and building insulation. In fact, these measures have 'negative cost' – they pay for themselves. While the McKinsey Curve is much debated, and (like the *World Energy Outlook*) is at a high level of generality, the key message is clear: energy efficiency is more important and more financially attractive than other technologies and policy measures.

**... the energy demand side is where we should put more of our effort for energy sustainability because, compared to supply, the demand side, including energy efficiency, offers better, quicker and cheaper policy options for reducing greenhouse gas emissions, ...**

What exactly is energy efficiency, if it is so important? Energy efficiency is a ratio of function, service or value provided, to the energy converted in order to provide it. In other words, it is the amount of work done in relation to the energy used (IEA, 2009). To increase energy efficiency is to increase the amount of the services that we get out of each unit of energy that we use. It is interesting that in many spheres of human activity the trend is for energy efficiency to improve naturally. The major OECD countries used a third less energy per unit of gross domestic product in 2000 than they did in 1973 (Geller et al., 2006). Cars in America now travel twice as far on a gallon or litre of gas (petrol) as they did in 1970. Lighting is now literally 1,000 times more efficient (in kWh per lumen-hour) than it was in 1300; in price, it is more than 10,000 times cheaper (Fouquet and Pearson, 2006). The challenge from a legal or policy point of view is how to accelerate this trend dramatically.

One would think that people would invest heavily in energy efficiency, for their own good. They do so invest, but they do so to a lesser extent than economic analysis would lead us to expect. People fail to make energy efficiency investments that appear to be rationally justified. To put it another way, people demand a return on investment much higher than they would expect elsewhere, for example in returns on money deposited with a bank. This is not an isolated phenomenon, but is very persistent. It is seen in households and in major companies, and is seen among both the rich and the poor. The phenomenon has come to be known as the 'energy efficiency gap' – a series of barriers that inhibit investment (Interlaboratory Working Group, 2000; IEA, 2008). Several barriers can be identified. The 'principal-agent' gap is exemplified by the division of costs and benefits where a landlord is not interested in investing in extra house insulation or in better heating appliances because the benefits will be reaped by the tenant, without a direct influence on the rent the landlord can charge. Other barriers which have been identified are information gaps, aversion to risk, and the presence of multiple gatekeepers whose approval or disapproval will influence an investment in energy-efficient technology.

Social and psychological investigations of energy use have been undertaken for quite some time, but they have not often been well integrated with conventional economics or with the making of law and policy. Human behaviour with respect to energy efficiency is complex and challenging. No single approach is

entirely successful. One multidisciplinary effort sought to make sense of energy behaviour in New Zealand households, with a particular focus on household space heating and water heating. It used several different social science methods, chiefly choice modelling and a national household survey with cluster analysis. It developed an integrated model of energy cultures: cognitive norms, material culture and energy practices; that is, what we think, what we have and what we do (Stephenson et al., 2010). Using this framework, it was possible to identify different groups of energy users, which are probably amenable to different energy efficiency policy tools (Lawson and Williams, 2012).

### Energy efficiency measures worldwide

Over the years, governments worldwide have devised a number of different policy measures to improve the uptake of energy efficiency (Eusterfeldhaus and Barton, 2011; Pasquier and Saussay, 2012; Ryan and Campbell, 2012). Information and education campaigns are among the simplest. Another that is apparently simple is a minimum energy performance standard or MEPS, which requires all appliances of a certain description – refrigerators, air conditioning units – to meet minimum standards of efficiency. Minimum energy performance standards work to eliminate the least efficient products from the marketplace. An MEPS that has been controversial in several countries is one to eliminate the traditional incandescent light bulb from regular use, and to replace it with compact fluorescent bulbs or other efficient light sources. A less intrusive requirement is for energy performance of a product or a vehicle to be stated on a label so that a prospective purchaser can make an informed decision. Subsidies can be used to encourage and enable people to invest in insulation or in replacing obsolete appliances. In some countries, although not New Zealand, energy companies selling electricity or natural gas can be required to produce demand-side management programmes where they make it easy for their customers to reduce or modify their energy needs. Other efficiency measures are found in building codes and in motor vehicle fleet performance standards. Nevertheless, simple price signals are often not enough to encourage energy efficiency; usually, a multitude of non-price barriers exist and prevent the uptake of efficient systems no matter how high the price of energy goes.

There is debate internationally about the efficacy of energy efficiency measures (Herring, 2006). This includes arguments about a rebound effect, where some of the efficiency gains are taken up by increased use of the service in question: if we use less fuel per kilometre, we are more tempted to go on longer trips. Energy efficiency measures can also be criticised for their effect on low-income households. However, detailed analyses provide a full rebuttal of these criticisms (Geller and Attali, 2005; Geller et al., 2006, p.556; IEA, 2009). Energy efficiency policy measures do work. They need to be carefully designed, and they need to distinguish between the promises of the engineering potential of a system and the operation of the system in practice.

**Energy efficiency policy measures do work. They need to be carefully designed, and they need to distinguish between the promises of the engineering potential of a system and the operation of the system in practice.**

California is a remarkable example of a jurisdiction where energy efficiency policies have been steadily and systematically applied for several decades with great success. The state uses less electricity per person than any other state in the United States. While per capita electricity consumption in the United States increased by nearly 50% over the past 30 years, California's per capita electricity use remained almost flat, due in large part to cost-effective building and appliance efficiency standards and other energy efficiency programmes (California Energy Commission and California Public Utilities Commission, 2008, p.6; Sachs, 2009, p.316). The legal framework is found in requirements for energy supply companies to provide 'energy efficiency portfolios' and budgets as a condition of regulatory approval. Another requirement affects decisions to build new power stations; the California Public Utilities Code §454.5 states as follows:

> (b) An electrical corporation's proposed procurement plan shall include, but not be limited to, all of the following ...
>
> (9) A showing that the procurement plan will achieve the following: ...
>
> C) The electrical corporation will first meet its unmet resource needs through all available energy efficiency and demand reduction resources that are cost effective, reliable, and feasible.

Since 2003 California's energy law and policy has defined a 'loading order' of resource additions to meet the state's needs for electricity: first, energy efficiency and demand response; second, renewable energy and distributed generation; and, third, clean fossil-fueled sources and infrastructure improvements. This strategy has had the benefit of reducing $CO_2$ emissions and diversifying sources of energy (California Energy Commission and California Public Utilities Commission, 2005; California Energy Commission, 2009). Energy efficiency is absolutely central in the state's energy law and energy policy. It is not peripheral in any way.

### Energy efficiency policy-making in New Zealand

Present energy efficiency policy in New Zealand is developed under the legal

framework of the Energy Efficiency and Conservation Act 2000. Section 5 of the Act states its purpose: 'to promote, in New Zealand, energy efficiency, energy conservation, and the use of renewable sources of energy'. It establishes the Energy Efficiency and Conservation Authority; it provides for the making of national energy efficiency and conservation strategies (NEECS); and it provides for the making of regulations for labelling and for minimum energy performance standards. By international standards, therefore, New Zealand has a far-reaching and progressive legal basis for the promotion of energy efficiency. Some aspects have been very successful. In particular, a subsidy programme for household insulation and heating, called 'Warm Up New Zealand: Heat Smart' and administered by the EECA, has been very successful and very good value for money (Grimes et al., 2012).

However, strategic direction in New Zealand under national energy efficiency and conservation strategies has been less successful. Although the first and second NEECSs had a number of positive elements, that of 2011 (Ministry of Economic Development, 2011) has a number of defects. It proposes that New Zealand continue to achieve a rate of improvement of energy intensity of 1.3% per annum. This target is an energy intensity rather than energy efficiency target. But the most extraordinary thing about it is that it is merely the reference scenario figure that is expected to occur anyway between 2010 and 2030, arising not out of policy action but out of the ordinary uptake of new efficient technology and possibly higher energy prices (Ministry of Economic Development, 2010). This is not taking energy efficiency policy seriously; it must be unprecedented for a policy target to be the same figure as is expected without policy action.

The poor treatment of energy efficiency is seen elsewhere in the NEECS of 2011. The strategy proposes seven sector-specific strategies and targets to achieve the overall rate of 1.3% per annum. Two of the targets are for renewable energy. One is for woody biomass and direct geothermal use in business. The other (which we will consider in more detail shortly) is that by 2025 '90% of electricity will be generated from renewable sources, providing security of supply is maintained' (Ministry of Economic Development, 2011, p.18). These two renewables targets have merit in being ambitious above present levels of performance, and in being specific and numeric. The third target is for household energy efficiency: that 188,500 homes be insulated by 2013. Again that is specific and numeric, which is good, but it is work that is well under way under the existing Warm Up New Zealand: Heat Smart programme.[2] The fourth is for products: to extend minimum energy performance standards, labelling and Energy Star product coverage 'to remain in line with major trading partners'. This is not specific and numeric, and even less ambitious. The last three targets are all for energy efficiency in transport, business and the public sector, and they are all phrased as targets of improvement from 2010 levels; but because no amount of improvement is stated, anything at all would qualify. This is unusual and unsatisfactory policy-making. We therefore see a pattern where the two renewables targets are couched in credible terms, and may well make a difference, but the five efficiency targets are weak. Energy efficiency is the poor cousin even in the national energy efficiency and conservation strategy itself.

There are other problems with the strategy. It is vague about the policy actions that will be undertaken to achieve the various targets; often no actions are stated at all. The targets are unconnected to the 1.3% per annum target in how much each will contribute. They are not supported by continuous data on energy efficiency, or by any evaluation of the success of existing policies; indeed, there is no reference to previous NEECSs (Eusterfeldhaus and Barton, 2011). Many of the criticisms made by the IEA of the draft relate also to the final document (IEA, 2010, p.50). Given the potential of energy efficiency to contribute to a more sustainable energy future, it is plain that the key strategy requires a great deal more policy effort than it has had.

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### Energy efficiency and renewables policy: the denominator problem

At this point we can turn to consider the connection between energy efficiency on the demand side and energy supply. There are many aspects to that relationship in an overall energy policy framework, and many of them are hugely challenging. One need think only of the complexities of transport, where much of New Zealand's fossil fuel consumption occurs, or building use and technology. But one matter is a vivid example of the relationship between supply and demand in a sustainable energy policy framework, and of the weakness of our present arrangements: renewable electricity generation.

The NEECS of 2011 (Ministry of Economic Development, 2011, p.18) continues the 2007 NEECS policy target of 90% renewable generation of electricity by 2025 (New Zealand Government, 2007), adding a proviso that security of supply is maintained. The target is referred to by a national policy statement under the Resource Management Act 1991 (RMA) (New Zealand Government, 2011). At present, renewable sources (mainly

hydro, with some geothermal and a little wind) account for most of New Zealand's total electricity generation. In 2011, total generation was 43,138 GWh (gigawatt hours), of which renewables was 33,097 GWh or 76.7% (Ministry of Economic Development, 2012, p.108). (The amount varies according to rainfall.) Ninety per cent renewables would be 38,824 GWh; on present consumption, there is a gap of 5,727 GWh to reach the target. The ministry reference scenario (Ministry of Economic Development, 2011a, p.6) for 2025 is for electricity demand of 52,000 GWh: 90% of that is 46,800 GWh, which leaves a gap of 13,703 GWh of new renewable electricity generation to find.

But would these requirements change if demand for electricity was moderated by vigorous energy efficiency policies? What if demand for electricity could be kept at present levels? (This may sound extravagant, especially if one thinks of likely population growth by 2025, but it simplifies the policy point; it is not forecasting.)[3] Less than half the amount of new renewable generation capacity would have to be built. To put it in concrete terms, let us use the Clyde Dam power station as a unit of measure. (The Clyde Dam was the last of the country's large hydro projects, and was intensely controversial.) Clyde, rated at 432 MW, produces about 2,100 GWh of electricity per annum. To achieve the 90% target on present consumption would require 2.7 Clyde Dams. To achieve the target on the 'business as usual' reference scenario for 2025 would be 6.5 Clyde Dams. So if we can stabilise demand, even if only to some degree, we do not need to invest nearly so much in renewable or any other kind of electricity generation. The main lesson from this 'denominator problem' is that we should focus not only on the '90' part of the fraction, the numerator, but also on the '100', the denominator – 90% of how much electricity?

The denominator problem received consideration by the Board of Inquiry into the Proposed National Policy Statement on Renewable Electricity Generation (Board of Inquiry into the Proposed National Policy Statement on Renewable Electricity Generation, 2010, paras 38-39 and 60, recommendation policy B.1).[4] The board saw a need for demand-side management to be taken into account in RMA policy-making in order to reduce the demand for new renewables. However, Cabinet decided to remove the reference to demand-side management, lest power companies be required to invest in energy efficiency before getting resource consents for renewable developments (Minister for the Environment, 2011).

Renewable energy sources have effects on the environment, even though their emissions of greenhouse gases and pollutants are low. New Zealand, like other countries, has seen much controversy about hydro generation projects, such as the Mokihinui River proposal, or wind farms, such as Project Hayes. Indeed, advocates for wild rivers will claim that hydroelectric generation is truly renewable only if the power company can create a new river. The supply of renewable energy has a negative side, just as do other sources of supply. The Parliamentary Commissioner for the Environment has considered the matter recently, not as to energy demand but as to protection of wild rivers by water conservation orders under the Resource Management Act (Parliamentary Commissioner for the Environment, 2012). Decision-makers are directed under the RMA section 7 to have particular regard to both the efficiency of the end use of energy and the benefits to be derived from the use and development of renewable energy. On the whole these considerations have strongly supported renewable energy projects in the resource consenting process (Palmer, 2011, p.145; Fisher, 2005). But the main reason why energy demand is not evaluated in RMA proceedings is that the need for a project is generally not a prerequisite for the grant of a resource consent for it. That is an issue of commercial judgement.[5] The RMA is oriented towards an examination of the adverse effects of projects, and away from economic planning. It would be difficult to re-direct the Act for the sake of energy demand alone, although that still leaves many opportunities under it to pursue demand management and energy efficiency more vigorously. Interestingly, for transmission lines, which may well accompany a renewable generation project, the need for the project will be scrutinised by the Commerce Commission in the approval of a grid upgrade plan.[6]

### Conclusion

To move towards an energy policy framework which produces long-term sustainability we need the demand side and energy efficiency to have a more central place than they do now. Policy action in relation to energy efficiency is not easy because it involves the complexities of human behaviour, but its substantial benefits are well recognised. We have considerable weaknesses in energy efficiency law and policy in New Zealand. The denominator problem that this article has particularly noted, of the relationship between a renewables target and the question of energy demand and energy efficiency, shows the need for a clear workable link or connection between different energy policy components. A good framework will guide project-specific decisions. Exactly how to make that connection is not easy – all the more reason for the matter to receive considerable policy effort.

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1 The *World Economic Outlook 2012* also introduces the efficient world scenario, which quantifies the effects of a major step-change in energy efficiency, assuming that all investments capable of improving energy efficiency are made, so long as they are economically viable, and any market barriers to them are removed. It sees substantial reductions

for demand for oil and coal by 2035. Getting there requires a public policy on energy efficiency that will: make it visible; make it a priority; make it affordable; make it normal; make it real; and make it realisable (pp.302, 322).

2 In 2011–12, 63,000 houses were insulated, taking total retrofits under the programme to 164,000 (Energy Efficiency and Conservation Authority, 2012).

3 But in fact growth in electricity demand has slowed noticeably, to 0.5% p.a. 2007–11 (Ministry of Economic Development, 2012, p.108).

4 The board did not use the term 'denominator problem' in its report, but I gladly acknowledge the origins of the term, and the insight that it contains, in the work of the board, and I thank the chairperson of the board, Royden Somerville QC, for valuable discussions of the matter.

5 Fletcher v Auckland City Council, Environment Court A82/07, 28 September 2007, at p.43; see Palmer (2011) p.121. Similarly, but mainly in relation to alternative locations, it has been held that an applicant is not required to demonstrate that its proposal represents the best use of the subject resources or is best in net benefit terms: Meridian Energy Ltd v Central Otago District Council [2011] 1 NZLR 482.

6 Electricity Industry Act 2010 s155, Commerce Act 1986 ss54R-54S. See Barton (2012).

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# Energy Efficiency in the Dutch Residential Sector: reflections on policy implementation

## Introduction

A major objective of Dutch energy programmes and strategies is the reduction in the emission of greenhouse gases, especially CO2. The CO2 reduction target currently being pursued by The Netherlands is 2% annually by 2020 below 1990 levels. Climate change mitigation has been receiving political attention in The Netherlands for a long time, resulting in a particularly close incorporation of energy programmes and measures into a comprehensive, long-term Dutch climate change policy programme, which started in 1998 after the country signed the Kyoto treaty.

In The Netherlands the built environment is responsible for 19% of domestic CO2 emissions (MNC, 2010). Within the built environment, the majority of primary energy consumption and greenhouse gas emissions are from dwellings. The Netherlands has approximately 7.5 million dwellings, housing its population of approximately 16.8 million people (Compendium voor de Leefomgeving, 2012). The CO2 emission impacts of the housing sector are of such a magnitude because many dwellings deliver poor energy performance. Therefore, there is significant scope for energy-efficiency improvements. By energy efficiency improvements we mean technical measures, such as thermal insulation and innovative, high-yield heating and cooling systems, which have the potential to dramatically improve energy efficiency levels of dwellings. If energy efficiency measures are to be applied on a large scale, it is necessary that homeowners be keen to adopt them, despite the fact that they are often unconventional.

Significant factors in the poor energy performance of dwellings are heat loss

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through porous walls, single-glazed windows and poorly-insulated roofs and floors. During the first decade of this century, energy prices doubled and electricity prices increased by 20%. (In The Netherlands gas is the main primary energy carrier.) Faced with increasing energy prices, tenants encounter economic hardship through higher living costs (Min BZK, 2011); there have already been cases of house evictions (Agentschap NL, 2012). Improving the energy performance of dwellings is therefore very important as an effective means to reduce fuel poverty (Healy and Clinch, 2004). Improving the energy performance of dwellings is also thought to result in an overall improvement in health (Milne and Boardman, 2000). Furthermore, it helps the Dutch government to achieve its climate policy goals. The Netherlands is committed to contributing to the European Union's climate policy target of 20% $CO_2$ reduction by 2020 compared to the 1990 level (Min BZK, 2011).

In this article we assess the role played by government policy in facilitating the transition towards sustainable energy consumption in dwellings. In addition, we seek to generate lessons for the New Zealand government regarding opportunities and challenges for energy efficiency improvements in dwellings. The article is structured as follows. First we explain what policy arrangements have been put in place in the period 2005–10, and describe the programmes aimed at both old and new residential dwellings. In the next section we address the implementation of these programmes and present arguments and reflections on the impact of their implementation. Following this, we reflect on the main experiences. We conclude by specifying some policy lessons from this Dutch case study that we consider relevant to the New Zealand government.

**Policy programmes on energy efficiency in residential areas**

Due to the influence of the Brundtland commission's report, *Our Common Future* (World Commission on Environment and Development, 1987), the issue of anthropogenic greenhouse emissions gained momentum in Dutch politics in the late 1980s. More attention was drawn to this issue in 1992 at the Rio de Janeiro Earth Summit, and in 1997 at Kyoto (De Jong et al., 2005). As a consequence, a formal climate mitigation programme was introduced in The Netherlands to achieve the national emission target set at Kyoto: 6% $CO_2$ emission reduction by 2010 as compared to the 1990 level (Min VROM, 1999).

**Besides encouraging local stakeholders to adopt energy efficiency measures, the programme also focuses on the development and demonstration of energy innovations in residential dwellings.**

Dutch climate policy is differentiated into economic sectoral packages, one of which concerns the 'built environment', meaning residential dwellings and utility buildings. In 2002 it was estimated that this sector would be responsible for emission of 57 megatons of $CO_2$ per annum by 2010. The goal for $CO_2$ reduction in the 'built environment' was 3.6 megatons per annum (Min VROM, 1999). This would lead to a 30% reduction by 2010 as compared to the 1990 level (SenterNovem, 2002).

In this article we address only residential dwellings. The programme in this sector has a reduction goal of 2 megatons $CO_2$ per annum (SenterNovem, 2002, p.5), and involves a comprehensive policy mix. Measures to reduce $CO_2$ emissions focus on different solutions, including change in energy consumption behavior, energy efficiency improvements, and use of renewable energy sources (SenterNovem, 2002). Given the character of the programme strategy and policy instruments, we believe that a further distinction in terms of government approach can be made between programmes for (a) construction of new residential dwellings, and (b) old residential dwellings. We address these below.

During the 1998–2010 period the Ministry of Housing was made responsible for implementation of the energy and climate policy programmes for residential dwellings. Managerial execution lay with the national energy agency SenterNovem, and operational execution at the local level with the municipalities (Hoppe, 2009). The main target groups of the programme are housing associations, homeowners, private commissioners (future home-owners) and project developers (SenterNovem, 2002). Besides encouraging local stakeholders to adopt energy efficiency measures, the programme also focuses on the development and demonstration of energy innovations in residential dwellings. Goals are to be achieved at household level, with homeowners adopting energy efficiency technology in household appliances. The basic presumption implies that they will make the investments with the expectation of a return due to lower energy costs in the long run.

*Programmes targeting energy efficiency in new dwellings*

The design and construction of new dwellings offers superior opportunities for sustainable energy consumption compared to the renovation of existing dwellings. A major advantage is that significant potential obstacles to high energy performance dwellings (which may be physical, social, institutional and infrastructural) are either minimal or absent. This permits a wider range of energy-efficient and renewable energy technologies and appliances to be installed, such as solar thermal, solar PV (photovoltaic) and even geothermal systems.

The main target group is project developers and future house-owners who are having new dwellings built. The policy programme mainly aims at improving

the energy efficiency performance of new dwellings by means of: minimum energy efficiency building standards; and subsidy schemes to encourage the adoption and diffusion of innovations (see Table 1). Beside these instruments there are several others, such as multilateral agreements and information campaigns. Here we address only the main instruments.

*Programmes targeting energy efficiency in old dwellings*

The most difficult challenge in the climate mitigation programme is to encourage the adoption of energy efficient technologies, measures and appliances throughout the existing (old) housing stock. This is because target groups are currently expected to invest in energy efficiency voluntarily. For these programmes the target group includes house-owners and small-scale landlords (who may rent living space to students in cities, for example), and housing corporations.

House-owners are most likely to be influenced to adopt energy efficiency measures at special times in a 'dwelling's lifetime' (SenterNovem, 2004). These 'natural moments' should provide significant windows of opportunity for adoption of energy-efficient measures. Renovation is such an occasion (Agentschap NL, 2012). Underlying the 'natural moments' logic is that house-owners and tenants have predominantly economic motives and expectations related to improved comfort. First, since they are already making an investment and there is some room for manoeuvre, it is easier for house-owners also to apply energy efficiency measures at such a time (even though these are seldom the main reason for action). Secondly, introducing energy efficiency measures at the same time as other modifications minimises the fuss and disruption involved for both house-owners and tenants. Beyond these 'natural moments', however, house-owners are quite difficult to target. In The Netherlands, renovation and maintenance activities in existing dwellings mostly do not require legal approval and permits. Local governments thus have little influence on such activities.

By contrast, housing corporations are relatively easy to target by means of policy instruments, since they own and manage large stocks of dwellings (on average 6,206 units per housing corporation). In The Netherlands, 389 housing corporations own 31.3% of the total housing stock, i.e. 2.4 million dwellings (CFV, 2012). Housing corporations are former semi-public organisations which manage dwellings with the public objective of delivering quality housing to citizens who cannot afford or do not have access to credit to buy houses themselves. The housing corporations were privatised in 1995 (Koffijberg, 2005) and ever since it has been the aim of the national government to achieve desirable societal goals in urban residential areas with their help. These policies mostly take the form of financial schemes, which are closely monitored and are accompanied by financial/economic and social performance indicators for the housing corporations.

**Table 1: Main policy instruments for energy efficiency in new dwellings.**

| Name of instrument | Type of instrument | Description | Assessment on the instrument's impact on energy performance (See section 3) |
|---|---|---|---|
| Energy Performance Standard (EPN) | Legal | Legal minimum standard reflecting the energy performance of a building to be constructed. Energy performance is expressed in the energy performance coefficient. The standard becomes periodically stricter. Meeting the energy performance standard is an obligation for anyone who builds a new dwelling. | Modest |
| Innovation subsidies | Economic | A subsidy scheme that supports local initiatives for demonstrating energy innovations that cannot yet compete under market conditions. | Modest |

**Table 2: Main policy instruments for energy efficiency in existing dwellings.**

| Name of instrument | Type of instrument | Description | Assessment of the instrument's impact on energy performance (see Section 3) |
|---|---|---|---|
| Energy Label | Voluntary, communicative | When selling one's dwelling one is expected to voluntarily hand over a certificate expressing the dwellings energy performance as a qualitative classification, where A++ expresses the best energy performance and F the worst. The energy label follows the implementation of the EU Directive EPBD 2002/91/EG. | Low |
| Rollout of Smart Meters | Physical, communicative | The Netherlands implements the EU Directive 2006/32/EG on energy efficiency, which also implies the replacement of old metering systems with intelligent ones. The EU aspired to have installation in 80% of households throughout the EU member states by 2020. Smart metering is assumed to increase the end-users' awareness of energy consumption and provide daily information on end-consumer electricity consumption to utilities. | Low |

The main policy instruments included in the programme targeting old dwellings are the energy label and the roll-out of smart meters (see Table 2). Not surprisingly, a lot of attention and budget is also devoted to information campaigns and subsidies. The programme targeting old dwellings has no legal standards.

**Implementation of the Dutch policy programmes**

Tables 1 and 2 present a qualitative assessment of the impacts of the policy instruments (column four). We have indicated whether the impact of the instrument was 'high', 'modest' or 'low'. We used these qualitative labels in the absence of straightforward quantitative performance data on assessment criteria. Performance data are either not monitored or are not disclosed to the public by the national government. This is also mentioned in Dutch climate mitigation programme evaluations (e.g., see KplusV, 2010). Below are our reflections that underlie arguments for our assessment of the two policy programmes.

*Implementation of programmes targeting energy efficiency in new dwellings*

*Energy performance standard*

The mandatory building energy efficiency standard (EPN) was adequately implemented, and was systematically and progressively tightened from 1995 onwards. The methodology of the standard is disputed, however. It differs substantially from other building energy performance standards elsewhere in Europe. Most European countries apply a standard which measures the energy consumption of a dwelling (in kilowatt hours) per square metre per annum. This is arguably a transparent method and is easy to measure. By contrast, the Dutch standard features a complex calculation method, which is considered (by adherents of innovative integrated housing designs, such as passive housing (discussed below)) to be non-transparent and to discriminate among energy systems and technologies with applications in buildings. Moreover, it is perceived as largely neglecting the impact of insulation on reducing energy demand. Furthermore, the building energy performance standard has been criticised by different experts in the field (such as project developers, passive housing experts and architects) as unambitious, as it provides little impetus for integrated system design of dwellings in order to optimise the energy efficiency standards (Faber and Hoppe, 2013). In sum, the legal requirement forces the target group members to meet a minimum standard, but it does not encourage them to build dwellings with energy performance that goes far beyond it, nor to adopt the most innovative energy efficiency technologies.

**Although several innovative projects were successfully carried out, the programme failed to achieve its main objective of supporting the transition towards a sustainable energy economy.**

In addition, current legislation prevents local authorities (which have the authority to enforce implementation of this legal instrument) from enforcing more ambitious local building standards. Moreover, ensuring compliance with the EPN standard is problematic, according to a 2007 survey in which EPN calculations turned out to be in error in 25% of cases, while the design was only constructed correctly in 50% of cases. Furthermore, monitoring policy enforcement is poor, as insufficient enforcement staff are employed by the local governments. Finally, construction safety and fire safety issues are prioritised over energy performance (Nieman, 2007; Min BZK, 2011).

*Innovation subsidies*

Innovation subsidies were implemented to encourage the adoption of innovations in dwellings (and utility buildings), and to 'support the transition to a sustainable economy'. The subsidies were part of a broader programme on energy research in the built environment ('Energie Onderzoek Subsidie Gebouwde Omgeving'), which started in 2005. Research focused on four areas: solar thermal systems, heat pumps, solar PV systems, and integrated systems for housing design. The subsidy scheme set strict criteria for the applicants – mainly collaborations between the market (project developers, material suppliers, construction companies, consultancies, housing companies) and public partners (universities, research institutes, local governments). These criteria were also applied to the innovation, and the pay-back period. The subsidy scheme involved co-financing the investments in energy efficiency materials and construction. It triggered several innovative projects, such as 'climate neutral dwellings' and the construction of passive housing design.

'Passive housing design' is an integrative concept which combines several measures to improve energy efficiency in dwellings: high-quality insulation, mechanic ventilation with heat recapture, and orientation towards the sun; sometimes, solar heating and solar PV systems are installed in addition. Passive housing will become the minimum energy performance standard for new dwellings in the EU member states from 2020. A successful demonstration project was the construction and retrofitting of 246 dwellings in the city of Roosendaal during 2008–11. This was the first time that the passive housing standard was applied on a large scale in The Netherlands. Previously, large-scale application of this innovation had been confined to the Nordic and Germanic countries. In total, 58 demonstration projects and experiments were carried out following the 'integrated system' programme tender (SenterNovem, 2007); and 15 demonstration projects (with at least 50 dwellings on-site) were funded following the 'climate neutral dwellings' programme tender.

Although several innovative projects were successfully carried out, the programme failed to achieve its main

objective of supporting the transition towards a sustainable energy economy. In common with many other Dutch innovation programmes, the focus in the demonstration projects was too much on technology and the supply side of the market. For that reason, the programme failed to consider the human and organisational factors and social acceptance that are necessary to trigger the adoption and diffusion of energy efficient and sustainability-oriented innovations. Moreover, it focused too little on the diffusion of best practices and lessons learnt. This was in large part due to the programme design, which placed the emphasis on technological measures which counted as 'proven technology', with fixed, short pay-back periods (to safeguard 'short-term feasibility of business cases'). Thereby, the programme omitted more radical, but financially risky, innovations and practices (Rotmans, 2011). Furthermore, some of the experiments and demonstration projects could not be carried out properly or were blocked altogether. This was due to a combination of factors: lack of regulative room (for organising 'policy experiments', thereby giving geographic and temporal exemption from existing regulations); limited interaction between stakeholders; and a lack of alignment in visions and strategic agenda-setting (Faber and Hoppe, 2013).

### *Implementation of programmes targeting energy efficiency in old dwellings*

#### *Energy label*

The energy label was designed to support and speed up the monetary appreciation of energy performance in buildings. Homeowners are required to hand over energy labels indicating the energy performance of their dwellings when their dwelling is offered for sale. The energy label (see Table 2) was introduced in The Netherlands in January 2008, following the Energy Performance Building Directive (Directive 2002/91/EC). Among EU member states, The Netherlands was the last country to introduce the label (the other member states having done so in 2006). In the years prior to 2008, the right-wing Dutch government continually postponed implementation of the directive for fear of high administrative costs (Hoppe, 2009).

When the energy label was finally introduced, it encountered significant implementation obstacles from the main target group, homeowners, organised by their representative association 'Own House' ('Eigen Huis'). This influential association publicly dismissed the reliability of the assessment method underpinning the energy label, and actively discouraged adoption by its members (Vereniging Eigen Huis, 2008). The energy label was problematic in other respects, too. Given its voluntary nature, the option was open for house sellers and buyers to omit any references to the energy label from the sale/purchase contracts. The seller is only obliged to provide an energy label to a potential buyer at the latter's request, and not at the request of any public authority. Hence, despite its 'obligatory nature', it is a voluntary instrument. Once it was known that energy labels were not really obligatory, energy labelling was dismissed in most housing transactions because house buyers ('on whom the costs would be eventually passed by sellers') were not willing to pay the amount of money involved to have an energy label drawn up by an engineer (the lowest price being €177). By 2012, only 2 million dwellings (of a total of 7 million) had acquired energy labels. Of those, only 13% were rewarded a 'green label', indicating the more advanced energy performance: labels 'A++, A+, A and B' (PBL, 2012).

In sum, the energy label might have been a potentially effective instrument, but it was compromised by its voluntary nature. In addition, slow progress is also explained by indirect implementation problems, in particular poor communication and coordination between central and local governments on support programmes (KplusV, 2010). Nonetheless, labelling also had a few positive effects: for instance, there appears to be a positive correlation with the financial-economic appreciation of dwellings (Brounen and Kok, 2011). Adoption of energy labels by housing companies was modest, even though they were legally obligated in 2008 to have energy labels applied to their housing stock. As a result, half of the social housing stock (1.2 million dwellings) had been labelled by 2011 (Min BZK, 2011).

**[The end users] did not like the idea that an energy company would have access to their private 'real-time' energy consumption data, and requested the responsible minister to investigate grounds of unlawful intrusion of privacy.**

#### *Roll-out of smart meters*

Smart meters record the consumption of electric energy in intervals of an hour or less, and communicate that information at least daily back to the utility for monitoring and billing purposes. Smart meters also provide end-users with feedback on their energy consumption, which might serve as an incentive to reduce domestic energy consumption. As in other EU member states, smart meters were planned for installation in all domestic dwellings in The Netherlands (against a penalty of up to six months in jail or a fine of up to €17,000 for refusing installation). However, the roll-out of smart meters was not successful.

This failure had its origin in the defective design of the policy instrument. To start with, the policy-making process placed great emphasis on the technical and commercial aspects, but neglected end-user aspects. The policy-making arena consisted of energy companies, producers of smart meters and national government; dwelling occupants and their representative bodies were not invited

to participate. By shutting out the end-users, the policy makers failed to identify risks that would occur when the roll-out was introduced. By 2008, when the smart meter roll-out was in full swing, it turned out that many dwelling occupants were opposed to the installation of smart meters in their dwellings. They did not like the idea that an energy company would have access to their private 'real-time' energy consumption data, and requested the responsible minister to investigate grounds of unlawful intrusion of privacy. In June 2008 a committee confirmed this claim. This meant that dwelling occupants could henceforth lawfully refuse smart meter installations: this created a precedent which effectively blocked any further smart meter roll-out.

In sum, the Dutch experience shows that introducing smart metering is liable to failure when the technical and commercial aspects are considered to be more important than the interests of the end-users (Hoenkamp et al., 2011). Another implication is that sustainable energy transitions may require legal changes more broadly, beyond energy programmes, to generate new and coherent legal frameworks. In this case, simultaneous changes in privacy legislation would have prevented end-users appealing and winning.

### Lessons

Central government had the programmes evaluated in 2010 (Min BZK, 2011). The Ministry of Internal Affairs and Neighborhoods concluded that, 'although progress had been made, a "breakthrough" in terms of meeting pre-set goals, had not been achieved' (Min BZK, 2011, p.4). In other words, progress had not been substantial. As we have shown, this was largely the result of a combination of factors: too ambitious goal-setting (very high energy efficiency targets, not matched by suitable policy instruments, as in the case of the energy label and smart metering); the failure to (adequately) involve key target groups in policy-making processes, and an overemphasis on technology and neglect of 'human' and organisational factors in innovation policies; the predominance of 'soft' policy instruments and the lack of legislation; innovation programmes which favour relatively un-innovative technologies and practices; target group members' mistrust of the energy labels, energy performance standards and their methodologies; and few incentives to encourage target group members to start radical innovative demonstration projects beyond the state-of-the-art of technology. These policy design and policy implementation obstacles are consistent with findings of other academics regarding the failure of 'green' transitions in the built environment (e.g., Rohracher, 2001; Ornetzeder and Rohracher, 2006; Van Bueren, 2009).

### Policy advice to the New Zealand government

Based on the Dutch lessons, we would advise the New Zealand government wishing to adopt similar policy instruments to:

- develop transparent and simple energy performance methodologies for energy standards and labels to make them adaptive to change;
- allow for temporal and geographical legal exemptions from the energy performance standard and label regulations in order to permit innovative experiments and demonstration projects;
- focus not only on technology and the rapid commercialisation of innovative technologies and practices;
- pay sufficient attention to 'human' and organisational factors, especially social acceptance;
- be sure to set innovation subsidy criteria which permit innovative technologies that are not yet (market) proven and do not focus only on financial/economic feasibility (e.g., short-term pay-back periods);
- involve end-users (dwelling occupants) early in policy-making processes, in order to avoid not identifying barriers that might threaten policy effectiveness once the policy programme is implemented;
- ensure that energy labels are really obligatory, not just a voluntary instrument disguised as a mandatory instrument (check legal frameworks for potential grounds for exemption).

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Valentina Dinica

# BIOELECTRICITY
## renewables' Cinderella in Spain, New Zealand and worldwide

Ever since the oil crises of the 1970s, governments around the world have grappled with the challenge of increasing the security of energy systems. On the demand side, policy interventions have focused on the energy efficiency of technologies, products and buildings, and on energy conservation through behavioural changes. On the supply side, the deployment of domestic renewable energy sources emerged as a logical option; this was especially encouraged in the contexts where political leaders also agreed to address the environmental impacts of energy production based on fossil fuels (air, water and soil pollution, next to biodiversity and human health impacts). The 1980s and 1990s brought about wider global concerns regarding the sustainability of development, reflected in the adoption by most governments of the 1992 Rio de Janeiro Declaration on Environment and Development and numerous other international agreements. Key among such concerns have been the depletability of natural resources, especially fossil fuels (United Nations, 1987), and the impacts of greenhouse gases on climate change. In many countries these concerns have consolidated significant societal support towards the idea of publicly subsidising the use of renewable energy resources if this is a necessary condition for a transition towards sustainable energy systems.

The renewable resources that are currently offered subsidies are solar and wind energy, geothermal, small hydropower,[1] ocean energy, and biomass, which is a common name for a wide variety of organic materials such as wood, crop and forest residues, grasses, and organic wastes from farming. A quick worldwide overview of renewables' uptake shows that the use of such resources in the total

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primary energy supply increased from 0.2% in 1973 to 1.4% in 2011 (IEA, 2012a, p.7). The total primary energy supply includes all three basic forms of societal energy consumption: heat, electricity and transportation fuels. A closer look reveals that the increase in renewables' uptake has mostly come in the form of electricity generation.

More interestingly, the best diffusion results have been obtained so far by onshore wind, based on technologies emerging in early 1970s. By 2011 the worldwide capacity of onshore wind energy was 240 gigawatts (GW) (IEA, 2012b, p.13). While this is good news, another statistic is quite worrying: that biomass, the oldest energy resource humankind has used since the discovery of fire, fuelled a power capacity of only 70 GW by 2011. Coincidentally, the very same power capacity was reached by a quite recent and very expensive technology producing electricity from solar energy: photovoltaic cells. This is an intriguing situation which is replicated across continents and countries (IEA, 2012b).

The low uptake of biomass is even more surprising because biomass resources are plentiful worldwide, and some technologies available for their conversion into electricity are technically mature or close to commercialisation (Johansson et al., 1993, pp.593-651). The uptake of biomass in New Zealand reflects this worldwide situation. While New Zealand has a particularly high potential for biomass resources by international standards, which could realistically cover at least twice its 2011 electricity consumption, by that year bioelectricity (or biomass-based electricity) accounted for only 1.3%.[2]

These statistics raise several questions worth exploring in some depth. Why does bioelectricity make such a meagre contribution to national energy systems? Can we explain this exclusively in terms of the extent of public financial support offered for renewables? Given that biomass resources have significantly greater advantages than any other renewables, why would governmental support be smaller? Are governments properly informed about these advantages? What other obstacles impede the diffusion of bioelectricity, and how can governments help to remove them, so that biomass can contribute to the sustainability of energy supply systems to their full potential?

This article tackles such questions by means of a longitudinal case study examining the diffusion challenges of bioelectricity in Spain between 1991 and 2011. This timeframe is relevant for New Zealand, because the extent of bioelectricity diffusion in New Zealand by 2011 was similar to that of Spain in 1991, with, in both cases, only 107 MW (megawatts) of capacity installed (Dinica, 2003, p.321; Ministry of Economic Development, 2012, p.113). Moreover, the same types of resources are now used in New Zealand as were used in Spain two decades ago: biogas (40 MW) and wood residues (67 MW). The Spanish case study offers the New Zealand government and energy stakeholders a look into a possible, bleak future for bioelectricity in this country, unless political and societal efforts are mobilised to tackle diffusion obstacles properly.

One can argue that the story of bioelectricity in Spain is a diffusion failure story because, after two decades of governmental financial and policy support, by 2010 the installed capacity was only 706 MW (Tena, 2012, p.36). By comparison, the intermittent wind technology reached 20,744 MW over the same timeframe. Solar photovoltaic technology accounted for 3,787 MW, its diffusion having started in 2004 (*Plan de Acción por las Energías Renovables,* 2010, pp.470-1). This diffusion result needs to be seen in the context that Spain has the third largest biomass potential in the European Union. In 2010 bioelectricity represented just 5.5% of Spain's electricity consumption, while its biomass potential could supply almost all annual electricity needs.[3] By exploring this case study, this article aims to improve the understanding of biomass resources and bioelectricity among the New Zealand public and decision-makers, and to generate policy lessons on the types of governmental interventions needed to avoid similar disappointing statistics in the decades ahead.

But what exactly are biomass resources, what is bioelectricity, and why are they important from a sustainability standpoint? These questions are addressed in the next section. Biomass is the most complex renewable energy resource, and its transformation into electricity can be achieved by means of a diversity of old and new technologies. The next section introduces the Spanish case study, focusing on the political aspects of the public support for bioelectricity. This ushers in a discussion of the diffusion obstacles on the demand side and on the supply side of bioelectricity production. In this context I examine the legal and policy interventions adopted so far, their effectiveness, and the extent to which the most recent policy commitments have actually been implemented. The article concludes with reflections on the need for policy innovations in New Zealand to support bioelectricity diffusion.

**While New Zealand has a particularly high potential for biomass resources by international standards, which could realistically cover at least twice its 2011 electricity consumption, by that year bioelectricity (or biomass-based electricity) accounted for only 1.3%**

### Biomass resources, bioelectricity and benefits of their use

Biomass is basically solar energy captured and stored by plants as chemical energy by means of photosynthesis. When we burn

plants, we destroy their internal chemical connections, and this process generates heat. Fuelwood is the most widely known biomass resource, used for millennia for cooking and heating purposes. However, plants are consumed by animals and humans, which means that farming and other human activities also produce biomass resources.

In modern societies, biomass energy resources are often grouped into two categories according to their energy content: primary and secondary resources. Secondary resources are organic wastes from industrial or agricultural applications. They can be generated by, for example, the paper and furniture industries, the food and drink industries, farming companies (generating animal manure that can be transformed in biogas), sewage/wastewater treatment stations, and solid wastes disposal sites (generating landfill gas). These resources are called secondary because their organic content was already harnessed once in various non-energy applications. They still have a useful residual organic content which can be extracted for energy purposes, but it is generally inferior to that of primary resources. Primary biomass resources are considered to be forest and agricultural wastes, industrial organic wastes or residential wastes (mowed grass) that have not been used in any way previously (never been exposed to chemical/thermal treatment). They are also sometimes referred to as clean resources. This category also includes existing (commercial) forest stocks and dedicated energy crops: i.e. plants or trees grown for the purpose of harnessing their energy content. Thus, biomass is a heterogeneous resource which comes in a diversity of forms, costs and energy values.

But is biomass a sustainable energy resource, in terms of resource depletability? Secondary biomass is produced by human activities and so its exhaustablility is less of a concern. Primary biomass, however, is a renewable resource (and climate neutral) only insofar as its consumption rate is lower than its production rate. This is why biomass energy planners give priority to the use of certain crops and tree species which grow very fast. Given the importance of the consumption rate, societies should also strive to promote the use of energy technologies with a high efficiency of biomass conversion into energy services.

Bioelectricity can be produced using four different technological principles for electricity generation. Direct combustion and anaerobic fermentation are commercially mature technologies. The problem with direct combustion, however, is its low efficiency, typically between 5% and 28% (Johansson et al., 1993). Higher efficiencies can only be obtained for plants with a generating capacity larger than 50 MW. When combustion takes place in co-generation plants (which supply to consumers both electricity and heat) the combined efficiency increases to 50–80% (Carrasco, 2002). Anaerobic digestion results in a biogas which contains high levels of greenhouse gases like methane and carbon dioxide. That biogas can be burnt with energy conversion efficiencies varying between 27% and 60%.

A promising group of technologies, referred to as gasification technologies, are able to transform biomass into combustible gases. They emerged in the 1970s and can reach efficiencies of 40–50% when large-scale projects are possible (Hume, 2005, p.8; Carrasco, 2002). However, they are more expensive and are best used in combination with primary biomass resources, given their superior energy content, to make an investment economically worthwhile. Likewise for the fourth technological principle, pyrolysis, which involves the transformation of primary sources into bio-oil. This can be used either for electricity generation or as transportation fuel. While pyrolysis is the most promising technology, with efficiencies of bio-oil production expected of around 80%, it is still in the development stage and very few governments around the world are committed to financially supporting it (Carrasco, 2002). Gasification technologies are also in need of technical improvements, but their development is closer to commercialisation than pyrolysis.

**Bioelectricity scores particularly high on the social and economic dimensions of sustainable development, compared to the other renewables, while having several unique environmental benefits**

The above considerations on resource availability are embedded in the wider concept of sustainable development. Seen at the societal level, sustainable development has been defined as the type of development that meets the needs of current societies without compromising the ability of future generations to meet their own needs, social, economic and environmental (United Nations, 1987). The societal diffusion of any individual renewable energy technology has benefits along each of these mutually-influencing dimensions of need. Looking at renewable energy metaphorically as a 'family' of resources, one could argue that bioelectricity is the most generous of all renewable energy sisters in terms the societal and ecological benefits it offers. Bioelectricity scores particularly high on the social and economic dimensions compared to many other renewables, while having several unique environmental benefits. For example, bioelectricity production based on secondary resources avoids the emission of greenhouse gases from the organic wastes unwanted for any other economic applications. This has an economic value when markets for the trade of greenhouse gas emission rights exist, as in the EU. Moreover, bioelectricity reduces environmental pollution from industrial and agricultural activities, the contamination of soils, water and air. These benefits are additional to the benefits all renewable energy sources bring

by avoiding the environmental impacts of the displaced fossil fuel technologies.[4] The use of primary resources combats soil erosion and can help restore degraded and abandoned lands.[5]

The social benefits are also considerable, as bioelectricity generates the highest employment per installed megawatt capacity of all renewable energy sources. For example, in Spain in 2011 bioelectricity plants created 22.3 new permanent jobs per megawatt installed (APPA, 2011a). The lowest employment is generated by wind energy and solar photovoltaics (Johansson et al., 1993). For bioelectricity, higher employment is generated not only in the construction phase but also (and especially) in the exploitation phase. The economic supply chain of biomass is very long and includes collection, processing, transport, transformation in feedstocks and storage. The supply chain of biomass can re-boost rural socio-economic development, offering jobs for people with lower qualifications. Another unique benefit is that the use of clean agricultural and forest residues reduces the risk of fires, which is significant in both Spain and New Zealand, and likely to increase with climate change.

In addition, biomass is the most hard-working of all the renewable energy sisters. A biomass power plant can operate for 8,000 hours per year, while most good sites for wind or solar power hardly enable operation for a third of this time. Biomass is also the most reliable of them because it can be generated continuously. It does not need expensive batteries for stand-alone applications, and it can even be used to cover peak demand. It is worth noting, finally, that biomass is the only resource that can serve all three basic forms of societal energy needs: heat, electricity and transport fuels. In the latter case, biomass is transformed into oils referred to as biofuels, such as bio-ethanol (from corn or sugar cane). Governments worldwide are very interested in biofuels, given the limited options for sustainable transport fuels. However, some scientists believe that the use of electric vehicles based on bioelectricity is a superior long-term solution. Campbell et al. (2009, p.1055) stated in the journal *Science* that:

> bioelectricity outperforms (bio-) ethanol across a range of feedstocks, conversion technologies, and vehicle classes. Bioelectricity produces an average of 81% more transportation kilometers and 108% more emissions offsets per unit area of cropland than does cellulosic ethanol. These results suggest that alternative bioenergy pathways have large differences in how efficiently they use the available land to achieve transportation and climate goals. (Campbell et al., 2009, p.1055)

**Table 1: The increase in power capacity 1991–2010**

| Year | 1991 | 1995 | 1998 | 2000 | 2005 | 2010 |
|---|---|---|---|---|---|---|
| installed capacity (MW) | 107 | 152 | 188 | 217 | 486 | 706 |

Source: IDAE, 2007; *Plan de Acción de Energías Renovables*, 2010

A significant factor in the superiority of bioelectricity is that electric vehicles are much more efficient than internal combustion engines. Biofuels could therefore be viewed as a transition pathway towards a future where the use of electric vehicles based on renewable electricity is dominant, and in which bioelectricity plays an important role.

Consequently, taking a long-term view, bioelectricity is the most worthwhile of the three basic forms of societal energy needs that biomass resources could support. This makes the examination of the obstacles to bioelectricity diffusion even more compelling.

### The political dimensions of bioelectricity diffusion in Spain, 1991-2011

In contrast to New Zealand, which is rich in both renewable and non-renewable resources, Spain has the highest dependency on imported energy resources in the EU: about 80–82%. Having been severely hit by the oil crises of the 1970s, most governments pursued policies aiming to promote domestic energy resources for security of supply. The Spanish governments seem to have been aware, already in the 1980s, of many of the benefits of bioelectricity discussed above. This can be seen in the introduction of legal instruments to offer bioelectricity financial support, and in the national plans for renewable energy. The first ones, adopted up to the mid-1990s, mentioned the potential of bioelectricity to reinvigorate the struggling agricultural sector, and the employment benefits. Later, other benefits were acknowledged as justification for increasing the social tariffs paid to renewable electricity. The avoidance of soil erosion, fires, environmental pollution and greenhouse gases were considered particularly important (APPA, 2004).

**... taking a long-term view, bioelectricity is the most worthwhile of the three basic forms of societal energy needs that biomass resources could support: heat, electricity and transportation fuels**

The acknowledgement of these benefits was, however, not reflected in an attractive legal framework offering bioelectricity production sufficient and reliable financial support to make projects economically feasible. Table 1 gives a snapshot of installed capacity increases since 1991. The pace of diffusion has been very slow, reflecting, among other things, the very incremental improvements in the legal framework for economic support over the past two decades (discussed in the next section).

The governmental targets for bioelectricity have never been achieved, and have been continuously trimmed

back. The target set in the 1999 government plan for the support of renewable energy was to develop 5,311 MW by 2010. This was later downgraded twice, to 1,695 MW by 2010. The latest plan of action for renewable energy aims for an installed capacity of only 1,350 MW by 2020. Of all renewable energy resources, biomass is the only one that was subjected to consistent and significant government cut-backs in targets. This suggests a limited political commitment on the part of the Spanish government to bioelectricity, which can also be seen in financial terms. The production subsidies offered during 2010 to all 'renewables sisters', totalled €5.1 million. Of this, only 5.2% went to bioelectricity. Solar photovoltaics received the highest support, with 48.5% of the budget, followed by wind energy with 36.5%; the late-comer, solar thermoelectric technology, was given 3.8% of the budget; the remaining 6% went to small hydropower plants (APPA, 2011a, p.100).

While solar energy has indeed a large potential in Spain, it is still much more expensive than bioelectricity, even when primary resources are used. It also generates the lowest employment per unit of capacity installed (APPA, 2011a), and it is intermittent. Wind energy is also intermittent and experts estimate that, given technical features of the grid infrastructure, Spain can only accommodate about 30% of wind energy in the electricity system (Menendez, 1998). This is equivalent to around 33,600 MW of wind power, of which two-thirds have already been installed. Returning to the metaphor of the renewable energy sisters, in the light of the relative benefits discussed earlier, one cannot help but see bioelectricity as the family's Cinderella.

Having studied the situation of renewable energy sources in Spain extensively since late 1990s, it appears that three main reasons underpin this limited political commitment. First, of all benefits the Spanish government prioritised security of supply, and later the reduction of greenhouse gases, meaning that the overall target for renewal energy was more important than the targets per renewable energy type. Besides, the EU targets on renewable electricity per country have always been aggregated for all renewable energy sources. As wind turbines and solar technologies do not have a supply side that needs government intervention for development, and are technically easy to install, they have been seen as easier options to increase the share of renewable energy in the electricity system in short–medium term.

**Decision-makers have been very slow to learn about the diversity and costs of biomass resources, ... which have consequences for the economic feasibility of bioelectricity projects.**

Second, decision-makers were interested in helping Spain become a world leader in the manufacturing of at least one renewable energy technology that was most likely to be of interest to governments worldwide (Dinica, 2003). It was considered in the early 1990s that wind technology was the closest to commercialisation, and that it was worth trying to stimulate the emergence of a strong Spanish industry for the manufacturing of wind turbines and all necessary equipment. By subsidising the production of wind power quite heavily, and requiring all foreign manufacturers to establish joint ventures with Spanish companies with production facilities in Spain if they wished to qualify for production subsidies, the Spanish government was very successful towards this goal (Dinica, 2003). Hence, the preference so far was to create employment by developing new manufacturing industries, as many industrial corporations (active in the areas of ammunition, aviation, mechanical equipment, etc) were facing dwindling demands and close-downs. The same industrial strategy can now be seen in the extensive production subsidies for solar technologies.

The third reason has to do with learning processes in the public sector. Decision makers have been slow to learn about the diversity and costs of biomass resources, the development needs of the more efficient resources and technologies, and the complex interactions between resource types, electricity technologies and project sizes, which have consequences for the economic feasibility of bioelectricity projects. This learning is illustrated below. While policy learning has been much faster among governmental officials, the electoral cycle typically makes learning among politically-elected decision-makers more time-consuming. This is a general problem for sustainable development challenges which are particularly complex, requiring political leadership for a whole-of-government approach.

Thus, when put in perspective the Cinderella treatment of bioelectricity in Spain can be rationalised to some extent. The following section explains the main features of the legal frameworks for price support adopted over the past two decades. This helps to understand the magnitude of (and changes in) the economic and financing obstacles.

#### Diffusion obstacles on the demand side of bioelectricity production in Spain

An energy conservation law was put in place in 1980 which guaranteed grid connection, along with some undisclosed financial support per kilowatt hour (kWh) supplied to the grid as excess by independent power producers. This was perceived by potential commercial investors as highly unreliable, as they prefer to see in legislation the price per kWh offered – referred to as social tariff or premium – and a specified contract length, ideally as long as the plant's economic life (Dinica, 2006). It took stakeholders a very long time to persuade decision-makers that only such legislative specifications would raise enough investment interest

among commercial and financing agents to achieve the objectives for installed capacity increase for bioelectricity. Up to 2011 there were many improvements in the legal framework in these two respects. However, in contrast to all other renewable energy sources, the improvement on the social tariff/premium offered for bioelectricity has been very slow.

In 1994 the Spanish authorities took the first steps towards liberalising the electricity industry, adopting a new electricity law and a special royal decree for renewable energy sources. Addressing the concerns of interested commercial agents, the law stated that contracts with independent power producers would be guaranteed for a minimum of five years. In addition, it removed the reference to excess electricity, which meant that only self-generators would be eligible for economic support. The decree introduced clearly specified feed-in tariffs per kWh, differentiated per renewable energy type, but failed to differentiate between secondary and primary resources. The price support offered in 1994 was hardly relevant for bioelectricity production (about a third to a half of the costs of production based on primary resources at that time). By 1998, three-quarters of the installed capacity used secondary resources. The dominant resources were biogas and industry wastes, which helped project owners avoid environmental charges (Dinica, 2003, pp.317-62).

The industry liberalisation project was completed with the 1997 electricity law, followed by another special decree for renewable energy sources in 1998. This new legal framework introduced market spot prices at generation level, giving renewable electricity producers two options: stay with contractually-guaranteed feed-in tariffs, or trade electricity in the spot market and receive a social premium on top of the spot price. Given that social premiums were higher than tariffs (to reflect the higher risk taken by investors), most large investors have opted for social premiums. Another change was the differentiation between primary and secondary biomass in the new decree. The price support offered per kWh increased for the tariff option, but insignificantly. The government preferred to make use, complementarily, of investment subsidies, targeting projects based on gasification and/or primary resources (offering maximum 30% of investment costs).

**Table 2: Primary biomass resource potentials and costs, assuming 45% humidity**

| Resources types | | Potential MTOE/year[6] | Average cost €/ton |
|---|---|---|---|
| Existing forest stocks | Woody wastes | 0.6 | 26.6 |
| | Harvest of existing trees commercially available | 3.4 | 43.2 |
| Agricultural wastes | Plant wastes | 6.4 | 20 |
| | Woody wastes | | |
| Energy-dedicated agricultural plant-crops | | 3.6 | 45.6 |
| Energy-dedicated forests on agricultural lands | | 1.5 | 34.7 |
| Energy-dedicated new forests on 'forestry lands' (hills, mountains) | | 1.8 | 42 |
| Primary biomass potential in Spain | | 17.3 | – |

Source: *Plan de Acción de Energías Renovables*, 2010, p.165

A follow-up decree, adopted in 2004, finally differentiated more meaningfully among ten types of biomass resources, three primary and seven secondary. A small price increase was given to investors choosing the premium option. The price difference between primary and secondary resources for the tariff option remained insignificant. Only very small increases in the tariff levels were allocated. The second important change in the 2004 decree was the introduction of long-term contracts for power purchase, set at 20 years. This was applicable only for primary and biogas resources.

The most recent change in the legal framework happened in 2007, when the level of price support became more realistic, given the expense of primary biomass resources (see Table 2). Secondary biomass was given between 7 and 11.3 euro cents/kWh, and primary biomass between 11.3 and 15.5 euro cents/kWh (*Plan de Acción de Energías Renovables,* 2010). The contractual guarantee lowered to 15 years for any new project. This is a setback, but still better than what was offered in the past. Overall, the legal frameworks of the 2000s have slowly increased the price support levels, which can be seen in a transition towards the use of primary biomass. By 2011, half of the installed capacity mixed secondary with primary resources, and 20% was exclusively based on primary resources (APPA, 2011b).

**biomass is the only renewable energy source that has a supply side. ... Its development requires policy innovation within, and coordination across, many institutional, legal and policy frameworks in policy domains that have so far evolved outside the scope of energy policies.**

Nevertheless, the 2007 price increases are still not high enough. The estimates of the government energy agency IDAE show that many resource/technology/size combinations of projects are still uneconomical (*Plan de Acción de Energías Renovables,* 2010, pp.169-73). Finally, the low levels of price support have resulted in investments that overwhelmingly use the two older technological principles described earlier: anaerobic digestion and direct combustion. By 2011, four small experimental projects were using the gasification technology (APPA, 2011b),

**Table 3: Size of bioelectricity projects**

| Size of project | 2002 | 2011 |
|---|---|---|
| <1 MW | 23% | 24% |
| < 10 MW | 49% | 47% |
| < 30 MW | 26% | 24% |
| > 30 MW | 2% | 5% |

Source: based on Dinica, 2003 and APPA, 2011b.

but there were no projects based on pyrolysis for electricity (only for biofuels, which receive much higher subsidies). Overall, the legal frameworks applicable for bioelectricity since 1990 aiming to address the economic obstacle have improved in the two main aspects of interest for commercial agents, banks and insurers: length of contractual guarantee and extent of price support. However, the pace of improvements has been too slow and they have enabled only a small number of projects to be profitable.

In addition, bioelectricity developers also encountered serious financing obstacles, given the policy-related risks to the economic feasibility of projects. These were especially high during the 1990s, before the long-term contractual guarantee was introduced. About three-quarters of the projects developed in that decade used internal financing schemes: either the financial resources of developers or corporate loans (with loans given against various assets, such as buildings, not related to the energy project). In the early 2000s banks started to approve project finance loans, whereby the loan is given against the energy project itself. Nevertheless, the financing terms offered by banks for project finance loans are much harsher than for other renewables. Banks offer less money for bioelectricity, often only a third of the investment, and often require the loan to be paid back much faster. This suggests that the financial reserves on which bioelectricity plants could draw over the past two decades has been very limited, contributing to the explanation for the small capacity increase by 2010. The availability of project finance loans is crucial for a significant and sustained diffusion of any renewable energy technology (Dinica, 2003). By comparison, the diffusion of wind energy in Spain could only catch speed when the improvements in the legal framework for price support made project finance loans possible for most investors at attractive financing terms.

Bioelectricity has not experienced such a success story so far. The improvements in price support and contractual guarantee came late. In 2009 the European financial and sovereign debt crises began. In January 2012 the government took the radical decision to stop guaranteeing any new contracts and production premiums/tariffs to renewable energy generators. This led the industry into a sudden hibernation stage, while the government works on a new strategy for the electricity sector.

It was mentioned earlier that biomass is the only renewable energy source that has a supply side. This side is more complex, in terms of policy interventions and public sector coordination needs, than the demand side. Its development requires innovation within, and coordination across, many institutional, legal and policy frameworks in policy domains that have so far evolved outside the scope of energy policies. One useful indicator of diffusion patterns which enables analysts to gauge the magnitude of supply-side obstacles is that of project sizes. This is a useful indicator because biomass projects have large economies of scale. Their production costs only start to decrease significantly for projects larger than 30 MW capacity (Carrasco, 2002). Whenever we observe predominantly small projects, this may indicate financing obstacles (banks do not lend too much money because of various risk perceptions), resource market obstacles or both.

In 2011 a review was carried out of all bioelectricity plants owned by members of the Spanish Association of Renewable Electricity Producers (APPA, 2011b).[7] Almost three-quarters of the APPA projects operating in 2011 were small, as shown in Table 3. An earlier study found very similar project sizes in 2002 (Dinica, 2003, p.336). This suggests that there has been no meaningful alleviation of resource market obstacles, since it is known that some improvements in the financing opportunities did emerge over the past seven–eight years. The next section reviews some key obstacles to the emergence of biomass resource markets, the policy interventions needed, and the latest government commitments.

### Diffusion obstacles at the supply side of bioelectricity production in Spain

*Lack of awareness and/or confidence in the energy business among potential resource suppliers*

Most potential suppliers of biomass (as raw resources, or in their processed form as feedstocks) are unaware or distrustful of the new business opportunity because this is very different from their established operational niche. This holds for farmers, public agencies managing public lands, industrial companies and other private actors (*Plan de las Energías Renovables*, 2005). For example, farmers are hardly willing to switch to dedicated energy crops when they do not understand the costs involved or the growing requirements, and there are no reference or average prices in the market. All farmers are producers of primary agricultural residues. However, they are typically reluctant even to respond to offers of contacts from interested power producers (Dinica, 2003).

Building new business relations among completely different commercial actors in a short to medium term may require a combination of direct regulations and communication instruments. The latter should focus on awareness-raising, but also capacity-building (e.g. through workshops and guidelines) towards an understanding of the economics and technicalities of supplying clean residues and (plant/woody) energy crops. They could also focus on the options to become involved in processing mechanically/thermally such resources and storing and transporting them (as, in such cases, vertical integration comes with better profits); likewise for industrial/forestry residue owners, and for equipment/technology companies looking for new business opportunities.

The three renewable energy policy plans adopted in the 2000s envisaged this, but implementation has been limited, as the allocated budgets were small (*Plan de Acción de Energías Renovables,* 2010; *Plan del Fomento de las Energías Renovables,* 1999; *Plan de las Energías Renovables,* 2005).

Examples of direct regulations are those proposed by APPA, but not yet adopted or implemented (e.g. APPA, 2004; Garcia, 2010). First, given the fire risk and the diffused environmental pollution they cause (air, soil and water), any generator of primary residues (agricultural/forest) could be obliged (and possibly subsidised, unless bioelectricity remuneration increases) to collect all or a quota of such residues from their lands and offer a minimum quota for electricity generation within Spain. More than 25 million tons of agricultural residues ends up in landfills annually (*Plan de Acción de Energías Renovables,* 2010). This intervention would also address the problem that most such residues that do not end up in landfills are sold for thermal applications or industrial applications (paper, furniture), domestically and in the EU (*Plan de Acción de Energías Renovables,* 2010). The direct regulations would apply for all forests (as 70% are in private ownership), unless there are ecological considerations from the Environment Ministry. Given the high fragmentation of private forest ownership, there is a role for public authorities to facilitate the emergence of associations/cooperatives for the energy management of biomass resources (Tena, 2012, p.56). It is estimated that a significant use of clean residues would avoid 50–70% of the annual fires (Garcia, 2010, p.19). APPA also suggests a drastic increase in the charges for environmental pollution through residues.

Such instruments require planning and policy integration efforts from several ministries, with competences on agriculture, trade, industries, forestry, land management, energy and environmental management. But they also require the involvement of sub-national authorities and integration into their legal/policy frameworks. Acknowledging the importance of policy coordination across a wide range of ministries, in 2005 the government set up an Inter-ministerial Committee for Biomass (*Plan de Acción de Energías Renovables,* 2010). This would be a suitable institution to consider such instruments. So far the committee's work has been limited, due to low budgets, but the 2010 plan aims to reinvigorate its activities and competences.

The legal framework for the location and extraction of forest residues already exists through the 2003 law of mountains, but implementation is needed to support the above-suggested direct regulation instruments. The reason for this implementation delay is that public authorities for forest management are uncomfortable with the expectation to extend their legal/policy frameworks to the area of energy policy to facilitate biomass supply. They are unaccustomed to planning and acting based on energy-use criteria (*Plan de las Energías Renovables,* 2005). As regards the emergence of dedicated energy crops, APPA suggested their introduction as compulsory crops in the national programme for crops rotation, aiming to address soil quality issues (Garcia, 2010, p.19). Additionally, the industry suggested the exemption of all biomass products from product taxes, which are the highest in Europe at 18% (Tena, 2012, p.58).

### *Uncertainties about the contractual arrangements for resource supply*

Numerous electricity investors have been concerned with the risks associated with biomass resources, given their large spatial distribution, quality variability and the need to contract with many suppliers and storage companies offering resources at various times of the year (*Plan de las Energías Renovables*, 2005). In 2004, the Ministry for Agriculture and the Ministry for Industry responded by developing a standard contract suitable for contracting with large numbers of resource suppliers. Such contracts are meant to ensure power producers a long-term, low-risk supply of sufficient biomass resources at predictable prices.

### *Expensive foreign technologies are needed to collect and process biomass into feedstocks*

Many mechanical and thermal processes are involved in the production of feedstocks for power plants. Improvements are still needed in many aspects of resource collection, transport, storage and processing (Tena, 2012). Storage without loss of energy value is a significant challenge, given the seasonality of biomass production and its vulnerability to decay. These factors affect both the size and reliability of resource markets. In 2005 the government promised financial support for investors in relevant equipment, companies and infrastructures (*Plan de las Energías Renovables,* 2005). Due to budgetary constraints, this policy programme was hardly implemented, and was reintroduced in the 2011–20 plan.

**Bioelectricity could be deployed to help New Zealand shift to 100% renewable electricity generation within several decades, and ... facilitate a shift to electric vehicles in the longer term.**

In addition to logistical obstacles, there are administrative obstacles here too. Sub-national authorities are still to design special permitting procedures for the new types of economic activities and agents involved in the supply and processing of biomass resources. In addition, permitting bioelectricity projects currently requires the involvement of numerous national and sub-national authorities, as the entire biomass supply chain needs to be considered and bioelectricity production cuts across many policy domains. The new Inter-ministerial Committee for

Biomass could draft a special permitting process, to be implemented either by itself or by a dedicated national bioelectricity committee, until sub-national authorities are able to set up their own integrated procedures and legal frameworks.

With the freezing of the legal framework for price support in January 2012, the policy gap for bioelectricity diffusion has widened. The renewable energy industry is now holding its breath to see how the Spanish government is planning to rescue the country from the financial crisis, and which roles renewable energy resources could play in Spain's economic recovery, security of energy supply and environmental quality.

**... the Spanish experience suggests that in order to address the economic obstacle, independent power producers should be offered feed-in tariffs guaranteed for a minimum of 15 years. ... The levels of feed-in tariffs have to reflect the real production costs of the biomass resources**

### The New Zealand energy system and policy context surrounding bioelectricity production

New Zealand is blessed with many types of renewable energy source, each having significant energy potential. Currently more than three-quarters of the country's electricity production comes from renewable resources, primarily large hydropower, geothermal power and small levels of wind energy. The government energy strategy aims to lift renewables' contribution to 90% of electricity consumption by 2025. Of all renewable electricity technologies, over the past years the government supported financially only the emergence of marine energy technologies. This article has made the case for bioelectricity, which has so far not received any (consistent) form of financial support in New Zealand. The experiences with biomass diffusion in Spain offer decision-makers and stakeholders in this country significant policy lessons. These deserve special consideration when designing legal and policy frameworks for the support of bioelectricity, once the necessary societal and political support is mobilised towards this promising technological option.

A large research project under the leadership of Scion[8] carried out an assessment of New Zealand's resource potential for biomass. It elaborated various scenarios, assuming several options for the percentages of biomass with energy applications (25%; 50%; 100%, relative to other industries), and the land possibly available (for both primary and secondary resources). Estimates show that for a minimum land use of 830,000 ha and a 25% use of biomass for energy, the potential would be 1.4 MTOE (million tons of oil equivalent) per year; for a maximum use of the available land considered, 5,100,000 ha, and a 100% deployment of biomass for energy purposes a potential of 34.46 MTOE/year emerges (Hall and Gifford, 2007, p.68). The maximum potential is seven times larger than the country's electricity consumption in 2011 (of 4.81 MTOE: Ministry of Economic Development, 2012).

Currently New Zealand uses large amounts of biomass, but mainly for heat applications in industries and households (Scion, 2009). While policy plans and commercial interests envisage a high future use of biomass for biofuels and thermal energy, clearly there is also potential for a significant production of bioelectricity in New Zealand. Bioelectricity could be deployed to:

- help New Zealand shift to 100% renewable electricity generation within several decades;
- meet future increases in electricity demand;
- help households and industries (whenever possible) to switch away from the current energy-inefficient and air-polluting heat generation systems (whenever their conversion efficiencies are lower than what could be obtained through commercially mature technologies); and
- facilitate a shift to electric vehicles in the longer term.

The Spanish experience shows that the organisation of biomass resource markets is a long-term nationwide project, requiring significant policy integration, alongside adequate legal/policy frameworks targeting the most fundamental of obstacles: economic and financial. New Zealand's policy framework for bioelectricity is currently limited to information supply and some technical guidelines. The 2011 national policy statement in renewable electricity generation focuses on the planning and permitting of renewable energy projects. However, looking at the diffusion obstacles for bioelectricity, this framework is unlikely to lead to anything but some niche projects, mostly for self-generation purposes, as long as resource markets are not in place and projects are not economically feasible.

If the New Zealand government decides that bioelectricity is a worthwhile technology which merits being supported with public funds, the Spanish experience suggests that in order to address the economic obstacle, independent power producers should be offered feed-in tariffs guaranteed for a minimum of 15 years, and ideally 20 years. This approach is more desirable than using premiums/kWh on top of spot prices, because the social costs of diffusion are lower (Dinica, 2003).[9] The levels of feed-in tariffs ought to reflect the real production costs of the biomass resources the government aims to support, and this has to be investigated before any legal price support system is put in place.

Additionally, it would be highly desirable to engage the finance and insurance communities in diffusion processes: for example, by regularly organising workshops to explore the

particularities and opportunities of bioelectricity, in relation to all possible risks, including political. Innovative and efficient technologies like gasification and pyrolysis are worthy of development and demonstration subsidies. When all this is properly done, the demand-side legal/policy framework needs to be matched by a comprehensive supply-side framework, capable of mobilising the human, entrepreneurial, administrative and physical resources needed for the development of reliable, high-quality biomass energy products and markets.

1 Large hydropower plants are typically excluded from public financial support as they are already competitive with fossil fuels.
2 These are estimates based on Hall and Gifford (2007, p.68) and Ministry of Economic Development (2012).
3 These are estimates based on IDAE (2010) data.
4 Bioelectricity plants do have some air emissions, while the cultivation of certain energy crops leads to environmental and greenhouse gas impacts that are of some concern. However, scientists are working on minimising these impacts and new crops are already under testing, such as the fast-growing switchgrass which demands less fertilizer. In long term, the agricultural, mechanical and transport equipment could be switched to bio-fuels and even bioelectricity (see below).
5 The application of biomass resources for energy purposes has often been criticised for reducing the potential for food crops. While this is a challenge in some developing countries where the cultivation of energy crops for biofuels was attempted, the reality in most OECD countries is that significant land areas are uneconomic for the current food prices and lay abandoned. For worldwide land potentials see Johansson et al., 1993, pp.593-651; for New Zealand see Hall and Gifford, 2007, p.68).
6 MTOE stands for million tons of oil equivalent. To put the potential of primary resources into perspective, in 2010 Spain's electricity consumption was 21.7 MTOE (*Plan de Acción de las Energías Renovables*, 2010).
7 Their investments total 510 MW, while by 2010 there were 706 MW operating.
8 The Crown research institute with expertise in forestry: http://www.scionresearch.com/general/about-us.
9 When contractual/delivery risks are high, this is reflected in higher interest rates on loans (because of higher financing risks). To make projects economically feasible, this needs to be reflected in high premiums, which will be passed on to consumers anyway.

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Janet Stephenson and Rob Lawson

# Giving Voice to the 'Silent Majority'

## exploring the opinions and motivations of people who do not make submissions

Most New Zealanders will accept renewable energy … The opponents you get on a project is [sic] more often a minority, local populations. The people who support these things don't generally come out applauding. Hayes is a classic example. Central Wind as well, we got a lot of what we call the silent majority.

— an energy company representative, quoted in Stephenson and Ioannou, 2010, p.70

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### Introduction

As captured in the quotation above, there appears to be a widespread assumption that there is a 'silent majority' of people who support proposals but do not make submissions, and that those who do make submissions tend to be opposed and therefore do not reflect the true state of public opinion. The New Zealand Wind Energy Association (a membership-based wind industry association) suggested that it would be useful to examine whether this was actually the case,

in respect to wind farms in particular. As researchers we were also interested in the broader question of why non-submitters might not be participating in formal planning processes, so we developed our research to address two questions: (a) how do non-submitters' perspectives of proposed wind farms differ from those of submitters; and (b) why do non-submitters not make submissions?[1]

While these questions are relevant to all development proposals, wind farms are an excellent context for inquiry because they are highly visible, and thus potentially have an impact on a geographically widespread population, and because they are known to create strong feelings of support or opposition (Wolsink, 2007). Wind power repeatedly polls among the New Zealand population as the most preferred form of electricity generation, with 76% being 'supportive' or 'very supportive' of wind energy in a June 2011 poll (Energy Efficiency and Conservation Authority, 2012). However, public reactions to specific energy development proposals do not reflect the same pattern. Wind farm resource consent applications are surprisingly highly controversial compared to those for other forms of renewable electricity generation (Stephenson and Ioannou, 2010).

This article reports on exploratory research into the perspectives and motivations of both submitters and non-submitters to two wind farm proposals, at Kaiwera Downs, Southland, and Mill Creek, Wellington. Here, we briefly explain the submission process in New Zealand and enlarge on the context of the research questions, discuss literature relevant to the research questions, describe the methodology, and then describe our findings in relation to each question in turn. We finish with a brief discussion of the implications of the findings. The research is more fully reported in Hoffman, Lawson and Stephenson (2009).

### Submissions and participation

Sections 95A and 96 of the Resource Management Act 1991 require that certain planning applications (generally those with potential adverse effects on the environment that are 'more than minor') must be publicly notified for submissions by the relevant planning authority. (There are some situations in which more limited notification occurs, but these are of little relevance in this context.) The proposal is advertised for submissions in newspapers which circulate in the area and on signposts on the site; those who are considered to be potentially adversely affected are personally sent an information pack and invitation to make a submission. In contrast to most other planning jurisdictions internationally, in New Zealand anyone can make a submission (either in support or in objection): there is no requirement for the submitter to have been personally notified, or to establish that they are personally affected or that they represent some relevant aspect of the public interest. Making submissions on planning applications is a relatively simple action which can be carried out by any person. While submissions must be in writing, there are no costs, and no requirement to appear before a hearing panel unless the submitter chooses to do so.

From a policy perspective, understanding the attitudes and motivations of those who choose not to actively voice their opinions in submissions, compared to those who do, could be of great value to policy makers, planners and developers. Public participation is widely accepted as essential to sound planning processes (Conrad et al., 2011) and many planning systems worldwide have introduced reforms in recent years to increase public involvement using a range of participatory techniques (Brownill, 2009). Yet within New Zealand, written submissions (and the consequent right to speak at a hearing) are the only legally required avenue for the general public to have input into planning applications. Leaving aside for now the question of whether the submission process is sufficient or effective as a means of public participation, the case remains that for much of the public it is the only means of input. Notwithstanding that a number of planning authorities in New Zealand are voluntarily engaging the public in less formal and more innovative ways (Thompson-Fawcett and Freeman, 2006), the formal submission process is still in most instances the only gateway for the public to air their views on development proposals.

**When planning proposals are publicly notified, the right to submit and be heard is intended to provide an equal opportunity to all, but this involves an assumption that the process will be equally accessible by all.**

When planning proposals are publicly notified, the right to submit and be heard is intended to provide an equal opportunity to all, but this involves an assumption that the process will be equally accessible by all. When people do not make a submission on a proposed development in their vicinity, there is no means of gauging their views – so their voice is effectively silent. If they do have a viewpoint to share, but have not done so, this raises the question of whether they may have they been prevented from submitting by barriers that should ideally be removed. These matters go to the heart of a fundamental premise of New Zealand's planning law (Young, 2001) and indeed contemporary international law (Zillman, Lucas and Pring, 2002): that civic engagement is an essential component of resource planning and that the public have a democratic right to be heard if they so choose. By taking into account the submissions received, decision-making authorities expect to be well informed as to the public's concerns (albeit that there is no expectation in law that submissions

will provide a representative sample of public opinions). The problem we seek to explore in this article is whether the non-submitting public do represent a different set of perspectives from the submitting public, and, if they have opinions that they would like to express, why they are failing to do so.

### Motivations to make submissions

A review of submissions to three New Zealand wind farm proposals (Graham, Stephenson and Smith, 2009) revealed that factors commonly raised in opposing submissions included the size and site coverage of the wind farm, negative landscape effects, construction effects, concerns about the developer, environmental effects, cumulative effects, acoustics, place-identity and energy policy. Supporting submissions referred to a positive attitude to wind power in general, perceived local or community benefits, enjoyment of the look of wind turbines, and the national good. These findings are similar to the abundant international literature on public reactions to wind farms, in which visual effects (Warren et al., 2005), noise pollution (Ellis, Barry and Robinson, 2007) and disruption to people's attachment to place (Devine-Wright and Howes, 2010) are prominent concerns.

At a lay level there is belief that those who feel negatively about a proposal are more likely to make submissions. A representative of the New Zealand Wind Energy Association, for example, noted that '[supporters] in general are not necessarily coming forward in formal processes e.g. RMA hearings … It's about risk and reward. People are not going to make it a priority as they think others will speak. Opposers are going to be more motivated to take action' (quoted in Stephenson and Ioannou, 2010, p.70). The obverse belief, that the non-submitting public is generally in favour of proposals, is also in evidence. This perspective was evident in the explanation used by a former minister of energy to justify the disparity between the high levels of public support recorded for wind energy in the abstract and the often intense opposition to concrete wind farm proposals:

> Just two weeks ago, EECA [Energy Efficiency and Conservation Authority] released its survey of the public's attitudes towards different types of generation. I am sure that many of you were delighted by the results with wind coming out most preferred with an approval rating of 82 per cent. The general public are often the silent majority when it comes to all sorts of developments. Now their views are known.[2]

Despite exhaustive searches we were unable to discover any published research which specifically set out to compare the perspectives of those who make submissions on planning applications with those who do not. Research investigated either submitters' views or the views of the public generally. However, there is evidence that those who oppose proposals are often more willing to be active and vocal than those who support them (Beddoe and Chamberlin, 2003; House, 1999; Walker, 1995; Wolsink, 2000). In the absence of specific prior findings, we put forward a tentative hypothesis that non-submitters will be generally supportive towards proposed wind farms in their vicinity.

In relation to the second research question – why non-submitters do not make submissions – more research has been undertaken. House, discussing citizen participation in water management processes, suggests that formal consultation and submissions processes can lead to 'the more vociferous minority within the community ... participating in the decision making process with the "silent majority" too intimidated ... to take part' (House, 1999, p.126). Carpenter and Brownill suggest that a distrust of the planning process, combined with 'apathy and a perception of disenfranchisement' (Carpenter and Brownill, 2008, p.234), creates barriers to participation. Van der Horst similarly suggests that the adversarial, 'us versus them' nature of many planning procedures, such as public hearings, may put people off participating (Van der Horst, 2007).

**Perceived negative aspects of the submissions process included the perceived tendency for decision-makers to have predetermined attitudes ... and lack of transparency in the eventual decisions.**

Within New Zealand there are no published studies on whether planning processes discourage people from making submissions, but Forgie's (2002) research on people who made submissions on local authorities' annual plans (the council's intended expenditure for the coming year) provides some relevant insights. Submission-makers were asked to identify those aspects of the submissions process seen as positive or negative. Perceived negative aspects of the submissions process included the perceived tendency for decision-makers to have predetermined attitudes; the volume and complexity of information; impersonal and intimidating processes; and lack of transparency in the eventual decisions. Forgie concluded that while submitters recognised a range of advantages in being involved in the annual plan process, they were also frustrated by these aspects. Such perceptions could be influential in dissuading people from making submissions, although this was not assessed in Forgie's study.

Public responses to developments are also strongly influenced by the quality of consultation processes, community engagement and the level of information provision (Birnie et al., 1999; Wolsink, 2007). There is evidence of a two-way reinforcement between engagement and a sense of political self-efficacy. Activities

such as open discussions of issues, identification with politically-oriented groups, and involvement in democratic decision-making processes can strengthen individuals' beliefs that they can influence political processes (Levy and Zint, 2012). As noted above, these matters are receiving greater attention internationally as planning approaches shift to more collaborative, inclusive approaches with the aim of achieving greater public trust and democratic legitimacy in planning decision-making (Hindmarsh and Matthews, 2008).

In a different but comparable context, political studies literature has long grappled with the question of non-engagement in voting. Studies explain the reluctance to participate in the electoral process as stemming from factors including a lack of group affiliation (Shyrane, Fieldhouse and Pickles, 2007) and alienation from the process because the values and interests of the political parties are too far removed from those of the individual (Merrill and Grofman, 1999). Shyrane, Fieldhouse and Pickles cluster non-voters into three categories: non-conformists (people who abstain because elections do not appear to provide for a satisfactory expression of their political preferences); alienated and indifferent non-voters (people who lack belief in and support for the political system, lack affinity with major parties, and/or have a low level of political awareness); and involuntary abstainers (people who fail to vote for circumstantial reasons rather than deliberately).

From this material we anticipate that we will identify a wide range of potential drivers of non-submission behaviour and barriers to making submissions. These include personal factors (Shyrane, Fieldhouse and Pickles, 2007), level of knowledge and engagement (Birnie et al., 1999; Wolsink, 2007), level of perceived positive and negative impacts (Devine-Wright, 2010; Beddoe and Chamberlin, 2003; House, 1999; Walker, 1995), degree of political or social engagement (Merrill and Grofman, 1999; Shyrane, Fieldhouse and Pickles, 2007; House, 1999), reactions to planning processes (Carpenter and Brownill, 2008; Van der Horst, 2007; Forgie, 2002) and degree of self-efficacy (Levy and Zint, 2012).

### Methodology

To address our research questions we undertook two exploratory case studies of proposed wind farm developments, at Kaiwera Downs in Southland (for 240 megawatts, up to 83 turbines), and Mill Creek in Wellington (for 71 megawatts, up to 31 turbines). Kaiwera Downs, in a farming district approximately 20 kilometres from the nearest small settlement of Mataura, had attracted 65 submissions, and Mill Creek, less than 10 kilometres from Wellington city, attracted 776 submissions (see Table 1 for a breakdown into supporting and opposing submissions). Both were granted resource consent at the council level in 2008, so that at the time the field research was being undertaken (January–March 2009) the submission process and council hearings were complete. Both were subsequently appealed, and final consents were granted by the Environment Court in 2009 and 2011 respectively. Construction began for Mill Creek in mid-2012 but has not yet begun for Kaiwera Downs.

Thirty-three in-depth interviews were conducted with residents in the vicinity of the sites, selected by random sampling methods. Our original objective had been to talk to ten submitters and ten non-submitters in the vicinity of each site, but finding non-submitters willing to be interviewed proved to be problematic, especially at Kaiwera Downs (24 refusals). Kaiwera Downs is a sparsely populated rural area, and although we widened the selection area from a radius of 15 kilometres to 20 kilometres from the proposed development site, we found only three non-submitters who were willing to be interviewed. There were also 16 refusals amongst Mill Creek non-submitters. At both sites many were not forthcoming with reasons for refusing, or said they were 'too busy' or 'not interested' – similar reasons, we later found, to why many had not made submissions. In contrast, no Kaiwera Downs submitters and only one Mill Creek submitter declined to be interviewed.

The sample included 15 men and 18 women aged between 30 and 79. The largest group (13) were self-employed, seven were retired and two were full-time homemakers. The rest were in part- or full-time paid employment. Annual household income levels ranged from $20,000 to over $100,000, with ten respondents earning more.

The respondents were asked a series of open-ended questions on such matters as: their opinions on wind as an energy source, support or opposition to the wind farm, sources of information on the proposed wind farm, whether they considered submitting, their awareness of the call for submissions, why they chose not to submit, and any changes they thought would make it easier to make a submission. These were followed by a series of questions designed to produce quantitative data. Respondents were invited to nominate their overall evaluation of the wind farm based on a five-point rating scale, from 'very poor' to 'very good'. They were then asked to nominate how concerned they were, choosing from a list of 14 potential

**Studies explain the reluctance to participate in the electoral process as stemming from factors including a lack of group affiliation ... and alienation from the process because the values and interests of the political parties are too far removed from those of the individual ...**

negative impacts of the wind farms, and how important they felt each of 15 potential positive impacts to be. The lists were derived from the literature and discussion with industry experts before the study was conducted.[3] A short survey at the end of the interview gained basic demographic data.

The Kaiwera Downs interviews were carried out face-to-face, and the Mill Creek interviews (for logistical reasons) occurred over the telephone. The interview lengths were comparable and there appeared to be no significant difference in the level of detail provided by the two interview methods. The surveys and transcribed interviews were analysed to identify emergent themes, while the rating scales were examined using appropriate exact tests in SPSS software to accommodate the small sample size and high levels of tied data.

#### Non-submitters' opinions of wind farms

All but one of the non-submitters were supportive of wind energy in the abstract, although some of this support was qualified, particularly in relation to location and density: 'in certain areas I haven't got an issue with it, but I would hate to see it on some of our tourism places' (KNS2); 'I don't want to go past one every 20km … or have the whole natural landscape blighted by them' (KNS1). The support for wind energy did not translate into a similar level of support for the specific wind farms. Comparing the overall attitudes of submitters and non-submitters, based on their self-designation during the interview, the submitters were relatively evenly spread between either opposition to or support for the wind farms, while the non-submitters spread between support, opposition and ambivalence (Table 1).

There was no significant difference between submitters' and non-submitters' evaluation of the wind farms based on the five-point scale (very poor to very good). However, some differences were identified in relation to perceived positive and negative impacts of the wind farms. The key differences between submitters and non-submitters related not to the average scores assigned to different impacts, but to the variance of the responses, with submitters having a wider range of opinions compared to non-submitters. Across both positive and negative impacts, non-submitters had less extreme views than submitters. They were not as concerned as submitters about the potential negative aspects of the wind farm, and less enthusiastic about the potential positive aspects. In general, the 'ambivalent' group of non-submitters were more similar to supporters of wind farms when it came to their perceptions of negative impacts, and more similar to opposers of wind farms when it came to perceiving positive impacts.

**Table 1: Submitters' and non-submitters' opinions of the wind farms**

| | | Total | Support | Oppose | Ambivalent/ Neutral |
|---|---|---|---|---|---|
| Kaiwera Downs | Total submissions | 65 | 26 | 27 | 12 |
| | Submitters interviewed | 10 | 4 | 6 | 0 |
| | Non-submitters interviewed | 3 | 1 | 1 | 1 |
| Mill Creek | Total submission | 776 | 364 | 408 | 4 |
| | Submitters interviewed | 10 | 4 | 6 | 0 |
| | Non-submitters interviewed | 10 | 3 | 1 | 6 |

A few did express strong opinions, both positive and negative, from 'I just think it's a great idea, get it up as quickly as possible' (KNS3) to 'They are … a blot on the landscape, but that's me' (MNS4). However, in the main the non-submitters' comments reflected their relatively weak opinions: 'it's not something that really concerns me. The only problem with wind farms is the visual effect, but even that I don't find too unpleasant' (MNS1); 'View-wise it didn't worry me … I had … maybe a noise concern, but it wasn't a big enough issue for me to feel that I had to submit' (KNS2). Their less extreme opinions of wind farms often appeared to translate into ambivalence about the development: 'I don't care one way or the other whether it goes ahead. I'm more than happy for it to go ahead and I'm not vehemently opposed to it' (MNS7), 'I don't really have an opinion one way or the other, but as I said, it's not in my backyard (MNS3); and indifference: 'It [the wind farm] is of no consequence to me' (MNS2).

Based on our findings we conclude that it cannot be claimed that non-submitters are generally supportive of proposed wind farms in their vicinity. While almost all were supportive of wind energy in the abstract, our participants expressed a range of supportive, negative and ambivalent views in relation to the actual wind farms. Compared to submitters, they displayed less extreme views towards the wind farms: they were less likely to strongly oppose or support, and more likely to not have a strong opinion either way. But, as discussed in the following section, the existence of weaker opinions appears to be an insufficient explanation for why these people did not make submissions.

#### Reasons for not making submissions

Analysis of the open-ended questions revealed a range of reasons why the non-submitters had not made submissions. Some of these were offered as responses to the direct question, 'Why did you choose not to submit on the XX wind farm proposal?', and other potential explanations emerged from our analysis of the transcripts as a whole.

In some instances the lack of interest in making a submission appeared to be directly related to ambivalence – 'I wasn't even interested in bothering, to be honest' (MNS8) – or lack of importance in the context of their lives – 'I didn't think this

was important enough to decide that I was opposed to it, I guess' (MNS9). Several explained that they chose not to submit because they did not feel personally affected: 'It's not actually going to affect me personally … I can't see it from where I live' (MNS10). In contrast, submitters generally did feel affected, either personally or were concerned on behalf of the wider community: 'we fought this as a community … and we want something to benefit the community' (KS7). Submitters had opinions and they appeared to be more motivated to express them: 'I didn't want to sit on the fence, as I do have an opinion on it' (MS6).

Most submitters were in possession of a good deal of information about the proposal, and many had had high levels of engagement in public meetings, open days and/or site visits. Even those who had not been personally notified by the council or the developer had sought out information, had been provided information by their networks, and/or had attended meetings.

In contrast, non-submitters were far less well-informed and engaged. Two non-submitters received information packs from the developer, and one of these also received the public notice in the mail, but the remainder got no information from either source. Only a few non-submitters had noticed the call for submissions in the newspaper, and none reported any personal contact from the developer. Non-submitters were not necessarily complacent about this lack of information: 'We've had no communication from the Council, and one communication from the developer. We'd hardly know it was going ahead, it's been hopeless' (KNS1). This lack of information appears at least in some cases to be responsible for ambivalence and thus the lack of engagement: 'I don't know enough about it, to be honest, to be able to say either way' (MNS6). One non-submitter directly linked their lack of action to minimal awareness: 'Something public in the paper probably doesn't do a lot to stimulate me to do anything' (KNS1). However, some well-informed people were also non-submitters: '[at the open day] there was open question time, there were photos … of existing wind farms and information on noise levels … You could go … and talk to the people, it was very good' (KNS3).

Making a submission requires a degree of self-efficacy, and it is evident that this was lacking for at least some of the non-submitters: 'I'm not necessarily the type of person who stands up and says anything … I leave other people to do that [make submissions]. If it goes ahead, it goes ahead and if it doesn't go ahead, it doesn't go ahead' (MNS1). Some were aware of groups making submissions and opted out because they considered that those groups were more capable than they were: 'Local environmental groups … will be putting forward the argument much better than I would' (MNS10). Others held back because they were not directly approached by others: 'No I didn't [make a submission], because I knew there were some people doing it and I thought they would have been in contact with us, and they haven't' (KNS1).

Apprehension about the formality of submissions and hearings also appears to have played a part in a reluctance to become involved: 'I've found the planning process to be] quite disempowering, really. There's a level of inside knowledge that you need. It's sort of like, in some ways, the first time you go into a courtroom – everybody else knows the rules and the games, besides you' (MNS5). Only four of the non-submitters had made a submission previously (and not all in relation to planning processes). Some were unclear about the process: 'I don't know whether there's a form you pick up that's half done or quarter done or whether you start with a blank sheet of paper for this process, I don't know' (KNS1). Others felt they could do it if necessary: 'I'm sure I could figure one out' (MNS6). Two supportive non-submitters incorrectly thought that submissions could only be in opposition to a resource consent application, not in support.

Regardless of their views, some did not become engaged because they felt powerless to influence the outcome of the planning process: 'In the end it's going to

**Table 2: Summary of findings**

| | |
|---|---|
| ***A: How do non-submitters' perspectives of proposed wind farms differ from those of submitters?*** | |
| Expectation from literature:<br>Non-submitters would be generally more supportive towards proposed wind farms in their vicinity than submitters. | Findings:<br>• Almost all non-submitters were supportive of wind energy in the abstract.<br>• In relation to actual wind farm proposals, non-submitters were overall no more or less supportive than submitters, and expressed a range of supportive, negative and ambivalent views.<br>• However, compared to submitters, their views were less extreme: they were less likely to strongly oppose or support, and more likely to express ambivalent views. |
| ***B: Why do non-submitters not make submissions?*** | |
| Expectation from literature:<br>Influential factors would include: | Findings:<br>Influential factors include: |
| Personal factors | Lack of personal interest; having other more pressing priorities in life |
| Level of engagement | Less engaged and informed than submitters |
| Perceptions of impacts | Not feeling impacted by the proposal |
| Level of political and social engagement | Not being engaged with action groups |
| Feelings about the planning process | Feeling apprehensive or ill-informed about planning processes<br>Feeling powerless to influence planning decision-making |
| Degree of self-efficacy | Lacking self-efficacy |

happen, as these things usually do, so I think, oh well, why bother' (MNS8); 'I kind of feel, with things like that, it wouldn't matter what I say, it wouldn't affect the end result anyway' (MNS9).

Finally, some non-submitters just had other priorities. 'They were having some meetings … I think they went ahead, but … we were doing something else so we didn't even go' (KNS1); 'If I look around the suburb there are people here who've got a lot of things on their mind, like the family, staying alive and feeding the kids, and things like that that are of much more immediate relevance than a proposed wind farm' (MNS8).

In summary, we could not identify any single reason for not submitting that was common amongst all non-submitters, but rather a number of influential factors. The primary ones were a lack of personal interest, feeling unaffected by the proposal, being less engaged and informed than submitters, lacking self-efficacy, not being engaged with action groups, feeling apprehensive or ill-informed about planning processes, feeling powerless to influence planning decision-making, and having other more pressing priorities in life. These themes bear a close relationship to the various literatures discussed earlier, as indicated in Table 2. The findings are not unexpected, but do reveal that there are very diverse influences on people's willingness to engage in the formal submission process.

### Discussion and conclusion

It must first be stressed that this was an exploratory study involving two case studies and a limited number of participants. Nevertheless, the degree of concordance between our empirical and qualitative data gives us confidence that the findings are reliable. A broader study involving more participants could help determine whether the same findings are applicable across other locations and development types.

We were surprised at the wide range of opinions expressed by non-submitters. It is clear that it is not safe to assume that non-submitters are generally supportive of proposals. Although they may not express their views as forcefully as submitters, many of the non-submitters had concerns about the wind farms, while others clearly supported them, although ambivalence appeared to prevail. While our findings confirmed that the majority of non-submitters supported wind energy in the abstract, the received wisdom that the silent majority supports specific wind farm proposals as well is untenable. This may well be the case in some instances, but our work certainly calls into question the blanket application of this assumption.

Apart from their personal circumstances, a number of the factors which appear to be dissuading non-submitters from making submissions are within the realm of influence of planning authorities and/or developers. Mitigating measures would include providing adequate information, providing a variety of means of inviting engagement on the issue, demystifying the submission process, making planning processes less formal and daunting for the public, and making decision-making processes more transparent.

But are more submissions really the answer? Can planning authorities and developers instead expand their repertoire from the one-way participation of submissions (McGurk, Sinclair and Diduck, 2006) to include a much wider variety of consensus-building approaches, thus engaging a wider public than can be accessed through submissions alone? These processes and techniques are characterised by early involvement, full information, transparency, inclusiveness, deliberation, participant diversity and partnership in agenda setting (Hindmarsh and Matthews, 2008). Techniques to encourage dialogue include citizen forums, roundtables, inquiry groups, world cafes, deliberative polls, and the use of visual communication technologies (Cronin and Jackson, 2004). A New Zealand example relating to wind farms is the range of tools utilised by the Blueskin Energy Project, a proposed community-owned wind turbine cluster near Dunedin. Mechanisms employed here included a community workshop to develop a vision for the future, running lively events to build energy literacy and broad community engagement, utilising multiple paths (public meetings, hui, online surveys, face-to-face discussions, independent research) to elicit community feedback, and running a series of events in community halls with interactive displays and multiple forms of response (Willis, Stephenson and Day, 2012).

Such techniques can mean that a wider proportion of the public is engaged and providing feedback than simply those motivated to write submissions. They help address the shortfalls in information, engagement and self-efficacy that is evident in driving at least some of the non-submitters' lack of action. However, unless they are used actively to shape the development in a meaningful way, they do not guarantee that the proposal that is eventually publicly notified will be a true product of consensus-building. This brings us back to the problem of the limited number of the general public who are likely to want to make submissions should a consultative process fail to 'get it right'. While our work is not designed to devise alternative methods to incorporate public views into formal decision-making processes, we believe that this is an area worthy of further research so that the perspectives of non-submitters can be taken into account by planning authorities.

In conclusion, non-submitters' views, even if not as strongly held, are as legitimate as those of submitters. At a time when greater attention is being paid to the importance of civic engagement and participatory decision-making (Hindmarsh and Matthews, 2008), it seems ironic that those with 'weaker' views are effectively closed out of the decision-making loop. In New Zealand's situation, where submissions are the only legally mandated way in which public views are conveyed to decision-makers, this would appear to disenfranchise a significant portion of the population with valid perspectives.

1 The research was funded by New Zealand's National Energy Research Institute.

2 Former New Zealand minister for energy, Peter Hodgson, in a speech at the New Zealand Wind Energy Association Conference in 2004, http://www.beehive.govt.nz/node/20336.

3 Options on the six-point Likert scale ranged from 'no concern at all' to 'very great concern'.

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Helen Clark

# Improving Global Governance

## making global institutions fit-for-purpose in the 21st century

In this lecture I will:

- comment on some of the complex challenges of the 21st century which cry out for effective global governance reflecting today's geopolitical and other realities; and
- examine whether global governance institutions – particularly in the areas of peace and security, economic governance, sustainable development and climate change – have kept up with geopolitical changes and been able to tackle emerging challenges to ensure their continued effectiveness, legitimacy and accountability.

**The Rt Hon Helen Clark** is presently the Administrator of the United Nations Development Programme. This is the text of an address she gave to the Institute for Governance and Policy Studies, Tuesday 13 November 2012.

My working definition of global governance will be that of Lawrence Finkelstein, former professor of political science at Northern Illinois University and former vice-president of the Carnegie Endowment for International Peace. Writing in the first issue of the journal Global Governance, he suggested that global governance could be defined as 'governing, without sovereign authority,

relationships that transcend national frontiers. Global governance is doing internationally what governments do at home' (Finkelstein, 1995).

Finkelstein suggested that use of the term global, rather than intergovernmental or transnational, enables discussion to embrace consideration of the roles of both traditional state actors and non-governmental actors. The latter category can include global NGO and civil society networks, the private sector, academic and research institutions, and the philanthropic foundations, all of which play a role in advocacy around global issues and in proposing solutions to cross-border challenges.

Finkelstein wrote of governance as an activity which includes not only setting rules and regulations, but also influencing behaviour through the promulgation of principles and norms, the exchange of information and the provision of assistance. He noted that: 'If we need to institutionalize it, we must say the institution in question is a means of governance, a governance organization or agency, or an actor in governance.' The United Nations plays a very significant role in these respects through the large body of treaties, conventions and review mechanisms for which its individual organisations are responsible.

### Complex challenges requiring effective global governance

At the turn of this century, world leaders met in New York for the Millennium Summit. They pledged their continued faith in the United Nations, noting that: 'We reaffirm our commitment to the purposes and principles of the charter of the United Nations, which have proved timeless and universal. Indeed, their relevance and capacity to inspire have increased, as nations and peoples have become increasingly interconnected and interdependent.'

Indeed, we do live in an era of unprecedented globalisation and interdependence, where global public goods cannot be secured and protected by any one nation alone, and where emerging threats and challenges require coordinated responses. The United Nations Millennium Declaration of 2000 acknowledged that a central challenge of this century is to ensure that globalisation becomes a positive force for all the world's peoples. Now, four years after the beginning of the global financial crisis, the risks posed by the way in which economic and financial integration has proceeded are clear for all to see.

At the United Nations Development Programme (UNDP) we are acutely aware of how a crisis generated in the markets of the north spread to all corners of the earth, affecting the poorest and most distant nations, which saw weaker demand and lower prices for their exports, higher volatility in capital flows and commodity prices, and lower remittances. Greater global financial stability is unlikely to be achieved in the absence of more coordination of financial regulation and oversight.

We see many other trans-border challenges too which require stepped-up global responses – from global warming to the spread of pandemics, cyber-war and transnational crime, trade barriers and the flow of refugees and other migrants. All these challenges tend to hit those who have the least power and voice to influence solutions, the hardest. For example:

- Least-developed countries and small island developing states have done the least to cause climate change, and can least afford the costs of adaptation to and mitigation of it, but they are most at risk from increased climate volatility.
- The poorest countries also bear the brunt of the stalemate in the World Trade Organisation's (WTO) Doha Round. They have the most to gain from accessing currently protected markets, and they have fewer – if any – cards to play in bilateral trade negotiations.
- Transnational crime, particularly trafficking in persons, affects poor women and girls the most, yet women are heavily under-represented in border control, police and prosecution structures.

As the challenges requiring global responses have expanded, so too has the range of state and non-state actors seeking influence on global decisions.

The rise of the large emerging economies is of particular significance, as their economic power and reach provides a firm foundation for greater geopolitical reach. The managing director of the International Monetary Fund (IMF), Christine Lagarde, commenting at the 2012 annual meeting of the IMF and World Bank Group in Tokyo on the economic aspects of these trends, noted that: 'Economic power is spreading from west to east, and prosperity has begun to move from north to south.' The evidence of this shift of economic power is clear:

- According to the IMF, in 2007 emerging markets accounted for 25% of GDP and 17% of world debt. By 2016 they are expected to produce 38% of world output and account for 14% of world debt.
- United Nations Conference on Trade and Development (UNCTAD) analysis shows south-south trade increasing dramatically, growing on average by 12% per year from 1996

**The managing director of the International Monetary Fund (IMF), Christine Lagarde, commenting at the 2012 annual meeting of the IMF and World Bank Group in Tokyo on the economic aspects of these trends, noted that: 'Economic power is spreading from west to east, and prosperity has begun to move from north to south.'**

to 2009, which is 50% faster than the growth in north-south trade, and now accounting for 20% of global trade.
- Countries of the south also dramatically increased their share of global inward foreign direct investment, from 20% to 50% of the total between 1980 and 2010.

The UNDP's next Human Development Report examines the rise of the south and the implications of that for human development. For example, alongside the growth in the size of developing-country economies there is significant growth in south-south development cooperation – not only in the form of grants, technical assistance and loans, but also through the exchange of knowledge, innovation and best practice.

In a recent paper, however, Professor Robert Wade of the London School of Economics issues a warning that the world may be moving towards 'multipolarity without multilateralism', as 'economic weight and influence in governance are different things', and that established states may not wish to compromise with newcomers – and vice-versa (Wade, 2011, p.349) Without stronger and more representative global governance institutions, emerging powers may look increasingly to pursue their interests through alternative – regional, bilateral or unilateral – mechanisms.

Calls for reform of international institutions generally highlight the inconsistency between the current structures, which reflect the economic and political realities at the end of World War II, and the vastly different realities of today. So, how are global governance institutions performing currently, and what needs to change?

**Ensuring global governance institutions are fit-for-purpose in the 21st century**

It is not difficult to draw up an inventory of global institutions and mechanisms struggling to reach decisions:
- The veto power in the United Nations Security Council can be a block to decisive action.
- The annual meetings of the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change have often struggled to reach agreement.
- The UN Commission on the Status of Women failed to produce an agreed outcome this year.
- The Commission on Sustainable Development ended its 19th session, in May 2011, unable to agree on policy decisions on practical measures to advance chemical and waste management, transform transport and mining practices, and establish a long-awaited 10-year framework of programmes for sustainable consumption and production patterns.
- The Rio+20 UN Conference on Sustainable Development reached a consensus among member states which fell well short of the level of ambition hoped for by those who want to see decisive action.
- Negotiations in New York on the outcome document for the fourth UN Conference on Least Developed Countries, LDC-IV, last year failed to reach agreement, and required late night compromise to be reached in Istanbul.
- The WTO Doha Development Round launched in 2001 is stuck.
- Negotiations on the declaration of UNCTAD XIII, the quadrennial UNCTAD conference, which was held in Doha in April this year, appear to have been particularly acrimonious.
- The IMF quota reform negotiated in 2010 still has to be accepted under the rules requiring 85% of the voting power to approve it.

**In some cases the reasons for paralysis, minimal outcomes or failure to reach agreement are structural, as with the veto in the UN Security Council, and with other bodies where agreements require full consensus.**

In some cases the reasons for paralysis, minimal outcomes or failure to reach agreement are structural, as with the veto in the UN Security Council, and with other bodies where agreements require full consensus. But also at play in general are the changing geopolitics of our times, as the relative power and economic balances change, and the voice of the south demands to be heard as never before. Multilateralism needs goodwill and dialogue across groupings to be successful, but that is not always to be found in abundant quantities.

Notwithstanding the difficulties, the United Nations with its universal membership enjoys enormous legitimacy and continues to have great convening power. In late September, more than 100 heads of state or government and 70 deputy prime ministers or ministers participated in the general debate of the 67th UN General Assembly. High-level meetings, formal and informal, were convened on a wide range of pressing issues, from the food and security crisis in the Sahel to events in Somalia, the Democratic Republic of Congo, Syria and Yemen, and on important areas in development such as expanding the rule of law, achieving education for all, scaling up nutrition and preventing maternal deaths.

In his closing remarks in the general debate, the president of the General Assembly noted that 'this Organization will only be as strong as the membership chooses to make it'.

The UN membership, of course, is composed of member states, while the UN charter begins with the words: 'We the Peoples'. Increasingly the UN's secretariat, agencies, funds, programmes and treaty bodies are interacting directly with civil society networks and private sector organisations with a shared vision for what a better world could be. These non-state actors can also be powerful

voices in moving global agendas forward, including, perhaps, in the future on reform of global governance institutions.

Let me now discuss some of the multilateral institutions and processes in a little more detail, looking at where reform could usefully occur, and at where it already has with some success.

*The United Nations Security Council*

The conflict in Syria and the stalemate in the Security Council over how to address it make the issue of reform of the UN Security Council a timely one. Around the world people are exposed to media reporting of the human toll of the Syrian crisis, and are asking why the UN cannot act to protect innocent civilians. The same questions were asked about the inability of UN peacekeeping missions to act in Rwanda and Bosnia in the 1990s.

Discussion on reform of the Security Council has proceeded in fits and starts for years, with a focus on two issues: the out-of-date membership structure; and the question of the veto held by the five permanent members, which is a key concern in relation to decision-making now over Syria. New Zealand opposed the veto power from the time of the writing of the UN charter. At the General Assembly in September this year, the minister of foreign affairs called on the five permanent members of the Security Council to accept restrictions on the use of the veto voluntarily, noting that it was originally intended only for the protection of vital national interests. Murray McCully was one among many at the general debate this year who highlighted the importance of ongoing revitalisation of the UN, including reform of the Security Council, for the future credibility of the organisation.

It is seldom that those holding power voluntarily cede it, which has always made reform of the veto power a tall order. Discussion on the expansion of the Security Council so that it reflects today's geopolitics, however, could make more progress. New Zealand itself is seeking a non-permanent seat on the Security Council for 2015-16. The elections for these seats are hard fought, because of the desire of many member states to play a role in the UN's most powerful organ. That organ could be more effective with reform.

That reform, when it comes, needs to be designed for flexibility, so that 20 years from now the global community will not need to repeat the current discussion about the council not representing geopolitical realities.

**While it was clear from President Obama's statements at Pittsburg ... that the G20 nations should see the grouping as the premier vehicle for their economic coordination, 'their' has often been dropped in references to the group, leading to it being seen as positioning itself as the world's premier vehicle for economic coordination.**

*The Human Rights Council*

An example of a successful UN reform in my view has been the creation of the Human Rights Council. It replaced the 60-year-old Human Rights Commission, which had suffered from a lack of credibility. The new, smaller Human Rights Council introduced the Universal Periodic Review as a mechanism for peer review of the state of human rights in member states. All member states report to the council accordingly, and the views of non-state actors are heard. The UNDP has played a role in supporting countries to prepare their reports and to follow up on the recommendations made by the council. This mechanism is having a positive impact on upholding human rights.

*Institutions of financial and economic governance*

The global financial crisis of the past four years has highlighted the absence of credible and strong global mechanisms for coordination of responses. In this vacuum, the pre-existing G20, designed for finance ministers and central bankers, was 'upgraded' to a higher level when President George W. Bush called for a meeting of G20 leaders for the first time in 2008. While the G20 is an informal intergovernmental grouping, any summit exclusive to leaders of many of the world's leading economies is of global interest. From the outset, therefore, the G20 faced challenges, as others affected by agreements it reached lacked a direct voice in the decision-making. A Global Governance Group (3G) was convened by Singapore in New York to express the views of smaller states about how to engage with the G20 (Chowdhury, 2010). New Zealand is associated with this group.

While it was clear from President Obama's statements at Pittsburg and from the related communiqué that the G20 nations should see the grouping as the premier vehicle for their economic coordination, 'their' has often been dropped in references to the group, leading to it being seen as positioning itself as the world's premier vehicle for economic coordination. The agreements it has reached appear to have come close to directing the work of formal multilateral institutions which have their own governance structures.

Robert Wade wrote, for example, that G20 leaders 'boldly announced their intention to make themselves the global economic steering committee' (Wade, 2011, p.355). He points to the communiqué of the second summit (London, April 2009), in which G20 leaders stated that:

> We are determined to reform and modernize the international financial institutions to ensure they can assist members and shareholders effectively in the new challenges they face. We will reform their mandates, scope,

> and governance to reflect changes in the world economy and the new challenges of globalization, and that emerging and development economies, including the poorest, must have greater voice and representation.

Leaving aside the irony of the G20 calling for greater voice and representation for the poor, Wade notes that G20 critics have questioned what authority G20 leaders have to supersede the governing bodies of the IMF and the World Bank, and to not only call for a change in voting shares but also to designate, broadly, what the details of the change should be.

Years before the G20 called for reform of the Bretton Woods institutions, the outcome document of the International Conference on Financing for Development in Monterrey in 2002 recognised important efforts to reform the international financial architecture, and called for more 'transparency and the effective participation of developing countries and countries with economies in transition' (United Nations, 2002). This was echoed at the 2009 United Nations Conference on the World Financial and Economic Crisis and its Impact on Development.

In 2010 both the IMF and the World Bank agreed on reforms to their governance structures to make the organisations more fit-for-purpose in the 21st century. For the IMF, the reforms agreed include a shift of 6% in quota shares from over-represented countries to under-represented member countries, including dynamic emerging market and developing countries. This will have the effect, when implemented, of placing Brazil, China, India and Russia for the first time all among the top ten IMF shareholders.

The US alone has accounted for around 17% of votes at the fund. It has been the only single country to have effective veto power on all major IMF decisions, including on approval of the quota reform which requires 85% of the total voting power to be reached. Some have suggested that the US election campaign has accounted for the delay in completing the IMF reform; if so, there will be an expectation that the reform moves forward soon.

The US shareholding does not change significantly with the reform, as it would keep its veto power. Rather, it is the European Union member states who are mainly losing shares and seats at the IMF executive board.

For the World Bank, reforms in 2010 expanded on previous reforms agreed upon in 2008. These relate not only to increasing voice and participation, but also to increasing transparency and access to information, promoting accountability and good governance, improving risk management, and reviewing internal governance.

**It is depressing, yet at the same time encouraging, that the dynamism around sustainable development at Rio+20 was coming for the most part from sub-national governments, NGOs and civil society, and the private sector, notwithstanding some impressive actions by individual member states.**

The G20 also spurred the creation of the Financial Stability Board, following the 2009 London Summit, where they agreed to 'establish a new Financial Stability Board (FSB) with a strengthened mandate, as a successor to the Financial Stability Forum (FSF), including all G20 countries, FSF members, Spain, and the European Commission'. At the G20 Los Cabos Summit in June 2012 leaders endorsed the recommendations and the revised charter of the Financial Stability Board, which includes strengthened governance, greater financial autonomy and enhanced capacity to coordinate the development and implementation of financial regulatory policies.

Countries of the south have also called for the UN to have a strengthened role in global economic governance, including through a more robust Economic and Social Council (ECOSOC) and better coordination between the UN, the Bretton Woods institutions and the G20.

### *The Economic and Social Council and new governance structures for sustainable development*

In 2005, then UN secretary-general Kofi Annan issued a report, *In Larger Freedom: towards development, security, and human rights for all* (UN Secretary General, 2005), in which he highlighted the need for reform to strengthen the UN system, including ECOSOC. There he proposed the establishment of annual ministerial review (AMR) assessments of progress towards agreed development goals, particularly the millennium development goals, and the high-level Development Cooperation Forum (DCF) as new, formalised mechanisms of ECOSOC. Following the 2005 World Summit in New York, the UN General Assembly adopted resolution 61/16 on the 'Strengthening of the Economic and Social Council', recognising ECOSOC as a 'principal body for coordination, policy review, policy dialogue, and recommendations on issues of economic and social development', and mandating the AMR and the DCF.

Both of these mechanisms, launched in 2007, have given ECOSOC greater weight: the former raising the level of debate on international development to the ministerial level, and the latter ensuring that a broad range of actors can engage with each other in a high-level dialogue on development cooperation.

As a UN platform, the DCF has been viewed as more inclusive than the aid effectiveness forums associated with the OECD's Development Assistance Committee (DAC). But now those OECD-associated forums are also being transformed with the outcome

of the fourth High Level Forum on Aid Effectiveness, which took place in Busan, and the launching of the Global Partnership for Development Effectiveness. It aims to provide a new platform for dialogue between the DAC donors and developing countries, including the south-south development cooperation partners.

Along with the reform of ECOSOC, agreement was reached at Rio+20 to establish a universal membership, intergovernmental, high-level political forum for sustainable development at the UN. It should build on the strengths, experiences, resources and inclusive ways of working of the current Commission on Sustainable Development, which it would replace. An intergovernmental process will define the features of the new forum, which is expected to convene at the beginning of the 68th session of the General Assembly in September 2013.

The UNDP advocated in the lead-up to Rio+20 for a new Sustainable Development Council, either to replace ECOSOC or as a stronger subsidiary body to it than the existing commission has been. We believed that it could benefit from having a peer review mechanism, to encourage countries to act on sustainable development in line with the commitments they make.

This is a question of relevance and effectiveness. The collective of member states is making too little progress on ensuring the future sustainability of our world's ecosystems. Fine words in outcome documents need to lead to action. It is depressing, yet at the same time encouraging, that the dynamism around sustainable development at Rio+20 was coming for the most part from sub-national governments, NGOs and civil society, and the private sector, notwithstanding some impressive actions by individual member states. That is why it is becoming so important for the voices of non-state actors to be heard in global governance forums.

### *Global climate governance*

One of the most visible 21st-century challenges is that of climate change. Coordinated action to combat global warming is badly needed, and the risks from failing to tackle the problem effectively are high.

Multilateral action centres on the 1992 United Nations Framework Convention on Climate Change and its associated Kyoto Protocol (1997), both of which have been ratified by almost all nations. The Bali Roadmap from COP-13 in 2007 and the Durban Platform from COP-17 last year have attempted to set firm timelines for reaching agreement on further measures for a new global agreement. Negotiations have been far from smooth, with many items over the years postponed for consideration at future sessions, and climate negotiations often seeming to fail or be held hostage to a myriad of interests and positioning. As with a WTO round, consensus is required for decisions to be reached, or at least near consensus as established at Cancun. To any casual observer the negotiations seem protracted, while the need for action becomes ever more pressing. It would be a tragedy for future generations if today's leaders and decision-makers prove incapable of taking the bold decisions which are necessary to stop catastrophic and irreversible change to the world's climate.

**Also, there is room for optimism associated with the expected large increase in the volume of climate finance available. Some of the $US10 billion per year which developed countries pledged at Copenhagen for low-emissions and climate resilient development from 2010 to 2012 has been delivered.**

The limited accountability mechanisms available for agreements reached and the lack of meaningful consequences for non-compliance have also been raised as obstacles to progress on a new climate agreement. Another concern around the global climate change architecture is that of fragmentation. Both within the UN and beyond there are a number of new institutional mechanisms and platforms for negotiation. Critics of this fragmentation have argued that agreements reached by only some countries are inherently flawed. Meanwhile, at the sub-national level of governance we see useful developments – for example, with cities cooperating as part of the C-40 network to bring about local change through policies for transportation and urban planning which will both reduce emissions and encourage adaptation to the climate change already affecting our lives.

Also, there is room for optimism associated with the expected large increase in the volume of climate finance available. Some of the $US10 billion per year which developed countries pledged at Copenhagen for low-emissions and climate resilient development from 2010 to 2012 has been delivered. Developed countries have committed to raising $US100 billion in climate finance annually by 2020. That would create an even larger base from which to leverage large-scale private investment for climate change adaptation and mitigation in developing countries.

The UNDP has long supported countries to overcome barriers to attracting investment. We are now applying this experience to help countries build the capacities necessary to access climate finance and navigate through the plethora of diverse funding sources. Overall, climate finance is now accessible through more than 50 international public funds, 60 carbon markets and 60,000 private equity funds. Without strengthened capacities too many localities and countries will be left out, unable to tap the upfront resources needed to leverage private investment and put sustainable development into practice.

**Conclusion**

In providing a detailed account of some of the successful, and at times less successful, reform efforts of multilateral institutions and processes, I have considered different elements which I believe are essential to make global governance institutions fit-for-purpose in the 21st century.

- First, *efficiency and effectiveness:* I have argued that global institutions are critical for coordinated action to tackle the most pressing challenges of our era, whether they be climate change, peace and security, or economic volatility. Outdated structures and functions, such as the UN Security Council veto, can undermine efficient and effective cooperation.
- Second, *legitimacy and transparency:* I have suggested that much more can be done to ensure that global institutions are representative and inclusive, and that they function in a manner which reflects the geopolitical realities and economic dynamics of the 21st century. The ongoing reforms at the IMF, the World Bank and other institutions are moving in the right direction for greater inclusiveness and transparency. A reformed ECOSOC which attracted finance ministers to its proceedings would also give the UN a more effective forum and voice on economic and financial issues.
- Finally, *accountability and fairness.* Here the key question is whether global institutions give voice and decision-making power to those most affected by global challenges – often the poorest and most vulnerable – and whether recipients of support are enabled to hold these institutions to account. Not enough attention is being given to these issues, but increasingly global civil society will demand that reform agendas take them into account.

Overall, there can be no doubt that progress has been made towards enabling global institutions to be more fit-for-purpose. So far, however, not enough has been done across the three dimensions I have outlined to ensure optimal functioning of a range of institutions at a time when unprecedented cross-border challenges require improved global governance.

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Sally Washington and Rachel Groves

# Seismic Shifts designing and growing innovation capability

The Better Public Services Advisory Group report (November 2011) noted that innovation in the New Zealand public management system is currently 'stifled by a lack of capability, an undue degree of risk aversion on the part of chief executives, boards and Ministers and little consideration of how to manage risk in this context' (Better Public Services Advisory Group, 2011, p.20). In launching the Better Public Services report and results, the prime minister called for 'a public sector that embraces innovation'.[1]

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A range of OECD governments, including those of Australia, Canada, Denmark, the United Kingdom and the United States, have established specific strategies for driving public sector innovation, recognising that they cannot meet the fiscal and social challenges of the 21st century without intentionally seeking new and different ways of doing business.[2] The wider application of recognised innovation methodologies, as well as improved organisational capability to generate new ideas and convert them into new approaches to the design and delivery of services, and more deliberate strategies to diffuse and upscale those approaches across the state services would improve the customer focus and responsiveness of New Zealand public services and help to achieve the vision of the Better Public Services report.

Canterbury, after the earthquakes showed what is possible. The earthquakes, provided a 'perfect storm' for innovation. The status quo was not an option and public servants were given permission from Wellington to 'do whatever it takes'. They responded to the challenge with new and different approaches to service delivery and design which provide live demonstrations of better public services.

**Box 1. Research questions**

**Characteristics of organisations that support and enable innovation**

1. Leadership that is passionate about outcomes and has clear goals but is flexible about how to reach those goals
   - How are those agency goals articulated – to staff/to stakeholders?
   - Where and how does innovation (or the desire to seek new and better ways of doing things) fit into organisational strategies and how is that communicated across the organisation?
2. Encourages experimentation and bounded and informed risk-taking, while tolerating some failure as a learning experience
   - How do they show that they are prepared to consider and trial new ideas and new ways of doing things?
   - How do they communicate a tolerance for risk? What risk management strategies are in place? How is efficiency and effectiveness built into decision-making – quick iterations/prototyping/"fail fast/fail cheap"? How is failure dealt with – is it seen as a learning opportunity?
   - What incentives? How is innovation recognised and rewarded? To what extent are budgets and fund allocations linked to improvements in performance driven by innovation?
3. Is customer focused, solicits ideas from and engages with diverse internal and external sources
   - What channels are there for seeking ideas from inside and outside the organisation – including scanning international exemplars, engagement with stakeholders/users?
   - How are successful innovations re-used/adopted/adapted and shared within and outside the organisation?
   - Is collaboration with other organisations part of the innovation equation?
4. Are capability, skills and experience in innovation disciplines/methods supported by resources (funding, time and space)
   - Do staff have access to and training in innovation disciplines, methods, tools and approaches?
   - Is there dedicated space and/or time for 'thinking' and developing new ideas/ways of doing things?
   - Is there a special part of the organisation dedicated to innovation (R&D, service design/design thinking)?

**The view from a different lens**

It is important to see the above characteristics and related questions, and the evidence that they exist, through multiple lenses – including the organisation's:

- Leadership/senior management – what commitment, support, permission is deemed important?
- Staff – what is their perception of engagement, ability to share ideas and sense of freedom/ permission to try new things?
- Key stakeholders – partners, customer/client/user perspective. How are they involved in generating/co-producing ideas, implementation and dissemination of innovations?

The State Services Commission (SSC) has an ongoing programme to document and disseminate the lessons from the Canterbury innovations. Case studies and a related report to Cabinet are available on the SSC website.[3]

Some of the Canterbury initiatives could be directly replicable elsewhere. But their greater value lies in demonstrating new ways of working that can inform and drive change elsewhere: a 'graft and grow' rather than a 'cookie cutter' strategy for upscaling successful innovations. The Christchurch story also paints a picture about what enables innovation to flourish in a public sector context. Many of the innovative responses to the earthquakes were not simply a reaction to the crisis. Rather, they were enabled by pre-existing innovation capability in public sector agencies there, most notably in the Canterbury District Health Board (CDHB) and in Inland Revenue.

Inland Revenue's service design team based in Christchurch was instrumental in initiatives such as Recover Canterbury[4] (a public/private partnership for business recovery), and co-location initiatives leading to the forthcoming Shared Front of House (a multi-agency shared service facility or 'one stop shop'). The CDHB implemented the 'shared care record view'[5] (eSCRV), a secure online system for sharing patient information between health professionals, invaluable in a disaster such as this when paper records were irretrievable and access to usual health providers was disrupted. The eSCRV was in the pipeline prior to the earthquakes but its development was accelerated in response to post-earthquake needs. In short, the earthquakes expedited innovations, but the organisational foundations were pre-existing.

The SSC has conducted a case study of Inland Revenue and the CDHB to describe their innovation capability. It tests both organisations against the characteristics cited in international literature as being common to innovative organisations. The case study is not an evaluation or comprehensive assessment of either organisation. The aim is to provide information to agencies wishing to develop their own capability to innovate. This article provides a summary of the case study findings. It starts with a description of the study method, including a template of research questions. The template itself might offer the foundations for an organisational self-assessment tool.[6] We then compare the two organisations against some broad headings derived from that template, including:

- The importance of leadership, clear goals and strategy to embed a culture of innovation.

- Permission, a tolerance for experimentation, risk-management and rewards as key components of the innovation-enabling environment.
- Customer focus, engaging stakeholders and soliciting ideas from diverse internal and external sources as key inputs to innovation.
- Capability and skills in innovation disciplines/methods supported by resources (funding, time and space) as the organisational tools for innovation.

The characteristics of innovative organisations align closely with the characteristics defined in the Performance Improvement Framework (PIF) system-level findings as common to the best performing agencies. In terms of the efficiency and effectiveness of their core business, 'the best agencies demonstrate that they value learning, innovation and continuous improvement' (Te Kawa and Guerin, 2012).

Responding to the prime minister's call for a public sector which embraces innovation requires a three-pronged approach. We need mechanisms to upscale and disseminate successful innovations, enhanced innovation capability in organisations, and an underpinning public management infrastructure that includes systemic incentives and support to encourage innovation. This article concentrates on the middle prong of that approach.

### Innovation and innovation capability – definitions and method

We adopt the following definition of innovation: '[I]nnovation is the creation and implementation of new processes, products, services and methods of delivery which result in significant improvements in the efficiency, effectiveness or quality of outcomes' (Mulgan and Albury, 2003, p.3). Innovation capability, therefore, is the capacity of an organisation to create the conditions, and apply the resources (people, financial, tools and methods), to enable and support innovation activity.

For this study we developed a template of research questions (see Box 1) based on the international literature about the characteristics of innovative organisations.[7] We conducted semi-structured interviews with a small group of leaders and staff of the two target organisations, to get views from people at a range of levels and functions. We then prepared individual case studies on the two organisations and a summary report comparing the two, which this article draws on.

**Senior managers noted that if an organisation penalises failure when people try new things, then it will perpetuate a risk-averse culture and reduce innovation capability.**

### Leadership, goals and strategy

Passionate leaders, a common vision and common language are key components of developing a culture which supports innovation. It is difficult to measure the relative 'passion' of leaders, but our interviewees saw this element as crucial, describing it as the need for leaders to be *courageous* and brave in defining and articulating their vision.[8]

In terms of clarity of purpose, vision and strategy, senior CDHB managers interviewed were all completely 'on message' with a shared understanding of the vision of the organisation and the wider Canterbury health system. They were clear that the visibility of senior management was vital to translating a vision and *a direction of travel* to all parts of the organisation, and further out to the wider health system. They saw this as an explicit responsibility. They emphasised the role of senior leadership as *painting the picture* so that staff and stakeholders could see where they fitted into it. The chief executive noted that *[We are] really passionate and dogged about the vision.* We also found that Inland Revenue staff interviewed for this case study all referred to Inland Revenue's strategy 'IR for the future' and could articulate the key messages embodied in it.

In contrast, an overview of the 21 PIF reviews to date[9] found that only about a third of the public service agencies reviewed were strong or well placed on indicators relating to articulating purpose, vision and strategy, indicating that this is a weakness across the system. In general, agencies appear to be good at serving ministers and dealing with day-to-day challenges, but less skilled at defining a vision for the future and developing a strategy and capability to get there.

### Permission, experimentation, risk management and rewards

Organisations that enable innovation encourage experimentation, support it with risk-management strategies, allow some failure, which is seen as a learning experience rather than sunk costs, and reward innovation initiative. People interviewed for this study identified permission from senior managers to 'do things differently' as the top enabler of innovation, supporting the notion that top-down permission enables bottom-up innovation. Yet research conducted by Ryan et al., (2008) suggested that we have very few champions or 'guardian angels' of innovation at senior leadership level across New Zealand's public service.

The CDHB was seen as encouraging of experimentation and tolerant of risk-taking. Senior managers noted that if an organisation penalises failure when people try new things, then it will perpetuate a risk-averse culture and reduce innovation capability. They argued that staff should understand what they are trying to achieve, know that their back is covered, and know if they fail it should be quick and early and used as a learning experience. The chief executive referred to this as tolerating *sensible risk*.[10]

The CDHB's 'Particip8' and 'Xcelr8' training and development programmes are designed to give participants the tools and permission to think and do things differently. Particip8 is largely about teaching change management, while Xcelr8 is about encouraging participants to seek new and better ways

of doing things – to own the innovation challenge. Xcelr8 includes a component where participants in small groups actually design an innovation for the Canterbury health system. Participants in that programme take away a 'permission card' from the chief executive which can be used to unblock future barriers to change. One senior manager noted that they were aiming to give *everybody permission to do things differently*, but within the boundaries of the vision: *Is this right for the patient and is this right for the system?* References were made to the need to create *architects of change* within the organisation and in partnership with stakeholders. One senior manager argued that the key to better services was shifting decision-making as close as possible to where the actual service gets delivered.

Inland Revenue interviewees were less confident that experimentation and failure would be tolerated. They often referred to the organisation as 'risk averse'. This might reflect the risk profile associated with the regulatory environment Inland Revenue operates in, including its strict legislative provisions related to privacy and secrecy. The commissioner expressed the challenge as follows: *One of our biggest challenges is how we develop such an innovative culture without compromising the integrity of the tax system. For me, ensuring that we protect the integrity of the tax system is paramount and we currently have strict secrecy and privacy legislative provisions to support this.*[11] But accepting a degree of risk and managing it effectively is a key factor in successful innovation. Managing risk is not the same as avoiding it.

Despite this apparent risk aversion, PIF findings show Inland Revenue to be the only public service agency to score consistently well on indicators related to self-review and improvement. This dimension of performance demonstrates how an agency learns from its experiences to identify opportunities for continuous improvement and innovation.

Both the CDHB and Inland Revenue include innovation and continuous improvement as part of a package of change strategies. Views from these organisations offer insight into the interface between innovation and continuous improvement: they are not interchangeable but complementary. One CDHB senior manager described a continuum involving *a need to do business as usual really well, constant improvement, and work on transformation at the same time*. Another noted that continuous improvement on its own was not enough: *you couldn't continuously improve this organisation, we had to transform it – you can't leap a chasm one step at a time*. A similar distinction was made by an Inland Revenue interviewee, using a series of questions to highlight the component parts of organisational transformation:

> *What level of investment is needed to keep the lights on?*
> *What is needed to ensure continuous improvement?*
> *What is needed for big change/ innovation?*
> *What is left over for seed funding or to keep improving innovation capability?*

Strategies for change that include keeping up the momentum of incremental improvement in processes (through continuous improvement) and innovation for more significant shifts reflect what David Albury describes as a 'split screen narrative'. His research defined leaders of innovative organisations as those who are 'interested in innovation but not for its own sake, rather they are concerned about how to continue to improve their day-to-day operations and services and products while at the same time building innovative capability to address present and future challenges' (Albury, 2011, p.230).

Recognition and rewards for successful innovation provide crucial messages about the value of doing things differently and encourage further innovation. There are some symbolic rewards for innovation in both Inland Revenue and the CDHB. Inland Revenue has an annual commissioner's award for innovation, while in the CDHB awards are given for the best idea coming out of 'David's Den' (a play on the Dragon's Den concept) at the end of each Xcelr8 programme. The fact that each successful Xcelr8 idea is allocated to a senior manager to take forward is further testimony to the value attached to innovation.

**The Better Public Services Advisory Group report pointed to poor customer focus as one of the weaknesses of the New Zealand public management system ... 'state services in New Zealand do not listen well or respond to citizens and businesses, nor adapt design and delivery to their needs'.**

#### Customer focus, ideas generation and stakeholder engagement

A focus on users, engaging stakeholders and soliciting ideas from diverse internal and external sources are all key inputs into the innovation process. The Better Public Services Advisory Group report pointed to poor customer focus as one of the weaknesses of the New Zealand public management system and one that has led to a general inability to design or adapt services to the needs of citizens and business: 'state services in New Zealand do not listen well or respond to citizens and businesses, nor adapt design and delivery to their needs'.[12]

We found that both Inland Revenue and the CDHB were strongly customer-focused and that the desire to improve the customer journey has been a key driver for change. The CDHB's map of the Canterbury health system[13] has the customer firmly in the centre of the picture, while a key indicator of success across the system is 'reducing the time people waste waiting'.[14] People

interviewed from Inland Revenue stressed that *the customer is at the centre of the organisation*. Their capability in service design, discussed below, is about understanding and designing services around customer needs.

Both organisations utilise customer feedback mechanisms. Inland Revenue was the first government agency in New Zealand to develop online customer forums. Both are also open to, or actively solicit, ideas from inside and outside the organisation. CDHB managers stressed the importance of looking to other sectors for new ideas and models. Its use of alliancing was borrowed from the construction industry, while organisations as diverse as Air New Zealand and public libraries are invited to present their service models at Xcelr8 sessions.

The CDHB exhibits strong engagement with stakeholders (reflecting the need to engage other health sector partners to deliver outcomes) and has deliberate strategies to engage staff and stakeholders in the actual design of improvements to processes and services. Over 2,000 stakeholders were involved in developing its Vision 2020 (described below). As noted above, the Xcelr8 programme involves participants (drawn from across the Canterbury health system) designing an innovation.

The CDHB also co-produces services with other parts of the Canterbury health system. The eSCRV was the product of collaboration between it, Pegasus Health, a range of health providers and a software company, Orion. Its use of alliancing is similarly based on good faith contracting, whereby projects and services are co-produced with outside partners. As one senior manager explained: *be clear about the end point, define the problem and context and enable people*. The intended results for users from this integrated process mean that *It should be seamless for the person … they have no sense of having been passed from one organisational structure to another … the services are just organised around them.*

#### Capability – skills, space, tools and investment

Innovation is not just about unleashing creativity. Successful innovation occurs through the conscious application of recognised disciplines, methods and tools. Both the CDHB and Inland Revenue have invested in developing capability and skills in innovation disciplines, most notably design thinking and service design. Service design is an internationally recognised method for driving innovation in both the public and private sectors (Saco and Goncalves, 2008). Through 'harnessing user participation, feedback, insight generation and connecting these things to organisational or system design and development, service design's model of change is focused on creating a system able to continuously adapt, reconfigure and most importantly, learn from itself' (Parker and Heaphy, 2006, p.90).

**'Experience and research show that top management must show long-term dedication to set aside resources for innovation in order to establish a lasting organisational capability to innovate' …**

Inland Revenue has a strong service design capability which is sought after by other public service organisations. Currently Inland Revenue acts the 'good corporate citizen' by deploying its capability to assist other agencies, in Christchurch and elsewhere (including for the delivery of Better Public Services result 10).[15] There is anecdotal evidence of increasing demand and a shortage of people with service design expertise across the public service. This might become more acute as agencies respond to the Better Public Services message to be more innovative.

The CDHB also has a recognised service design capability, but its innovation capability extends well beyond this team. Its training Particip8 and Xcelr8 programmes are designed to give participants across the organisation and wider Canterbury health system the tools to generate new ideas and drive their implementation. Moreover, innovation is evident in not only what they do, but how they do it. For example, Vision 2020 was produced through a highly innovative experiential process, dubbed Showcase.[16] This involved small groups of participants being taken through a warehouse where they experienced mock-ups of health services. Their reactions were captured and later used to define a vision for the Canterbury health system. It took a lot of courage on the part of the chief executive to agree to such a non-traditional process, but the result was highly successful and was perceived to have been responsible for the high level of buy-in and ownership of the overall vision. A second Showcase is being held in early 2013 to refresh that vision.

A key message from this case study is that it takes time and investment to develop and maintain organisational capability to enable innovation. This echoes the international literature on innovation capability, and is common to both the public and private sectors: 'Experience and research show that top management must show long-term dedication to set aside resources for innovation in order to establish a lasting organisational capability to innovate' (Davila, Epstein and Shelton, 2006). Both Inland Revenue and the CDHB have invested in innovation capability. This has been built over five–seven years and sustained over the tenure of several chief executives and, in the case of the CDHB, several boards.

One of the early architects of Inland Revenue's service design capability highlighted the potential return on that investment: 'The journey is worth it. Everyone is a citizen, everyone has a customer experience; better design will benefit all New Zealanders. Also, if we achieve excellence in public service design, the result will be an innovative and efficient public service' (McLean, Scully and Tergas, 2008, p.37).

**Table 1. Indicators**

| High performing public institutions | Organisations that enable innovation |
|---|---|
| Are clear about their purpose; know how they can add most value to New Zealand now and in the future; and are clear about the strategy for delivering that value. | Have leadership that is clear and passionate about what it is trying to achieve (outcomes and goals) but is flexible about how to reach those goals (tight/loose balance). |
| Develop and use information and analysis to support decision making to add value and manage risk. (The others avoid risk rather than manage it.) | Encourage experimentation and bounded and informed risk-taking, |
| Enlist the active support of all those outside the agency who are necessary to the agency delivering its key results. | Are customer focused, solicit ideas from and engage with diverse internal and external sources. |
| Demonstrate that they value learning, innovation and continuous improvement. | Have capability, skills and experience in innovation disciplines/methods supported by resources (funding, time and space) |

**A cross-agency innovation hub?**

The CDHB service design team and the Christchurch-based Inland Revenue service design team intend to co-locate, which could provide a prototype for some future cross-agency innovation capability. The two teams already share information, methods and training and expect to co-locate in early 2013.

Overseas jurisdictions with a strong innovation strategy have put in place an innovation hub, or some centre of expertise (virtual or real), to provide practical support to develop innovation capability.[17] The functions provided by such labs/centres of expertise include:

- providing advice, active support and practical toolkits;
- providing a repository of local and international, public and private exemplars of innovations and innovation capability;
- facilitating networks for sharing knowledge and experiences;
- providing capability development (training and development/ expertise);
- Providing mechanisms for upscaling or diffusing innovations.

The CDHB sees this Canterbury co-location as an opportunity to create a 'design lab' and is explicit about the potential for the hub to provide cross-government innovation capability. It promotes the potential public value to be gained from that. Inland Revenue is more cautious, perhaps reflecting the current regulatory constraints around privacy and the related tensions co-location raises. The hub will be something to watch.

**Innovation capability links to superior performance**

The characteristics derived from the literature as being common to organisations that enable and support innovation align closely with the characteristics defined by the PIF system-level findings as indicators of good performance and of aspirational 'great public institutions'. Table 1 compares those two sets of characteristics. [18]

The PIF currently concentrates on public service departments, and while a few Crown entities have been reviewed it has not yet reviewed any district health boards. Among the public service departments that have undergone a PIF review, Inland Revenue is a high-flyer.[19] An indicator of the CDHB's growing reputation as a high-performing organisation is that it is becoming a popular destination for professionals from overseas jurisdictions[20] and other district health boards seeking to emulate its innovative approach to achieving an integrated health system. Both organisations demonstrate that they value and invest in learning, continuous improvement and innovation.

**Discussion and conclusions**

Both Inland Revenue and the CDHB embarked on an innovation journey based on a similar 'burning platform', a desire to put the customer at the centre of the business while at the same time responding to increasing demands for services and decreasing funding baselines. Both agencies have also invested in innovation capability over some time, not in isolation but as part of a package of business transformation strategies.

This case study found that both Inland Revenue and the CDHB reflect most of the characteristics derived from the literature as being common to organisations that support and enable innovation. However, we argue that there is a qualitative difference between the organisations. The CDHB encourages experimentation and seems prepared to accept and manage related risk. The perceived risk aversion in Inland Revenue was seen as a barrier to the agency realising its full innovation potential. Inland Revenue's innovation capability is synonymous with its service design capability, whereas the CDHB takes a broader and more extensive approach to innovation. It has an explicit strategy to embed innovation across the organisation and wider system. It is innovative in what it does and how it does it. However, the relatively new Inland Revenue commissioner is committed to building Inland Revenue's overall innovation capability, which bodes well for the future: *Although Service Design is one of our key capabilities in delivering innovative and customer centric services, we also want to ensure we have a culture of innovation embedded throughout all areas of the organisation.*[21] Moreover, our findings also suggest that even if an agency does not fully reflect every characteristic – for example, where risk aversion may mean it is not tapping its full innovation potential – having strong capability in service design or some other innovation discipline means that it can still enable innovation activity. That is an important message for other public sector organisations wishing to improve their own innovation capability.

Upscaling successful innovation and building innovation capability in organisations are both crucial parts of the quest to embed innovation across the state services. Underpinning that, we need a public management environment

that encourages innovation. Systemic barriers, related to the overall public management system and not specific to either organisation, were also mentioned by people interviewed for this study. These were manifested more in Inland Revenue than in the CDHB, which as a Crown entity is relatively more autonomous. They included the challenge of collaboration between agencies and with private sector and NGO partners, difficulties with jointly funding initiatives, barriers to information sharing, and business case processes that require a level of specificity that does not enable the iteration and adjustments involved when prototyping or trialling design options. [22]

The challenge now is to build an 'innovation infrastructure' for the state services, including enhanced systemic incentives (demand, mandate and expectations to innovate) and support (guidance on capability and methodologies) to move from 'random innovation' or 'innovation by necessity' – responding to crises such as the Canterbury earthquakes – to a new state of 'innovation by design'. We need a seismic shift.

1 http://www.beehive.govt.nz/speech/better-public-services-speech-auckland-chamber-commerce.
2 The OECD has a programme to document these strategies: see http://www.oecd.org/governance/oecdobservatoryofpublicsectorinnovation.htm.
3 http://www.ssc.govt.nz/christchurch-innovations.
4 http://www.ssc.govt.nz/ci-recover-canterbury.
5 http://www.ssc.govt.nz/ci-shared-care.
6 Diagnostic tools have been developed elsewhere to test the innovation potential or performance of organisations. For example, the Australian public service includes a diagnostic tool in its Public Sector Innovation Toolkit: see http://innovation.govspace.gov.au/tools/diagnostic-tool/2/.
7 These were based on: David Albury's research on more than 40 high-performing innovative organisations and 10 innovative sectors, http://www.anu.edu.au/discoveranu/content/podcasts/creating_the_conditions_for_radical_public_service_innovation_david_albury/; the Australian public service 'Innovation compact for leaders', http://innovation.govspace.gov.au/; *The Public Innovator's Playbook: nurturing bold ideas in government*, Deloitte and the Harvard Kennedy School's Ash Institute for the Democratic Governance and Innovation, http://www.deloitte.com/innovatorsplaybook; and I*nnovation in the Public Sector: enabling better performance, driving new directions*, Australian National Audit Office, www.anao.gov.au.
8 Quotations (italicised) in this article are generally not attributed to protect the confidence of the people interviewed.
9 http://www.ssc.govt.nz/pif.
10 Interview with David Meates, chief executive, CDHB, 9 October 2012.
11 Naomi Ferguson, chief executive and communication commissioner of Inland Revenue, 21 December 2012.
12 See www.ssc.govt.nz/bps-background-material.
13 The map is a pictorial depiction of the health system and used to describe Vision 2020, which became Transition 2012 following the earthquakes.
14 Transition 2012, CDHB, April 2012, p.4, www.cdhb.govt.nz/communications/documents/transition_2012_plan.pdf.
15 Result 10 is: 'New Zealanders can complete their transactions with the Government easily in a digital environment'. Further information about BPS results is available at www.ssc.govt.nz/bps-results-for-nzers.
16 Described in more detail in a forthcoming SSC report on the CDHB, *Designing a growing innovation capability*.
17 For example, Denmark's MindLab is internationally recognised. Australia has recently established a Centre of Excellence in Public Sector Design as part of its Public Service Innovation Action Plan.
18 For a discussion of the PIF system-level findings, see Te Kawa and Guerin (2012).
19 Ibid., Figure 4, p.34
20 These include several Australian states, Singapore, Canada and the UK National Health Service.
21 Naomi Ferguson, chief executive and communication commissioner of Inland Revenue, 21 December 2012.
22 Legislative changes proposed in the State Sector and Public Finance Reform Bill provide for greater flexibility in funding arrangements including through multi-category appropriations. More flexible business case processes can also support agencies to work collaboratively and enable an iterative approach to service design and delivery.

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Malcolm Menzies

# Harnessing Science For Business

**A brief history of technology transfer**

The New Zealand government has announced the creation of a new Advanced Technology Institute – since renamed Callaghan Innovation after the late Sir Paul Callaghan – to be launched in 2013. Callaghan Innovation's purpose will be 'to help get New Zealand's most innovative ideas out of the lab and into the marketplace more quickly and provide a high-tech HQ for innovative New Zealand business'.[1] This development is the latest in a long line of attempts to use research, science and technology to boost the country's economy (Palmer and Miller, 1984; Ministerial Working Party, 1986; Science and Technology Advisory Committee, 1988; Ministerial Task Group, 1991; Ministry of Research, Science and Technology, 2006, 2007).

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Twenty years ago the former Department of Scientific Research, the advisory divisions of the Ministry of Agriculture and Fisheries and some other smaller groups were disestablished and their assets combined and redistributed to ten Crown (state) research institutes or CRIs. Each CRI was established with a focus on an economic, environmental or social sector,[2] in the belief that such an alignment would foster closer relationships, ensure better transfer of knowledge between researchers and users, and incorporate the business-oriented skills required to manage science-based innovation processes. There was also reform in the way policy was set and government funding allocated to research, with the establishment of the separate Ministry of and Foundation for Research, Science and Technology.

Over time there emerged considerable dissatisfaction with the performance of the reformed science system, particularly in relation to funding, structures, and connections between science and business

(Institution of Professional Engineers, 2004; Ministry of Research, Science and Technology, 2008; National Science Panel, 2008), so in 2009 the government set up a review which produced a number of recommendations for further changes. Most of these recommendations related to funding, ownership and governance matters, but it was also reiterated that technology transfer was 'a core responsibility for all CRIs and [that the government should] require CRIs to develop, invest in and manage intellectual property with the intent of moving that intellectual property from their balance sheet into the private sector as soon as possible' (Crown Research Institute Taskforce, 2010, p.12).

A further report on the high-value manufacturing sector (2012) led directly to the establishment of Callaghan Innovation. The panel of experts who prepared this report analysed primary barriers to technology and knowledge transfer, but also acknowledged the complexity of the innovation process. The panel was more nuanced in its view than many of its predecessors, and the establishment of Callaghan Innovation may provide an opportunity to reflect on the dominant model of technology transfer and to consider whether modifications or alternatives might deliver better economic outcomes.

A strong argument can be made that previous reforms of the research, science and technology system in New Zealand were premised on a mental model (Johnson-Laird, 1983; Ramirez, 2007) of science and business existing in inherently different realms populated by people with separate and mutually exclusive sets of attributes (Menzies, 2008). This thinking in part underpinned a view of technology transfer wherein ideas are created by scientists and passed to others along a chain of increasing application and commercialisation (Slaughter and Leslie, 1997; Evans, Kersh et al., 2004). This view makes little allowance for the possibility that the desired attributes may be combined within the same individual(s) – scientific entrepreneurs – who can move with their scientific ideas into the marketplace (Etzkowitz, 1998; Graversen and Friis-Jensen, 2001; Nås, Ekeland et al., 2001; Corolleur, Carrere et al., 2004; Murray, 2004; Abramo and D'Angelo, 2009). Scientific entrepreneurs are rare, though probably not as rare as policy makers and managers may think (Aldridge and Audretsch, 2011). As one such scientific entrepreneur put it, albeit a little awkwardly: 'I think a good scientist could be a good entrepreneur but – it's the same tools but a different mindset.' Better understanding of this 'different mindset' could be used alongside structural reform to support the development of systems and processes to increase the incidence of scientific entrepreneurship.

### The potential of scientific entrepreneurship

The foregoing discussion does not mean to dismiss the efficacy of conventional processes of technology transfer in the presence of already-existing sectors with 'absorptive capacity' and capable of delivering very good returns on investment (Hall and Scobie, 2006). But where there is no absorptive capacity – for example, in nascent industries – the pure transfer model breaks down both conceptually and in practical terms (O'Shea, 2008). In New Zealand major barriers to the transformation of existing industries or the growth of new ones are low research intensity and inadequate absorptive capacity within the economy (Carlaw, Devine et al., 2003). Instead, New Zealand firms generally take an informal and incremental approach to innovation, and, rather than referring to research and development or groundbreaking innovations, most cite feedback from customers or employees (especially sales staff) and changing customer needs and values as important inputs (Knuckey, Johnston et al., 2002). It is a major challenge for research outputs to be taken up by a broadly unreceptive business sector.

Scientific entrepreneurship offers the potential to create radical, 'technology-push' innovations and underpin the development of new economic sectors (Workplace Productivity Working Group, 2004; Göransson, Maharajh et al., 2009). To help come to grips with this phenomenon, it's worth starting with the literature on the various components, beginning with that on entrepreneurship.

### Entrepreneurship

The study of entrepreneurship faces an inherent difficulty, which is how to analyse a process which cannot be foreseen by most people and is generally recognised only in retrospect (Baumol, 1983). Nevertheless, from past cases it is possible to identify a priori indicators of entrepreneurial success and contextual factors or individual attributes that contribute to entrepreneurship. Several studies have shown a cluster of personality traits common among all successful entrepreneurs, including the need for achievement (McLelland, 1961) as well as persistence, innovative outlook, low need for conformity, high energy level, risk-taking and efficiency (Belt, 1990). The factors which empirical evidence most strongly links to entrepreneurial success are: high self-efficacy; ability to spot and recognise opportunities; high personal perseverance; high human and social capital; and superior social skills (Markman and Baron, 2003). Meta-analysis by Zhao and Seibert (2006) indicates significant differences between entrepreneurs and managers on four personality dimensions, such that entrepreneurs score higher

**The factors which empirical evidence most strongly links to entrepreneurial success are: high self-efficacy; ability to spot and recognise opportunities; high personal perseverance; high human and social capital; and superior social skills ...**

on conscientiousness and openness to experience and lower on neuroticism and agreeableness. Hansemark (1998) claims that only two psychological attributes have shown any significant relation to entrepreneurship: need for achievement and locus of control.

Risk is a major recurring theme and numerous attempts have been made to measure the risk-taking attribute of entrepreneurs, but this is not just a function of personality. It also seems to reflect organisational context and history (McCarthy, 2000). Opportunity recognition is also seen by many as a key behaviour (Smart and Conant, 1994; Baum, Locke et al., 2001), although opportunity recognition might also be seen to be driven more by the distinctive knowledge possessed by individual entrepreneurs than by their personality traits (Shane, 2000). Entrepreneurs often challenge existing wisdom and reconcile opposing forces, moulding external information with their individual decision-making processes. Nevertheless, entrepreneurs need a considerable amount of social and interpersonal skill to build and cultivate networks and other social capital which will enable them to glean the information and resources they need (Cromie, 1994; Baron and Markman, 2000; Shane and Stuart, 2002; Audretsch, 2003; Aldridge and Audretsch, 2011). They have to be able to organise and lead others if their endeavours are to be successful.

**Science and entrepreneurship**

Science differs from entrepreneurship in that it is often regarded as being based on a particular set of norms and a sociology which create a difference from the world of business in general (Merton, 1973; Ziman, 1984, 1994; Bortagaray, 2009). But many of the traits required by scientists are not inherently different from those required by people working in many other realms – imagination, self-criticism, diligence and curiosity, for example. Scientists are considered to have a devotion to truth and respect for the public literature, and to be motivated by the science itself rather than by external rewards. In this respect they are quite similar to many entrepreneurs.

Like entrepreneurs, scientists spot opportunities and take risks, albeit these are less likely to be of a financial nature. They also at times challenge conventional wisdom (Kuhn, 1996). Scientific effort is motivated by the crucial aim of being original (adding something to the body of knowledge that was not known before). Recognition of originality and the associated rewards are of critical importance to scientists and signify that the institutional aim of science has been fulfilled. It could be argued that entrepreneurs are also motivated by a desire to be original (by exploiting a hitherto undetected opportunity), although they work in a different 'recognition market' (Musgrave, 2009).

Leaving aside the strong knowledge requirements for science, the literature seems to suggest that some attributes of scientists and entrepreneurs are similar: for example, the desire for autonomy and creativity. Self-efficacy is more often mentioned with respect to entrepreneurs, but there is no reason to believe that this is an attribute high-performing scientists lack. Even those aspects that are superficially the same may be qualitatively different: for example, scientific research does require a degree of risk-taking, but it is also subject to painstaking review processes. This does not discount the possibility of leaps in thinking, but it does seem generally at odds with entrepreneurial processes wherein an individual acts on imperfect information, backs his or her own judgement, and is judged retrospectively by results in the marketplace.

**Human capital and the competency movement**

The fields of science and entrepreneurship may have differences, but they are both human activities which may be employed for the purposes of economic innovation. In order to understand the overlapping phenomenon of scientific entrepreneurship, therefore, it seems sensible to draw on the knowledge base related to human capital – a subset of the economics literature which originated with Becker (1964) and Schultz (1971). Much human capital development, particularly in the sciences, is cumulative – i.e. new elements build on what has gone before (Ziman, 1984) – and tends to move incrementally rather than in leaps and bounds. There is an implication that it is expensive to add on human capital later in life to people who are highly trained in another field. In purely investment terms, it is better to embed desired attributes as early as possible in the life cycle (Durbin, 2004; Keeley, 2007).

Policy work on science and technology human capital has tended to focus on quantitative measures of stocks and flows represented by traditional indicators such as qualifications or codified knowledge such as patents (Schibany and Streicher, 2008; Royal Society, 2009). While undoubtedly important, these measures are not adequate for recognising the increasingly important tacit knowledge (Polanyi, 1967) and other attributes which are coming to assume greater significance within research, science and technology-based innovation (Cohen and Levinthal, 1990), and particularly in the commercialisation of scientific research (Buenstorf, 2009; Fagerberg, Mowery et al., 2009; Póvoa and Rapini, 2010). The *quality* of human capital is measured only indirectly, although there are trends towards assessing what people are actually capable of doing and the

**Policy work on science and technology human capital has tended to focus on quantitative measures of stocks and flows represented by traditional indicators such as qualifications or codified knowledge such as patents ...**

degree of matching of those abilities with future needs. A competence 'movement' has arisen out of controversy over the validity of measures and insufficient correlation between measured intelligence and life outcomes (Brophy and Kiely, 2002), and one logic which suggests that identification and direct measurement of observed behaviours and their underlying composition and effects in particular situations (together comprising competencies) are key elements in building understanding of the role of human capital in a national innovation system (Tomlinson, 2001).

A useful model of effective performance based on fit between the individual, a job's demands and the organisational environment has been developed by Boyatzis (1982). Specific actions or behaviours lie in the overlap between the three domains. In Boyatzis' terms, an underlying characteristic (attribute) of a person may be a motive, trait, skill, aspect of one's self-image or social role, or a body of knowledge that he or she uses. The existence and possession of the above characteristics may or may not be known by the person who has them (an idea which owes much to Polanyi (1967)).

Given different schools of thought as to whether competencies are characteristics of an organisation, a job (or role) or an individual (Ellstrom, 1997; Brophy and Kiely, 2002; Lawson, 2004), the value of the Boyatzis model is in its recognition of all these elements and their interaction within a context, thus enabling whole-system thinking.

**Figure 1: Attributes of metacompetencies of scientific entrepreneurship**

| Attributes of scientific entrepreneurs | |
|---|---|
| Ability to reconcile differences in respective competencies<br>High level communication skills within and between realms<br>High level leadership and teambuilding abilities<br>High level ability to realise opportunities for commercialising RS&T | |
| **Attributes for scientific realm** | **Attributes for entrepreneurship realm** |
| Motivated by knowledge for its own sake<br>Deep knowledge<br>Aversion to financial risk<br>Incremental decision maker<br>Tending to perfectionism<br>Ability to realise scientific opportunities | Motivated by desire for application<br>Broad knowledge<br>Open to financial risk<br>"Heuristic" decision maker<br>Satisfied with 'good enough'<br>Ability to realise commercial opportunities |
| **Shared attributes** | |
| Creative, lateral thinking<br>Vision<br>Seek out and create knowledge<br>See ideas as tools<br>Focus<br>Problem solving<br>Managed risk taking<br>Connectedness (building and using related social capital)<br>Perseverance<br>High levels of self-efficacy | |

## Research

The research on which the rest of this article is based comprised interviews with 26 people who closely matched a working definition of scientific entrepreneurship. They came from a range of organisational and scientific backgrounds: biotechnology, the physical sciences, and information and communications technology (ICT). Four were women. All were interviewed using the same basic semi-structured format to discover their perspectives on how their own and others' scientific entrepreneurship had been recognised, by themselves, by others and by the system at large. The interview transcripts were then analysed using precepts of constant comparative analysis (Strauss and Corbin, 1998) and a software programme (NVivo) which is closely modelled on the application of grounded theory. From this analysis a series of thematic 'nodes' was derived within which relevant comments were gathered, and the nodes organised to show the underlying attributes of scientific entrepreneurs (Figure 1).

As can be seen, the attributes of entrepreneurs, scientists and scientific entrepreneurs emerge as being different from one another, but the sets of attributes are not mutually exclusive. Some attributes are unique to one particular group, but others are similar or shared.

## Discussion

### *Policy challenges*

Scientific entrepreneurship is not proposed as a 'magic bullet' alternative to current practice. However, new policies and schemes aimed at fostering its development could be introduced in parallel with existing approaches. In that case, it will first be necessary to allow for the *possibility* of scientific entrepreneurship. This means rejecting artificial distinctions between science and commerce (and between basic and applied research), and the adoption of new mental models which expand the overlaps between science and entrepreneurship.

Such changes in perception may be resisted, for reasons described by several authors (Snow, 1963; Schön, 1983; Musgrave, 2009), although not as much as was once the case (Slaughter and Leslie, 1997). It is possible that current policy problems that do not exist and is consequently missing reality on this point.

Before any resistance can be overcome, values such as the pursuit of knowledge for its own sake and for earliest publication will need to be reconciled with the values of commercialisation. This can be achieved if scientists are imbued with notions of consideration of use (Stokes, 1997) or integrative thinking (Martin, 2009), and have the desire, competencies and opportunities to move with their ideas as they progress to application and ultimately the creation of public benefit (Etzkowitz, 1998). This suggests a change in incentives for CRIs to facilitate the exit of entrepreneurs (with safety nets for

those who fail) rather than holding onto them tightly.

Some scientific entrepreneurs are well recognised once they have succeeded in general; these are people for whom no additional policy intervention would make any difference to their propensity for entrepreneurship, although it might be possible to influence the timing of their success. Conversely, some are engaged in valuable scientific research who do not have any of the innate attributes of entrepreneurs, and in whom it would be counterproductive to try to engender scientifically entrepreneurial behaviour.

The group that is of most interest is made up of those who have the necessary innate attributes but not acquired ones, such as key knowledge, skills and attitudes, that are able to be influenced through the creation of the right context and various other developmental measures. If these individuals can be better recognised as their competencies of scientific entrepreneurship emerge, it will be possible to design policies aimed at *tipping them over* into scientific entrepreneurship, thereby increasing its overall incidence within the national innovation system. For this to happen, there will need to be an 'undoing' of existing ways of working (Carroll, Levy et al., 2008).

In several countries there have been considerable efforts made at creating an appropriate context for the commercialising of research, science and technology, not only through structural means but more widely: for example, in attempting to engender culture change and in making linkages within innovation systems. This activity is presumably intended to generate desired behaviour and is to be applauded, but it is insufficient in and of itself. All levels are important in a competency model and it is at least as important to work from the bottom upwards. Yet innovation policies directed at the attributes layers are inconsistent and in their infancy. A competency approach can assist in simultaneously nurturing desired attributes and creating the appropriate context for them to find expression.

A holistic concept of competence-building systems (Tomlinson, 2001) is required, implying a broadening of the conception of national innovation systems to include agencies dealing with schooling and tertiary education. The competency-based approach is consistent with international trends in education and general management, but before it can be accepted in research, science and technology, and innovation policy more broadly, there will first need to be deeper and more consistent consideration given to the nature of human capital. This includes acceptance of the view that merely measuring conventional indicators of human capital is insufficient for recognising its quality. While such measurement remains important, it is a particular feature of centralised systems, and needs instead to be embedded in a broader view of the process by which quality is recognised (Menzies, 2008).

A common language of competencies will help facilitate a faster move towards policy integration, and provide the basis for broader, innovative approaches to the creation of quality in human capital (Bilton and Cummings, 2010). Current approaches to developing deep scientific knowledge are probably appropriate as they are, but traditional, content-based training is unlikely to bring about the attitudinal change and breadth of knowledge that are most likely to underpin the desired tipping-over process. New approaches (already being employed in some places) connect learners with the contexts within which they simultaneously create and apply new knowledge. Experiential, cross-disciplinary learning and a developmental approach (Ellstrom, 1997), and apprentice-style (relational) approaches to competency formation, are likely to be more effective (Gonczi, 2002). Specifically, attention needs to be given to recognising the key attributes underlying meta-competencies as shown in Figure 1.

It has to be acknowledged that the characterisation and assessment of competencies is still problematic because most of their underlying attributes are tacit and invisible to conventional methods of measurement. More research is needed, but an interim solution is to devolve responsibility for recognising these attributes to research organisations, while retaining centralised measurement of aggregate outputs and outcomes at a higher level. This will raise new challenges for the ways in which science and its commercialisation are managed.

**Where scientific entrepreneurs are recognised – as they are in Sweden ... – they will need to be given opportunities to lead the commercialisation process, with the discretion to create the teams and other capabilities they need rather than those capabilities being assembled by others who do not have the required whole-picture insight ...**

### *Management challenges*

Policy and practice aimed at the entrepreneurial connection of science and business frequently relies on brokering between the two. The ability of scientists to engage directly with the marketplace is quite restricted, and perceived deficits in their entrepreneurial competencies are rectified through the agency of others (a relatively passive or reactive strategy to team-building on the part of the central individual). But successful entrepreneurship involves the mobilisation of other people and their resources in pursuit of what the entrepreneur is trying to achieve. Indeed, a crucial difference between those who are scientific entrepreneurs and those who are not may be that the former can, if they

have a vision, collect together the team they need (a proactive strategy) rather than having the team added to them. This implies a whole new approach on the part of senior management to building 'renaissance teams' containing 'integrative thinkers' (Martin, 2009).

Recognition of scientific entrepreneurship is more likely to be effective if focused on real-time behaviour and with reference to a sensitising mental model. It is multi-skilled mentors in commercial contexts who are in the best position to recognise and tip over emergent scientific entrepreneurs. The competency approach provides a tool for the further training and development needed in order to be able to manage tacit knowledge and other attributes, and to infer entrepreneurial behaviours and manage their development.

Where scientific entrepreneurs are recognised – as they are in Sweden (Etzkowitz, Ranga et al., 2008; Leong, Wee et al., 2008) – they will need to be given opportunities to lead the commercialisation process, with the discretion to create the teams and other capabilities they need rather than those capabilities being assembled by others who do not have the required whole-picture insight (Göktepe-Hultén, 2008). The corollary will be a reliance on managers' reflective judgement (Schön, 1983), and resources placed at their discretion yet no increase in, and probably a diminution of, measurement-based reporting on how those resources are deployed.

Changed management practices will be possible only given the right organisational context (Ziman, 1984, 1994; Bryson and Merritt, undated). Entrepreneurial decision-making is heuristic (Forstater, 1999; Barney, 2004) and not particularly compatible with corporate processes. Organisations need a high level of corporate management skill to create an environment that will incentivise and allow for both entrepreneurial and non-entrepreneurial behaviour, and to allocate appropriate levels of risk and reward (Göransson, Maharajh et al., 2009). There will also need to be managed changes in the sociology of science so that scientists affirm, rather than create negative peer pressure on, their fellows who engage in commerce (Walton, 2003). For some scientific entrepreneurs there is great value to be gained from networking together (it seems that they are good at recognising each other). Modelling their behaviour on that of successful exemplars can assist scientific entrepreneurs to recognise their own competencies, thereby enabling them to follow the same path.

Sir Paul Callaghan was himself a consummate scientific entrepreneur, although he came to realise this late in his career. It is to be hoped that his example will inspire creative approaches to developing entrepreneurial human capital at the institute which now bears his name.

1 See www.irl.cri.nz/newsroom/advanced-technology-institute-announced.

2 AgResearch for the pastoral sector; Crop and Food and HortResearch (since merged) for cropping and horticulture; ESR for environment and health; Forest Research (latterly renamed Scion); Geological and Nuclear Sciences; Industrial Research Ltd for the manufacturing sector; Landcare for the land-based natural environment; and the National Institute for Water and Atmospheric Research. A social research CRI proved to be unviable and was soon disestablished.

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