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ERAWATCH COUNTRY REPORTS 2011: New Zealand

ERAWATCH Network

Kenneth Husted

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Executive Summary

New Zealand lies in the south west Pacific Ocean, nearly 2,000 kilometres from Australia and about 20,000 kilometres from Europe. The total land area is around 270,550 square kilometres, with approximately 10,000 kilometres of coastline. Currently the population is of an estimated 4.4 million people, with about 1 million living in Auckland. Māori, the indigenous people of New Zealand, make up about 15% of the population and most of them live in the North Island.

New Zealand is involved in the Pacific Islands Forum, the Asia-Pacific Economic Cooperation and the Association of Southeast Asian Nations Regional Forum, including the East Asia Summit. New Zealand is also a member of the United Nations, the Commonwealth of Nations, the Organisation for Economic Co-operation and Development and the Five Powers Defence Arrangements.

Since the signature of the Closer Economic Partnership (CEP) with Australia in 1983, the country went through a long period without signing other Trade Agreement. However, since 2001, when New Zealand signed the CEP with Singapore, another 5 bilateral or multilateral agreements were signed. As of 2011, New Zealand concluded negotiations with Thailand, TPP (P4), China, ASEAN, Malaysia, and Hong Kong. In addition, there are 8 additional agreements being negotiated (MFAT, 2012). This, prolific activity favouring the liberalisation of trade, is seen by the Ministry of science and innovation (MSI) as a great opportunity for New Zealand, to leverage its international S&T cooperation policies (MSI, 2012).

Until the beginning of the 1970s New Zealand was one of the richest societies in the world, measured on GDP per capita. New Zealand has a modern, well developed market economy that has been, in general, perceived as successful. The economy is to a large extent dependent on international trade. Several free market reforms of the last decades have eliminated barriers to foreign investment. The key trade partners are Australia, the European Union, the US, China, Japan and India. In 2005 the World Bank praised New Zealand as the most business-friendly country in the world.

The estimated gross domestic product (GDP) at purchasing power parity (PPP) per capita is roughly €19,635 (NZ$34,685). Over the last two decades GDP per capita has fallen to a level 17% below the average for OECD whereas the closest neighbour Australia has retained its position in the top of OECD. The gap to Australia in economic performance creates difficulties for New Zealand in retaining talent and attracting talented migrants and resources. The New Zealand Government has articulated the goal of closing the gap to Australia by matching the GDP per capita by 2025.

There are also some other challenge New Zealand faces as a country. Income levels, which used to be above much of Western Europe prior to the deep crisis of the 1970s, have never recovered in relative terms. Income inequality has increased greatly; however, this is much due to the fact that significant portions of the population have relatively modest incomes. Further, New Zealand has a very large current account deficit of 8–9% of GDP, yet its public debt is relatively small compared to many developed nations. After 1984 net foreign debt increased substantially, most of it being held by the private sector. As of December 2010, net foreign debt was NZ$253b, or 132% of GDP.

According to latest numbers from New Zealand Statistics, New Zealand's research and development (R&D) expenditure as a proportion of gross domestic product (GERD) increased from 1.19% in 2008 to 1.30% in 2010. Despite this growth, New Zealand is still well behind Australia's level R&D expenditure, 1.97% of GDP in 2006.

The impact of the economic crisis is still largely being felt in New Zealand and may be an indicator for reasons behind the reversal of the tax credit scheme for R&D in the 2010 income year (IRD, 2010). Overall however, the impact of the economic crisis is difficult to be quantified in the short term. Currently there is very little evidence as to the exact impact of the global economic crisis, besides two facts: a) the tax credit scheme for business expenditures on R&D was abandoned, and b) the budget for 2011/2012 does not allow for further growth in government spending on R&D.

However, the government indicates its willingness in prioritising science and innovation was the creation of the office of the Prime Minister's Science Advisor in 2009. The Office is intended to stimulate a closer contact and interaction between the higher federal government, ministries and a wide range of RS&T stakeholders. Sir Peter Gluckman, the Chief Science Advisor (CSA) in his 2011-12 annual report describes its own major functions encompassing (Gluckman, 2012)

Also aiming to stimulate economic growth, the government is putting in place one of the main recommendations of the High Value Manufacturing and Services review report "Powering Innovation" (John Raine, 2011). The Report recommends the creation of the ATI (Advanced Technology Institute). The ATI will be a Crown agent, acting to support firms, especially in the manufacturing and services sector, to establish better connections with the major providers of research and innovation expertise available in New Zealand ("Building Innovation ", 2012).

Current research policy recognises the need for increasing the support for business research and ultimately for lifting the level of business investment in research. As part of the "Business Growth Agenda" government's has communicated target for New Zealand businesses' investment in R&D to reach more than 1% of GDP ("Building Innovation ", 2012). Other quantitative goals such as R&D intensity have not been clearly defined and publicised by government.

The current policy mix tends to favour increasing R&D investments by already R&D active firms. This might not result in the desired growth in private R&D investments as the starting base is relatively low. The main barriers to R&D investments are 1) the lack of tax incentives for R&D business investment, 2) focus on the primary sector in the country's economy without providing the needed competence development in R&D management and innovation for the sector's non R&D inactive firms and 3) increased university focus on research commercialisation leading to knowledge asymmetry and risk shifting in relation to small and medium sized enterprises.

Knowledge Triangle

	Recent policy changes	**Assessment of strengths and weaknesses**
Research policy	Increased base funding for CRIs to 50%	Provides a more stable funding regime for CRIs; enables them to commit to strategic initiatives and competences
	PBRF exercise	Increases research productivity and output, but may potentially lead to a disconnect between research on the one hand and business and society on the other

Innovation policy	Removal of R&D tax incentive Funding instruments aimed at promoting links between research organisations and businesses Primary Growth Partnership programme Creation of the ATI (Advanced Technology institute)	As some of these policy changes serve to increase level of business investments in R&D (e.g. introducing technology transfer vouchers and technology development grants) and others (e.g. eliminating the tax incentive) might have the opposite effect, it is difficult to assess the strengths and weaknesses of these changes in isolation from each other. As the Primary Growth Partnership programme does not include any R&D and innovation training to help inexperienced firms to overcome initial barriers for engaging in R&D, the programme might be less efficient in convincing firms that are currently not R&D active to engage in R&D initiatives and activities. The Creation of the Advanced Technology institute has not been finalised. Some Scientists and policy experts believe the initiative will be postponed to the beginning of 2013
Education policy	Increased focus on research commercialisation and entrepreneurship	The attention towards stimulating students' interests in both entrepreneurship and research commercialisation through entrepreneurship competitions might potentially have a positive long-term effect on graduates' willingness to engage with the field. The effect could, however be reinforced and intensified if supported with entrepreneurship education as a supplement to both bachelor and masters programmes in all fields.
Other policies	Recently the Government has announced its intention to establish a new super Ministry of Business, Innovation and Employment to take effect from July 1, 2012. The new mega Ministry would be a merger of the current Ministry of Science and Innovation, the Ministry of Economic Development, the Department of Labour, and the Department of Building and Housing.	There's a general feeling in New Zealand that the current National government has been implementing sound government policies. This move, however has been interpreted with some scepticism mainly because represent the merger of somewhat diverse aspects of the public administration.

Assessment of the national policies/measures

	Objectives	Main national policy changes over the last year	Assessment of strengths and weaknesses
1	Labour market for researchers	Government intends to address country's challenges related to R&D and academic workforce ("Building Innovation ", 2012) by: • Attract attention of the new generation by lifting the profile of science through a series of initiatives (National Science Challenges, Rutherford Discovery Fellowships and the creation of the Chief Science Advisory office) • Complete a stocktake of PhD Opportunities for young scientists (aimed to analyse and adjust market demand and supply for Post PhD workforce). • Encouraging tertiary institutions to focus on growing numbers of highly-demanded engineering graduates, by increasing investments and incentives over the next four years (additional $ 42 million operating funding for engineering and additional $ 17 million operating funding for science).	A report commissioned by Universities New Zealand (Nana, Stokes, & Lynn, 2010) foresees (up until 2020) a challenging scenario and an increasing demand for researchers basically due to: • Increasing number of national and international students. • Ageing academic staff, at a higher pace than the inflow of younger academics. • New Zealand academic salaries are lower than in Australia, Canada and the US and are similar to those in the UK. However, the supply of academic and R&D personnel has been relatively adequate in most areas generally due to: • Overall attractive work and life conditions for researchers. • Reasonable salaries (although lower than other markets). • Reasonable access to permanent positions (applicable to most universities some have unfavourable continuation procedures after 3 years of employment). • Favourable research and study leave arrangements.
2	Research infrastructures	• Government crated a public private partnership to roll out fibre optic / Ultra-fast broadband to 75% of New Zealanders by the end of 2019 (including business, homes and schools). Government is funding $ 1.35b. • Government is spending over the next four years $300 million on Upgrading the Rural Broadband intended to improve opportunity for innovation in the primary sector. • Government has made some noteworthy investments such as the RV Tangaroa, NeSI Supercomputer Network and the Australian Synchrotron. • Government is investigating and encouraging the development of Innovation Parks throughout the country.	• Costs of broadband Internet and communications are relatively high in New Zealand compared to other OECD countries. This is partially due to market and competition conditions and because of its demographic characteristics (small and sparsely populated cities). • However, the new Zealand government is investing heavily in some initiatives intended to improve quality and speed of internet access throughout the country. • The New Zealand e-science infrastructure a network of high-performance computers (NeSI) is helping to keep New Zealand researchers at the cutting edge of science, by facilitating access to the super computers available at research centres and government funded universities.
3	Strengthening research institutions	• The government has launched the National Science challenges, seeking to be implemented in 2013. • Government is gradually increasing the PBRF fund to $300 million per year up until	• Low levels of Government funding for research and development (0.59% of GDP in 2010). • Current fiscal conditions and economic scenario will hinder government's ambitions to increase its funding to 0.8% of GDP.

	Objectives	Main national policy changes over the last year	Assessment of strengths and weaknesses
		2016. • Government aims to increase annual public science and innovation funding towards 0.8% of GDP.	• The PBRF has been a highly detailed manner of assessing the outcomes generated by research personnel, departments, faculties and universities. Based on PBRF results Government provide financial support for universities.
4	Knowledge transfer	• The creation of the Callagham institute aiming to facilitate knowledge transfer and circulation from CRI's and Universities to businesses. • The creation of the National Network of Commercialization offices which aims to improve the circulation of knowledge between the centres and generate more income from R&D performers.	Knowledge transfer is one of the critical issues identified within New Zealand's R&D and Innovation systems. These two initiatives aim to address these issues. However these initiatives cannot be evaluated yet, as they are currently been implemented
5	International R&D cooperation with EU member states	No new changes over the period.	• FRENZ (Facilitating Research Co-operation between Europe and New Zealand) has been established to enhance the engagement and collaboration of the New Zealand research, science and technology community with EU. • Researchers based in universities and Crown research institutes have traditionally have had close collaboration with researchers and universities in Europe.
6	International R&D cooperation with non-EU countries	• With the creation of the Science Advisory office, the government is actively engaging in closing ties in science, R&D and innovation with New Zealand's major trading partners. As trade with Asian countries is growing on annual basis, the trend is to see more cooperation within New Zealand and that region. • MSI led a delegation to China, with a specific intent to boost bilateral research collaboration. • In June 2011, New Zealand and India signed a protocol for Cooperation on Science and Innovation, during the Prime Minister's visit to that country. • Furthermore, the country has also orchestrated new partnerships with Australia and USA respectively featuring cooperation in geothermal and marine research.	In 2010 the International Relationship Fund (IRF) came into effect. It supports global links which foster innovations and research ties.

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1 INTRODUCTION

The main objective of the ERAWATCH International Analytical Country Reports 2011 is to characterise and assess the evolution of the national policy mixes of the 21 countries with which the EU has a Science and Technology Agreement. The reports focus on initiatives comparable to the ERA blocks (labour market for researchers; research infrastructures; strengthening research institutions; knowledge transfer; international cooperation). They include an analysis of national R&D investment targets, the efficiency and effectiveness of national policies and investments in R&D, the articulation between research, education and innovation as well as implementation and governance issues. Particular emphasis is given to international research cooperation in each country.

2 PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM AND ASSESSMENT OF RECENT POLICY CHANGES

2.1 MAIN POLICY OBJECTIVES / PRIORITIES, SOCIAL AND GLOBAL CHALLENGES

There are no specific priorities set by the government that need international cooperation or that is specifically addressing Grand Challenges. However, New Zealand has a great deal to gain through international scientific collaborations and the government actively supports collaborative links with a number of countries by way of bilateral science arrangements, other government initiatives and funding mechanisms, such as the International Relationship Fund.

An arrangement between the New Zealand and the European Community for Co-operation in Science and Technology was first signed in May 1991 and focused fields of science and technology of mutual interest, including agriculture, biomass, biotechnology, environment, forestry, renewable energies and telecoms/information technologies. In 2007 the following FP7 themes were identified as priorities for enhanced EU-NZ cooperation Health, Information and Communication Technology, Environment and Food/Agriculture/ Fisheries/ Biotechnology, along with the researcher mobility schemes of the FP7 People Specific Programme.

Cooperation with non EU countries is dealt on a case by case basis with mutually agreed programmes that are not necessarily conditioned to being part of Global Grand Challenges.

2.2 STRUCTURE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM AND ITS GOVERNANCE

New Zealand has a population of an estimated 4.4 million people (Statistics New Zealand, 2011). Until the beginning of the 1970s New Zealand was one of the richest societies in the world, measured on GDP per capita. Since then GDP per capita has fallen to a level 17% below the average for OECD whereas the closest neighbour Australia has retained its position in the top of OECD.

This economic gap with Australia creates difficulties for New Zealand to retain talent. In addition, New Zealand traditionally had a poor history of R&D investment. However, expenditure as a proportion of gross domestic product (GERD) increased from 1.19% in 2008 to 1.31% in 2010 (Statistic New Zealand, 2010). Despite this growth, New Zealand is still well behind Australia's level R&D expenditure, 2.2% of GDP in 2008-9.

The New Zealand Government, currently led by the National Party has been communicating a strong emphasis on science and innovation since its election in 2008. The government then outlined four main priorities that were aligned with its focus: faster economic growth, lifting achievement in education, safer communities and improved public services. The evidence of its focus on science and technology was more prominently noticeable from 2010.

At the political level the New Zealand government and the office of the Prime Minister's Science Advisor are the main actors in setting the political agenda. The Science Advisory office and its Committee were established in 2009 and may be one of the key facts indicating the willingness of the government in prioritising science and innovation. The Office is

intended to stimulate a closer contact and interaction between the higher federal government, ministries and a wide range of RS&T stakeholders. Sir Peter Gluckman, the Chief Science Advisor (CSA) in his 2011-12 annual report describes its own major functions encompassing (Gluckman, 2012):

1. Promoting the public understanding of science;
2. Providing a point of reference for various stakeholders in the New Zealand science and innovation system;
3. Providing a sounding board for science and innovation policy;
4. Promoting the use of evidence in policy formation across government;
5. Undertaking special across-agency tasks;
6. Providing reports and advice as requested by the Prime Minister;
7. Using science to promote New Zealand's Diplomatic Interest;
8. Liaising with equivalent offices overseas.

The 2010 Budget followed a year of recessionary economic data and a need to stimulate New Zealand's economy to recover. Prime Minister John Key noted in his opening speech to the Parliament: "Our objective is a high-performing public science system which supports economic growth and a wider innovation system that encourages firms to increase their investment in, take-up, and application of research". The Government sees its investment in research, science and technology as a major driver of innovation and economic growth. Four themes have been identified as critically important to improving the RS&T sector and to maximise its contribution to New Zealand's economy. The themes are:

- Enhancing migration from lab to marketplace;
- Strategic investment in public good science to support the economy;
- Boosting economic growth and
- Simplifying the science system.

Addressing these overarching themes in December 2009 the Cabinet set out six new science priority outcome areas for the Government's investment in RS&T. The priority outcome areas are:

- High-value manufacturing and service;
- Biological science;
- Energy and minerals;
- Hazards and infrastructure;
- Environment;
- Health and society.

At the operational level, there have been significant changes since the 2008 election. As a result of the National Party led government's effort to rationalise and simplify the science system, a new Ministry of Science and Innovation (MSI) became operational on 1 February 2011, as a result of a merger of the Foundation for Research, Science and Technology (FRST) and the Ministry of Research, Science and Technology (MoRST). The new Ministry has assumed responsibility for the policy and investment functions that were previously taken care by these two separate agencies.

The merger was prompted by a review of the Science and Innovation system in New Zealand and a recommendation to simplify the system and funding structures and centralise the system in its totality. After the 2008 election there was a greater focus on the efficiency of the state sector which included how funding was allocated to research and development. In June 2010 the Minister of State Services upon reviewing the system as a whole announced the amalgamation of the FRST and MoRST into the new MSI in an effort to support the Government's vision for science and innovation driving economic growth. The new MSI

introduced new legislation in February 2011. This legislation established two boards which will make independent decisions on proposals for R&D funding. One board will focus on science, the other on innovation. The view of the government is that this will give a more balanced approach to funding processes. Each board is made up of highly qualified industry leaders with vast R&D experience.

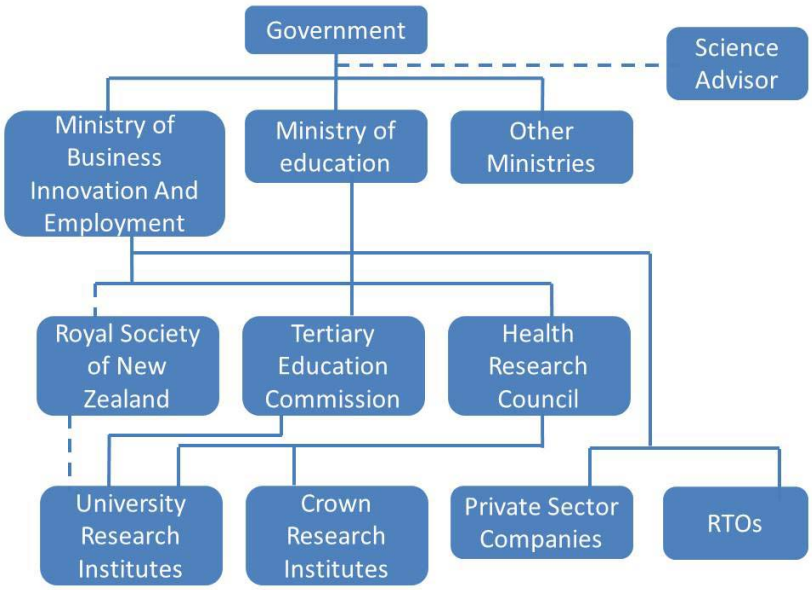
In a speech held on March 15, 2012 Prime Minister John Key announced **another major change**: the creation of a new Ministry of Business, Innovation and Employment which will swallow up four existing government departments - the Economic Development Ministry, the Department of Labour, the Science and Innovation Ministry and, in a major surprise, the Department of Building and Housing (Joyce, 2012).

The new single, dedicated ministry follows similar models set up in the UK (where a new Department for Business, Innovation and Skills was established in 2009) and in Australia (where a new Department of Industry, Innovation, Science, Research and Tertiary Education was created in 2011). The new Ministry is said to be designed to help drive the Government's priority of building a more productive and competitive economy. It is also charged with the objective of strengthening the public service's ability to work on business policy, regulation and engagement in order to allow the Government to achieve a much more co-ordinated and focused resource allocation and management. The key overall goals behind establishing the new ministry are to:

- Provide clear, co-ordinated and focused government policy leadership with a commitment to economic growth and innovation.
- Reduce complexity for agencies working with each other and for businesses engaging with the Government.

The new model had been agreed in principle by Cabinet, and staff in the current four ministries has been informed about the upcoming major restructuring. The new ministry is to be established by 1 July 2012 and is planned to have around 3,200 employees at the outset.

Figure 1: Structure of the New Zealand's research system Governance:



The institutional role of regions in research governance

Regions have traditionally not played a large role in the New Zealand science system. Considering the fact that the country has a total population of 4.4 million people, it is not particularly surprising that science policy and science funding have been treated as a governmental issue and responsibility. However, it seems that regions in the future will play a bigger role in research commercialisation by taking responsibilities for creating regional innovation systems around universities and CRIs. This trend is reinforced through a number of government initiatives aimed at increased decentralisation of responsibility for regional economic development.

The increased autonomy of regions in developing and implementing their own sustainable economic development plans is reinforced by the on-going tertiary education reform (see e.g. "*Investing in a Plan – A New System for Investing in Tertiary Education*"). According to this plan, tertiary education organisations (TEOs) will in the future be encouraged to increase specialisation and to focus on developing their strengths to meet the needs of both the region in which the respective TEO is anchored and the nation as a whole.

At a municipal level, Auckland (NewZealand's largest city) and Wellington (New Zealand's capital) have been a relatively active in promoting Innovation and R&D related themes. The Auckland Regional Council (ARC) communicated through the *"Auckland Plan Discussion Document"* its intention to support growth through R&D in the Auckland region and also to collaborate with MSI and New Zealand Trade and Enterprise (NZTE) in order to promote technology parks and to stimulate regional growth by making existing knowledge sources (e.g. universities and CRIs) more accessible for regional industry. The Wellington City Council also encourages innovation through provision of funds for projects that stimulate and nurture creativity and innovation in the city.

In general, modes of regional funding exist but are modest and play a minor role. For example the Auckland Regional Council is implementing projects such as the Thematic Research Initiative - Transforming Auckland: Institutional, Technological and Cultural Innovations for Sustainable Cities. In addition, regional funding also occurs in partnership with Central Government. For example the federal Government has set up a project to investigate and encourage the development of innovation precincts in New Zealand. In Auckland, the regional council supports projects such as the Wynyard Quarter ICT precinct. In other regions, local and regional councils play similar roles. For example, in Wellington the IRL Gracefield campus, and in Christchurch the Innovation precinct that comes as part of the city's reconstruction project after a series of devastating earthquakes.

Main research performer groups

The business sector is the most active research performer in NZ. In 2010, the total amount of BERD expenditure was €599m[1] (NZ$1,013m) representing 41.4% of GERD, followed by the Higher Education sector with 32.8% and the Government sector with 25.7%. This distribution of research performance is much more equally split in New Zealand than in the EU27 where 63.6% is performed by industry, 22.5% by higher education and only 12.8% by government. This significant difference in distribution - where Higher Education and Government performed research play a larger role in New Zealand than it is in EU - is mostly due to a relatively low level of business sector investment and research performance compared with EU average. In 2010, New Zealand's BERD as a percentage of GDP was 0.54 %, whereas the ratio for the EU-27 was 1.23% and 1.27% for the Euro area.

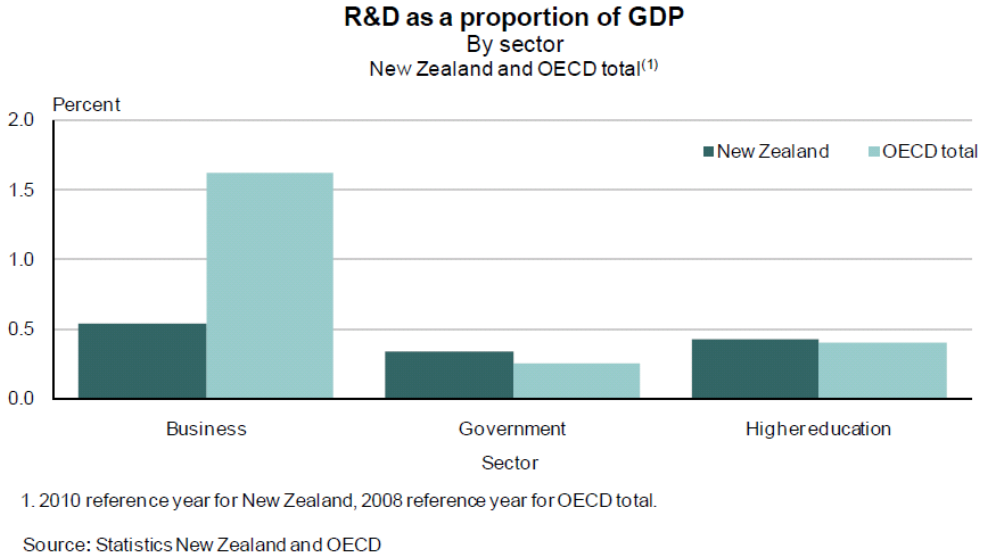
There are 8 Crown Research Institutes (CRIs) currently in New Zealand. Government expenditure on R&D (GOVERD) was €371m (NZ$629m) in 2010 (Statistics New Zealand,

[1] The conversion rate utilised in this report is € 1 = NZ$ 1.69.

2011). CRIs received 90% of this funding, equalling €335m (NZ$567m) "Research and Development in New Zealand," 2011).

The higher education sector expenditure (HERD) was €472m (NZ$969) as of 2010. According to the 2010 MoRST Scorecard, HERD as a percentage of GDP is 0.36% when compared to an OECD average of 0.39%. Higher education institutions receive €12m (NZ$20m) or 1% of New Zealand business funding.

Figure 2:



Retrieved from: Statistics New Zealand (2011)

2.3 RESOURCE MOBILISATION

2.3.1 Financial resource provision for research activities (national and regional mechanisms)

According to Statistics New Zealand (2011) gross expenditure on R&D was €1,265m in the 2010 period (NZ$2,444m). This is an increase of 13 per cent (NZ$283m) from the 2008 period Statistics New Zealand (2011). The business sector spending on R&D went up to 0.54% of GDP (up from 0.48% of GDP in 2004), the higher education sector spent 0.43% of GDP in 2010 (up from 0.36% in 2008) and the government sector increased to 0.34% of GDP. The growth in all sectors surpassed the overall growth in the New Zealand economy between 2008 and 2010.This trend is in line with the government's emphasis on science and innovation as a growth engine. This ambition is, however, not articulated in more firm investment targets.

The impact of the economic crisis is still largely being felt in New Zealand and may be an indicator for reasons behind the reversal of the tax credit scheme for R&D in the 2010 income year (IRD, 2010). Overall however, the impact of the economic crisis is difficult to be quantified in the short term. Currently there is very little evidence as to the exact impact of the global economic crisis, besides two facts: a) the tax credit scheme for business expenditures on R&D was abandoned, and b) the budget for 2011/2012 does not allow for much growth in government spending on R&D. However, for the 2012/2013 fiscal year, total

cross government investments on research and Innovation is budgeted to reach record levels of €739m (NZ $1.25b) from €660m (NZ$1.117b) in 2011/2012.

The public investment in education, research and innovation are well articulated in various sources including Igniting Potential (*Igniting Potential*, 2010), the TEC funding documents (TEC, 2011) and CRI Taskforce reports (report, 2010). The taskforce has recommended that government funding should be continuous and predictable in order to allow more effective expenditure and research planning. The government accepted the Taskforce recommendations and began to action these in 2010.

The Government has recently developed a multiannual strategy for research development and innovation (Igniting Potential, 2010). It is communicated in the Igniting Potential document released in 2010 by the Ministry of Science, Innovation and Technology (Igniting Potential, 2010). One of articulated purposes of the latest strategy was to focus on new priorities for the science and innovation system in New Zealand. There was an extensive consultation process into the development of the document. The Government stated that one of the reasons for re-prioritising science and innovation was to better align the science system with needs associated with economic growth and the realisation that especially in a small society, choices needed to be made that allow concentration of scarce resources in priority areas reflecting the strength and needs of the New Zealand society. Igniting Potential provides a framework for the Government's current vision for R&D and the particular industries and sectors such as health and food innovation where they have identified a need for greater investment.

Besides the programmes administered by MSI, the main channels for allocating funding for research are as follows:

- Tertiary Education Commission (TEC) funds research in tertiary organisations through programmes like the Performance Based Research Fund (PBRF) and Vote Education. Vote Education is a source of umbrella funding (TEC, 2010). Each university is allocated this funding in accordance with the number of students attending the institution (TEC, 2010).TEC is a Crown entity and has an independent board of directors accountable to the Minister of Tertiary Education.

- The Ministry of Agriculture and Forestry, has become a hub for the sector needs.

- The Health Research Council (HRC) is the main sponsor of health research in NZ. HRC is a Crown entity and is governed by a Council that reports to the Minister of Health.

- The independent national academy of sciences Royal Society of New Zealand (RSNZ). RSNZ represents some 60 scientific and technological societies and individual members and administers several funds for science.

The Marsden Fund allocates competitive funding to individual researchers based on their own initiatives. It is aimed at research excellence in science, engineering and mathematics, social sciences and humanities.

Institutional funding is the most prominent feature in the funding of CRIs and universities in New Zealand. The funding for CRIs is 50% base funding and the remainder is provided on a competitive basis. This follows a recommendation from the CRI Taskforce report (2010) that suggested that in order to achieve more efficient outcomes, the overall funding base needed to be more stable and continuous. Universities in New Zealand face an alternative funding scheme. The initial base funding is based on agreed student numbers and provided through Vote Education and the Tertiary Education Commission and the remainder is made up of

competitive funding through PBRF and Marsden Fund initiatives (TEC, 2011). This ideally provides an incentive to maintain high research performance standards.

Whilst for the 2009/2010 financial year there was a tax credit scheme for business expenditures on R&D, this has since been reversed and will not be applicable to the 2010/2011 year (IRD, 2010).

There is a trend towards paying more attention to funding mechanisms that support collaborative funding. Accordingly, most of the new priorities for science and innovation policy will contain some elements of collaborative funding.
Recent policy changes are:

- In 2008 the National Party led government's effort to rationalise and simplify the science system led to a new Ministry of Science and Innovation (MSI) which became operational on 1 February 2011, as a result of a merger of the Foundation for Research, Science and Technology (the Foundation) and the Ministry of Research, Science and Technology (MoRST). The new Ministry has assumed responsibility for the policy and investment functions that were previously taken care by these two separate agencies.
- Removal of tax credit – In the 2010 budget the National led Government reversed the 2008 initiative of a tax credit for R&D in New Zealand businesses. The Government articulated a desire to encourage R&D through appropriate tax rates and suggested that the economic crisis made the scheme not feasible.
- An important new initiative leading to a development of new priorities has been to restructure government funding to clarify priorities and provide a more direct pathway for implementing them (Igniting Potential, 2010). The priority outcome areas are: high-value manufacturing and services; biological industries; energy and minerals; hazards and infrastructure; environment; health and society.

The Government has, in some areas, moved beyond thematic and isolated approaches when setting priorities for science and innovation policy. One example is the priority focus on environment that includes both the sustainable development of New Zealand Business and the provision of knowledge needed for addressing broader environmental issues. Another example is the new priority area "Health and Society" also reflects broader societal approach to health research in the wider context of social, cultural and economic wellbeing. The new priorities are expected to be activated through all existing funding mechanisms.

2.3.2 Providing qualified human resources

More than 50% of all New Zealanders aged 15 to 29 hold a tertiary qualification. In 2009 there were 469,107 enrolments in tertiary institutions throughout New Zealand of which 155,000 were enrolled into one of the eight universities. Almost 10% of all enrolments were international students.

In the 2007/2008 period employment in R&D activities in New Zealand, amounted to 24,700 Full Time Equivalents (FTEs). This equals 1.1% of the economically active population which is 2,225,100 people according to the 2009 Workforce statistics (Statistics New Zealand, 2010). 17% (4,100 people) of all R&D employed had a PhD qualification (Statistics New Zealand, 2010). Furthermore, there were approximately 65,000 students participating in science and technology courses at a Bachelors level or higher (Statistics New Zealand, 2010).

In 2010 the number of R&D staff has increased to 28,500 FTEs (Statistics New Zealand, 2011). Researchers made up 75% of this representation (Statistics New Zealand, 2011). Of these, 3,900 people (14%) had PhD qualifications - this is down from the 16% or 4,000 FTEs

in 2008 (Statistics New Zealand, 2011). However, at a Bachelor's degree level there was a slight increase in 2010 for 19,200 FTEs (67%) compared to 16,400 FTEs or 65% in 2008 (Statistics New Zealand, 2011).

Universities New Zealand, the major representative body of New Zealand's eight main research based universities, commissioned a report in 2010. The report aimed to address human resources issues that members could face over the coming 10 years. Among other issues the report highlights(Nana et al., 2010):

- Ageing workforce of academics, as 43% is over 50 years old and 15% is over 60.
- There is a very likely increase in both national and international student numbers.
- New Zealand academic salaries are lower than in other markets such as Australia, Canada and the US. More recently, Asian countries are also actively attracting academics around the world.
- Better quality facilities or ample funding are more commonly available to academics in Europe and North America.

Based on statistical projections of low, medium and high population growth, the report suggests that universities in New Zealand will need to attract between now and 2020 some 560 to 920 new academic staff each year. This is a considerably larger figure than the average 500 staff New Zealand Universities have managed to attract over the last few years. The report also suggests a series of joint initiatives Universities New Zealand should take in order to alleviate the likelihood of skill shortages within the academia.

Education policies in New Zealand respond in a number of ways to private and public research needs. The Building Innovation Report (2012) indicates the Government is addressing some skill shortages in areas such as engineering and management. According to the report the government is working to address these shortages by:

- Collecting and providing better information for students as of which professions will be in high demand in the years ahead.
- Boosting interest of youngsters towards high quality skills vital for innovation and lifting the profile of science. To this end, some key initiatives have been implemented such as the creation of the chief Science Advisor and the National Science Challenge. In addition, the government has allocated, over four years, €12.9m (NZ$25m) to The Rutherford Discovery fellowships and €4.7m (NZ$9m) over three years, starting in to attract top entrepreneurial science talent to New Zealand.
- The Government is gathering data related to post-PhD opportunities. The aim is to assure current policies would generate enough opportunities for young scientists.
- Increasing investments and incentives for tertiary institutions to train scientists and engineers. To this end the government allocated extra funding to encourage institutions to increase the numbers of students in such courses.
- Creating an advantageous combination of competitive tax policies and quality of life to encourage high-skilled workers to work from New Zealand.

Entrepreneurship training is receiving increasing attention across Universities, but is currently not coordinated at national level. New Zealand's universities to various degrees offer entrepreneurship education, however mostly as an elective option for students in various programmes. These programmes are often associated with different national and internal business plan competitions. There is not yet any significant effort in terms of nation-wide coordination of entrepreneurship education. The links with and spillover effect from

entrepreneurship education at universities and other activities to promote science-based entrepreneurship and entrepreneurship research are less developed. These links appear to be embedded in individual initiatives rather than being institutionalised through national policies and practices. Examples of initiatives at institutional level are entrepreneur competitions like SPARK and Chiasma at The University of Auckland Business School. These activities also contain elements of training and education.

On the whole University curricula are starting to exhibit movement towards more team and/or group based learning. Using The University of Auckland as an example, it is widely encouraged and assessments are set around tasks to be conducted in teams or groups. There are academic courses dedicated to entrepreneurship and these encourage creativity, critical thinking, problem solving and teamwork and communication skills through assessments such as a group based venture creation and proposals.

2.3.3 Evolution towards the national R&D&I targets

Current research policy recognises the need for increasing the support for business research and ultimately for lifting the level of business investment in research. As part of the "Business Growth Agenda" government's has communicated target for New Zealand businesses' investment in R&D to reach more than 1% of GDP ("Building Innovation ", 2012). Other quantitative goals such as R&D intensity have not been clearly defined and publicised by government.

Total business expenditure on R&D (BERD) was in 2004 0.49% of GDP (MoRST, 2010). In 2010 BERD has grown to 0.54% (compared to 1.25% in EU-27 in 2009). New Zealand has a low level of BERD relative to other OECD countries, but growth rates have been relative high, between 7% and 11% per year, in the period from 1994 to 2004. The annual growth rate from 2004 to 2010 was 8%. The growth rate has been declining over the last two year period (10% from 2008 to 2010 compared to 21% from 2006 to 2008) (MoRST, 2010). This decline in growth rate in BERD might be a result of the economic climate; we do however not have any data to confirm this.

This growth was in particular in the scientific research industry, which trebled its R&D expenditure in the period from 1994 to 2004 and increased its share of BERD to 34%. Almost all sectors have a lower R&D intensity than the corresponding OECD average. In 2009, 79% of BERD was funded from within the business sector, 9% from the government and only 6% from overseas sources.

Only in 2012 the Building Innovation Report, the New Zealand government introduced a number that may be interpreted as a target for BERD. The report indicates that the government is "committed to" encourage the business sector to double investments in R&D to reach 1% of GDP. Although the actual number exists, the report does not mention a specific time frame. Instead, the report recognises the limitations and characteristics of New Zealand's economic landscape that may impede the country to easily reach such a modest target (when compared with European or OECD figures). This could be due to aspects of New Zealand's industry structure which includes many small and medium sized businesses rather than larger firms. In addition, New Zealand has a relative low presence of R&D intensive industries such as motor vehicles, electrical equipment and pharmaceuticals ("Building Innovation ", 2012). A variety of policy instruments are aimed at increasing private sector R&D investments:

1. Stimulating greater R&D investment in R&D performing firms;

The government has expressed the belief that increasing business investment in R&D from the current level of 0.54% of GDP is essential for creating economic growth. Instead of using

tax incentives to stimulate increasing R&D investments in R&D performing firms, the government has decided to fund on a competitive basis up to 20% of R&D costs in research intensive firms with a good track record. In the 2010 budget for the sector, the government has allocated extra funding of €121m to support business R&D over four years. New measures include:

- €98m over four years for technology development grants to support R&D in firms which successfully conduct a significant amount of R&D. This measure targets only firms with strong R&D track records.
- €10m over four years to trial technology transfer vouchers, which will encourage links between firms and publicly-funded research organisations.
- €10m over four years to support technology transfer from research organisations to firms, and commercialisation of new products and processes.
- €7m over four years in contingency funding for initiatives to improve the transfer of technology from research organisations to the private sector.

More recently the report Building Innovation" (2012) also refers to a series of government initiatives aimed at encouraging business Innovation:

- The Government is investigating if the absence of tax incentives is actually discouraging firm R&D
- The creation of the Advanced Technology Institute (ATI) aimed at supporting high value manufacturing and services with a budget of €98m (NZD$ 166m) over the next four years
- Increased direct support through MBIE co-funding suit of programs called TechNZ. These programs will receive €68m (NZD$ 115m) per year.
- The Government is increasing the proportion of total public innovation investment dedicated to firm –led innovation, and is also examining improvements for incubator settings in the country.

2. Promoting the establishment of new indigenous R&D performing firms;

The promotion of establishing new indigenous R&D active firms is implicitly supported by several instruments. The measure "Vision Maturanga" is a policy framework for unlocking the innovation potential of Māori knowledge, resources and people. The framework has since 2005 been applied across all Vote RS&T investments and has provided strategic direction for funding agencies investing in research relevant to Māori.

3. Stimulating firms that do not perform R&D yet;

The government is emphasising that funding and support should primarily be directed towards areas where firms see the most value. This approach favours firms that are already R&D active rather than stimulating firms which are not yet R&D active.

4. Attracting R&D-performing firms from abroad;

For the time being no policy instruments are designed with the explicit objective to attract research intensive firms. Currently the proportion of R&D performed by firms from abroad is

limited. At present there are no explicit policies to attract R&D-performing firms from abroad.

5. Increasing extramural R&D carried out in cooperation with the public sector;

The government has in the latest national research strategy put emphasis on stimulating the flow of knowledge from publicly funded institutions to the business sector. This ambition is supported by various programmes aimed at either knowledge transfer or cooperation between the public and private sectors. Technology Transfer Vouchers is an example of a programme aimed at stimulating knowledge transfer and potentially creating the basis for cooperative research. Vouchers will provide 50% funding towards businesses' R&D projects focused on access to research services and expertise from accredited R&D partners. Businesses must pay the remaining 50%.

Increased cooperation is also stimulated through programmes like Primary Growth Partnership. This instrument focuses on growth and sustainability across the primary sectors, from producer to consumer. The partnership will involve investments of €147m (NZ$ 250m) from the federal government and nearly €207m (NZ$ 350m) from the private sector. Investments can cover the whole of the value chain, including education and skills development, research and development, product development, commercialisation, commercial development and technology transfer. Each programme will be a joint investment between the Crown and industry. Qualifying contributions by the co-investors must be equal to or greater than the Crown Primary Growth Partnership funding.

6. Increasing R&D in the public sector

Growth in public sector investment in R&D is not a primary objective.
Considering the relatively low level of private sector R&D investment in New Zealand, the policy mix might have a too strong focus on stimulating additional investments in already R&D performing firms. In order to radically change the level of R&D investments by the business sector in New Zealand, it would be crucial to stimulate firms that are not yet R&D active to engage systematically with R&D. The primary growth partnership funding instrument might, however, serve exactly this purpose as it is focused on a sector which traditionally has had a low level of R&D investment at the level of individual firms.

Currently New Zealand does not explicitly support innovation through procurement. The Government expects its departments to comply with the following principles in their procurement:

- best value for money over whole of life;
- open and effective competition;
- full and fair opportunity for domestic suppliers;
- improving business capabilities, including e-commerce capability;
- recognition of New Zealand's international trade obligations and interests; and
- requiring sustainably produced goods and services wherever possible, having regard to economic, environmental and social impacts over their life cycle.

In 2005, the procurement policy was reviewed with the perspective of supporting innovation through government procurement. The recommendation resulting from this review was published by the Ministry of Economic Development.

New Zealand Trade and Enterprise (NZTE) promote R&D investment through policies such as offering mentoring and business training frameworks for businesses seeking advice. In New Zealand the requirements for setting up a business are relatively simple and transparent; however, there are no real fiscal incentives currently. Incorporating a company

in New Zealand requires registration with the Companies Office in accordance with the Companies Act 2003. Often this is a simple, one-off fee to register. There are requirements as to availability of company documents and shareholders, but these are relatively similar to international standards.

Intellectual Property is associated with adequate legislative protection in New Zealand and is relatively affordable. The Ministry of Economic Development (MED) actively promotes issues related to protection of intellectual property in New Zealand and provides information for business owners.

2.4 KNOWLEDGE DEMAND

The Primary sector industries such as agriculture, fishing and forestry have a relatively high contribution to GPD (9.2% in New Zealand compared to 2% in OECD average, OECD 2007). Even more significant is these sectors' contribution to export - the agriculture sector alone accounts for close to 60% of New Zealand's export. Innovation in the agriculture sector is traditionally highly dependent on research performed and funded by the public sector.

The Government's support to this sector is historically high and may be dated as far as 1928 when the Plant Research Centre was formed as within the Department of Industrial Science and Research-DSIR. Throughout the years many administrative and departmental changes occurred, culminating in 2008 with the creation of a Crown research institute (CRI) named Plant and Food Research (PFR).

At the policy level the new priorities articulated in the latest strategy document "Igniting Potential" clearly identifies the need for New Zealand to capitalise on its primary industries. Furthermore the building innovation report also recognises the need for New Zealand to build on its strengths by innovating and moving up on the value chain. This is because nearly a third of the country's goods exports (32%) are primary-unprocessed products. Although the proportion of processed primary products is higher (38%), New Zealand's economy would benefit immensely by processing and adding more value on its primary goods exports.

As a result of this thinking, the government is allocating over a quarter of a billion dollars towards the Primary Growth Partnership programs such as the Farm IQ. This programme is aligned with a broader policy to prioritise Business led research. It also aims to take more of a consumer requirements-led, value chain approach rather than an industry production-driven approach. On the same lines the government introduced the *New Zealand Food Innovation Network*, aimed to supports firms' ability to develop new food and beverage products and ingredients through a nation-wide network of open-access food development facilities.

New Zealand's economy mostly consists of small and medium sized businesses and relatively fewer large companies. Fifty eight per cent of all R&D in businesses is performed in firms with more than 100 employees. R&D expenditure is concentrated in relatively few companies. The five largest R&D performing companies contribute 24% of the total business R&D in New Zealand. The largest proportion of New Zealand's R&D expenditure in 2010 was for manufacturing purposes. This accounted for €229m or 18 per cent (NZ$449m). The business sector undertook most of this research. R&D for primary purposes accounted for 16 per cent of spending. Research and development for health, environment, and information and communication services purposes all made significant contributions to the total R&D expenditure which accounted for approximately 9% of total R&D expenditure. The top 50 firms contribute 64% of the total business R&D in the country.

The second largest funding source of R&D is the business enterprise sector which, with €486m, contributes 38% of GERD. The business sector performs 41% of national research funding, an amount that equals €524m. There is very little overseas funding at about 5% of

R&D research in New Zealand. The private non-profit sector and other funding sources, is with expenditures of €29m in 2009 insignificant in terms of research funding. The sector did not perform any noticeable research activity.

Although business expenditure on research has grown during recent years in New Zealand, the level of investment is, at 0.54% of GDP, still well below OECD norms. The government believes that this gap in investments can only partly be explained by structural factors such as lack of multinational corporations in New Zealand combined with a significant agricultural sector which traditionally has relied on research performed by universities and CRIs rather than research performed in industry. In addition, New Zealand is a small, commodity-exporting economy, quite remote geographically from major international markets.

2.5 KNOWLEDGE PRODUCTION

2.5.1 Quality and excellence of knowledge production

Measured on the number of publications per researcher New Zealand is doing well with approximately 0.4 publications per researcher FTE. This is significantly higher than the OECD average of 0.3 publications per researcher FTE (OECD, 2010; Scorecard, 2010) and indicates that the New Zealand Science system is very productive when measured on this dimension. The citation impact of New Zealand publications is on average across all subject areas lower (normalised impact .92) than OECD (normalised impact 1). The level of patent activity is relatively low in NZ, with only 11.8 patents per million population compared to countries like Denmark and Finland with 60.1 and 60.6 patents per million respectively.

2.5.2 Policy aiming at improving the quality and excellence of knowledge production

In 2010 the Government announced the introduction of performance-linked funding for Student Achievement Component (SAC) funded Tertiary Education Providers and for Industry Training Organisations. Performance-linked funding is one of a number of approaches intended to improve educational outcomes for students and employers and increase value for taxpayers' money. Performance-linked funding will be targeted to encourage all Tertiary Education Providers and ITOs to reach an acceptable standard of educational performance.

A part of the research funding for universities is distributed based on research performance. This is known as the Performance Based Research Fund (PBRF), which is managed by Tertiary Education Commission. The Government is dedicated to increase the fund from the current €147m (NZ$250m) to €207m (NZ$350m) over the next four years. The primary purpose of PBRF is to ensure that excellent research in the tertiary education sector is encouraged and rewarded. PBRF is assessed every 6 years and funds are distributed annually based on this assessment. This entails assessing the research performance of tertiary educational organisations and subsequently funding them on the basis of their performance.

Universities have the autonomy to decide about the number of academic positions and in which fields. Departments will be the core organisational unit recommending which academic disciplines should be represented and which candidates hold the needed qualifications to conduct research and teaching in the selected disciplines. Academics employed in New Zealand universities in principle have full academic autonomy in terms of their own research and projects. It does however look like PBRF puts pressure on academics

to add more weight to the ability to publish their research in high level, internationally top-ranked journals than to other criteria. More specifically PBRF is designed to:

- increase the average quality of research;
- ensure that research continues to support degree and postgraduate teaching;
- ensure that funding is available for postgraduate students and new researchers ;
- improve the quality of public information on research outputs;
- prevent undue concentration of funding that would undermine research support for all degrees or prevent access to the system by new researchers;
- underpin the existing research strengths in the tertiary education sector;

The PBRF is accessed by universities, Institutes of Technology and Polytechnics (ITPs), Wananga (Maori education providers) and Private Training Establishments (PTEs). The size of the PBRF funding pool is determined by government through its annual budget. PBRF funding is agreed through the Investment Plan. Delivery of the Plan is monitored by TEC. So far PBRF has been conducted in 2003 (partial round) and 2006. Currently researchers across the country are in the final stage of submitting their individual evidence portfolios for assessment. In the current 2012 PBRF round research performance assessment will cover the period 01 January 2006 - 31 December 2011.

The PBRF model has three elements:

- Quality Evaluation: to reward and encourage the quality of researchers (60 percent of the fund); is an assessment of the research performance of individual researchers at eligible TEOs, by a peer review panel which is held periodically. The initial round was completed in 2003. The next full round of quality evaluation takes place in 2012.

- Research Degree Completions: to reflect research degree completions (25 percent of the fund); is a yearly measurement of the number of PBRF eligible postgraduate research-based degrees completed at participating TEOs.

- External Research Income: to reflect external research income (15 percent of the fund); is a yearly measurement of the amount of income received by participating TEOs from external sources for research purposes.

The government is also providing Crown Research Institutes (CRI) with non-contestable funds for capacity building. The 2007/08 budget saw the government allocate €22 million for this purpose. New Zealand has eight CRIs which play vital roles in the national science and innovation system. They receive approximately €248m of government funding per year and generate total revenue of €349m according to the CRI Taskforce Report released in February 2010.

A recent taskforce recommended a need for greater clarity on the roles of CRIs, more certainty of funding through long term contracting, strengthening CRI board accountability and focus on outcomes as well as establishing balanced performance indicators. The government embraced these changes and has since increased long term investment in CRIs. This included the 2009 Budget's commitment to €20m over four years to CRIs to support strategic roles and the introduction of the State Sector Amendment Bill passed December 10th 2010.

As universities and CRIs in New Zealand are public entities, they possess very little financial autonomy. Each entity is subject to performance review and evaluation and often salaries for academics are pre-determined by collective agreements with universities on behalf of the Government. Universities and CRIs do, however, have high degrees of autonomy regarding

hiring and recruiting and selecting researchers in New Zealand and this is actively encouraged through immigration policies and seeking a skilled workforce in New Zealand.

Another tool for improvement of the quality of the research in New Zealand is The Marsden Fund which provides funding for projects for researchers employed at universities, Crown Research Institutes, private research organisations or as private individuals. Each proposal is measured on merit and its ability to contribute to the advancement of knowledge in New Zealand. The Marsden Fund is the main channel for competitive funding for research in New Zealand. It was established in 1994 and is administered by Royal Society New Zealand. The fund supports excellent fundamental research. In 2010/11 the Marsden Fund invested €30m in research. This represents 7% of the government's 'Vote Research, Science and Technology' and includes a €4m increase as compared to 2009.

2.6 KNOWLEDGE CIRCULATION

2.6.1 Knowledge circulation between the universities, PROs and business sectors

The New Zealand industry structure is dominated by small and medium-sized enterprises (SMEs). This, in itself, creates specific challenges for the interface between universities and industry. A recent study suggests that an increased focus among New Zealand universities on research commercialisation actually has created barriers for SME's ability to access research based input (Karlson, 2011).These barriers are, most notably, increased transactional cost, knowledge asymmetry and complexity in the management of the relations with universities.

New Zealand's universities to various degrees offer entrepreneurship education, however mostly as an elective option for students in various programmes. These programmes are often associated with different national and internal business plan competitions. There is not yet any significant effort in terms of nation-wide coordination of entrepreneurship education. The links with and spillover effect from entrepreneurship education at universities and other activities to promote science-based entrepreneurship and entrepreneurship research are less developed. These links appear to be embedded in individual initiatives rather than being institutionalised through national policies and practices.

In terms of policies, the government has recently introduced a voucher system with the ambition of increasing the cooperation between universities and industry. The results from this initiative are not yet known. Furthermore, the current government has also placed focus on improving the effectiveness and efficiency of commercialisation technology transfer offices. Following a wide consultation and direct involvement of the Prime Minister's Chief Science Advisor, the government has in the budget for 2010 allocated €5m over the next 4 years to establish the National Network of Commercialisation Centres (NNCCs) in order to improve the effectiveness and efficiency of commercialisation technology transfer offices. The initiative was kicked off in August 2010 by the Ministry of Science and Innovation.

MSI senior management has pointed out that the NNCCs will bring together the best ideas and people. One of its key intended functions is to develop a national database or repository of commercialisation opportunities, projects and IP. This is supposed to facilitate knowledge transfer between individuals and institutions and make sure there is a single point of contact when overseas investors consider their investment options in the country. Through the NNCCs the Government is seeking to generate benefit to NZ from its investment in R&D, to encourage firms to raise their investment in, and uptake of, R&D. It is also intended to create scale, enhance capabilities and improve collaboration among those involved in commercialisation activities.

The individual commercialisation offices based in universities and Crown Research Institutes will continue playing their current roles. The new Network is also supposed to take over MSI's investment and management of its pre-seed funds which are presently €2.7m. The most prominent example of such commercialisation centre is the Auckland UniServices Limited (a research and development company entirely owned by The University of Auckland). UniServices manages The University's intellectual property rights and is responsible for all research-based consultancy partnerships and commercialisation. Uniservices is a large and growing organisation with an annual turnover of NZ$100 m (€51m), and utilises its own staff and also collaborates with The University of Auckland with their staff.

New Zealand has about 14 business incubators, most of them associated with a university. The ICEHOUSE is an example of a business incubation centre that promotes business growth programmes for small or medium enterprises, incubation for start-ups and access to Angel Investors. It is a collaborative partnership between The University of Auckland Business School, The Boston Consulting Group, Telecom and Gen-i, BNZ, Ernst 8 Young, HP, and Microsoft. The ICEHOUSE was established in 2001 and its purpose is to take responsibility for delivering 350 of the 3000 firms needed to get New Zealand into the top half of the OECD.

In addition to the above, the government is putting in place one of the main recommendations of the High Value Manufacturing and Services review report "Powering Innovation" (John Raine, 2011). The Report recommends the creation of the **ATI** (Advanced Technology Institute). The ATI will be a Crown agent, acting to support firms, especially in the manufacturing and services sector, to establish better connections with the major providers of research and innovation expertise available in New Zealand ("Building Innovation ", 2012). The ATI, was recently renamed Callagham Institute and is also aimed to stimulate economic growth.

2.7 OVERALL ASSESSMENT

Resource mobilisation

The gross expenditure on R&D has grown with 13% in the period 2008-2010. The business sector spending went up to 0.54% of GDP. While this is the highest level of business R&D spending in NZ ever, it is still significantly lower than comparable EU countries. The government has recently developed a new multi-annual strategy for R&D in consultation with relevant stakeholders. This strategy promotes new priority outcome areas for science and innovation in New Zealand. However, it does not set better-defined national R&D budgetary targets.

On one hand, this lack of clearly defined targets might actually hinder the broader progress and evolution R&D spending in New Zealand as stakeholders won't have much of a sense of direction and purpose. On the other hand, the lack of set targets might allow the government to have some flexibility and more room for provisional budgetary adjustments. In a context of economic reliance on agricultural commodity prices, unstable markets and current global economic recovery yet to occur, New Zealand's budgetary flexibility is probably a good thing.

The government is currently analysing the impact on the removed R&D tax incentives for business R&D. This can be interpreted as positive move, as it demonstrates the government willingness change its direction when necessary. At the same time the government introduced a few new instruments to stimulate greater R&D investments in R&D performing firms. By prioritising investments on such firms, the government is mitigating the risk of its

investment. Although, this policy might generate better ROI and economic benefits for the country; the policy might instigate an even more concentrated and polarised scenario of R&D performing in New Zealand with larger firms performing an even higher proportion of the BERD. To date 5 largest R&D performing firms are responsible of 24% of the country's BERD and the top 50 firms contribute 64% of the total business R&D in the country. It is possible to assume that in general the government is not only willing to increase its investments on R&D, but also it is also concerned to maximise its investments.

Knowledge demand

The government has introduced instruments aimed at increasing R&D and innovation activities in the primary sector. Considering the relevance of this sector to New Zealand's economy the initiatives are expected to generate good results. The Farm IQ for example, is not only involving some of the biggest names in agribusiness but also taking a much more market-oriented approach to R&D

Although business expenditure on research has grown during recent years in New Zealand, the level of investment is, at 0.54% of GDP, still well below OECD norms. This gap in investments may be partly be explained by structural factors such as lack of multinational corporations in New Zealand combined with a significant agricultural sector which traditionally has relied on research performed by universities and CRIs rather than research performed in industry.

New Zealand's demographic characteristics, high labour costs, geographic isolation and poor manufacturing sector contribute to the lack or absence of some R&D intensive industries. For the time being no policy instruments are designed with the explicit objective to attract research intensive firms.

Knowledge production

New Zealand gets good value for its R&D investments. Each FTE in research publishes peer-reviewed 0.4 publications per year which is significantly higher than the OECD average of 0.3. This productivity is however not completely matched by impact as the citation impact publications by New Zealand researchers is in average lower that the OECD average. In order to improve the quality and excellence of knowledge production, research institutions are evaluated on a regular basis and universities are allocated part of their research funding based on actual research performance.

In 2010 85,000 FTE were engaged in research in New Zealand and the availability of qualified researchers is supported by immigration policy. However, it is not supported by any incentive for foreign R&D personnel. The importance of availability of qualified human resources is also emphasised in the latest strategy for R&D and is supported by two new funding programmes aimed at supporting excellent individuals and attracting top entrepreneurial R&D talent.

Knowledge circulation

New Zealand has a relatively new but well-developed system of innovation parks and incubators associated with universities and CRIs. The government has recently allocated funds for a national-wide network to increase coordination among commercialisation offices. There is some evidence that the increased focus on commercialisation among universities has resulted in an increased bureaucracy which is perceived by small and medium sized enterprises as a barrier for accessing university knowledge.
Some of the knowledge transfer offices have explicit strategies and procedures for accessing customers abroad. These strategies and procedures seek to actively sell research output from universities and CRIs on either license basis or consulting basis.

Assessment of recent policy changes

The government has recently introduced a number of changes aimed at addressing the industry level of R&D investment. As some of these changes serve to increase level of business investments in R&D (e.g. introducing technology transfer vouchers and technology development grants) and others (e.g. eliminating the tax incentive) might have the opposite effect, it is difficult to assess the overall effect of these changes.
The professionalisation of technology transfer offices might also have a negative impact on the perceived accessibility of research based knowledge, particularly by small and medium sized enterprises and by firms which are not yet R&D active.

3 National policies for R&D&I

3.1 LABOUR MARKET FOR RESEARCHERS

3.1.1 Stocks of researchers

The economic gap with Australia creates difficulties for New Zealand to retain talent. However, immigration policies contributed, to a certain extent, to alleviate the problem. In 2011, 2,303 engineering and science professionals immigrated to New Zealand, and 2,137 went overseas generating a net inflow of 166 such professionals (MSI, 2012). In order to stop the so called "brain drain" the New Zealand Government has articulated the goal of closing the economic gap by matching its GDP per capita with its neighbouring country by 2025.

In 2010, the number of full-time equivalent (FTE) researchers was 10,500 (Statistics New Zealand, 2010). The number of researchers per 1,000 people employed is 7.8 (Statistics New Zealand, 2010). These figures put New Zealand eighth among the OECD countries (Statistics New Zealand, 2010). In 2010, 46% of researchers were involved in business R&D, 30% in higher education and 23% of FTE researchers was engaged in government research. Of all personnel involved in R&D (includes researchers, technicians, support staff and post graduate research students) 14% hold PhD qualifications (approximately 3,900 research personnel in 2010).

The number of researchers has not changed significantly since 2008. This indicates that the global economic crisis has not had a visible impact on the labour market for researchers. The number of post graduate students involved in research has however grown significantly from 8,300 FTE in 2008 to 10.800 FTE post graduate student researchers in 2010. This 30% increase over a two years period could partially be explained as a consequence of a tighter labour market for people with higher education.

Over the last 30 years New Zealand has had a net migration of people with RS&T occupation. According to the 2010 RS&T Scorecard statistics on net migration the subtotal arrivals ratio of 1.3 means approximately that, for every three scientists who departed NZ in the period between 1980 and 2010, four scientists arrived to the country (MoRST, 2010). Most arrivals into New Zealand over this period were from the UK or Asia (MoRST, 2010). Australia was the only country where the outflow outweighed inflow of people with RS&T occupations.
Income differences can have a greater impact on outward flow. Many institutions in New Zealand offer a midrange salary when compared with the EU and Australia. The current legislation provides a break from repayments on student loan schemes for study while working overseas and thus offers an incentive to stay and work abroad for a longer period of time.

3.1.2 Providing attractive employment and working conditions

Both universities and Crown Research Institutes have well-articulated promotion criteria that relate to tenure and performance.

Employment law prevents extensive use of temporary positions and therefore a majority of positions in the public R&D are permanent. Some, but far from all universities apply a continuation procedure where new employees need to have their position confirmed after 3-4 years of initial employment. This procedure can have a negative impact on the willingness of researchers from abroad, who are already in tenured positions, to take up positions at universities in New Zealand.

According to the MoRST Scorecard 2010, New Zealand rates in the top 15 countries in the OECD in terms of publications per FTE researcher. New Zealand has very high research productivity with approximately 0.5 publications per FTE researcher in 2007. Therefore, in general it is possible to assume that productive researchers would encounter an attractive and relatively prolific environment for research in New Zealand.

Regulation of salaries is up to individual universities in negotiation with the relevant unions and is often dependent on broader funding allocation. Besides this decentralised regulation of base salaries following negotiated salary scales under the existing collective agreements, universities and Crown Research Institutes have the option to reward individual performance based on salary and increments.

According to the 2007 EU report "Remuneration of Researchers in the Public and Private Sectors" the EU 25 report an average salary of €37,948 shows that salaries for researchers in New Zealand are comparatively higher with an average of €42, 715 ($NZ 83,431).

Parents in New Zealand are entitled to paid parental leave of up to 14 weeks following the birth of a child. Furthermore, parents are entitled to 52 weeks unpaid leave within the year of their child's birth. There is also a secured right to return to the job vacated over this period. However, parents need to negotiate leave options within their employment contracts and whilst they get preference options over their jobs, this does not always guarantee progression later on. If one is on a fixed-term contractual basis, one is unlikely to get an extension with the employer as usually maternity leave provisions require 12 months service in order to be entitled to the parental leave.

New Zealand has relatively progressive employment relations legislation. The Employment Relations Act 2000 and the Human Rights Act 1993 Act in conjunction promote equal opportunity in New Zealand. However, there is no legislation requiring equal gender opportunities in academic research committees, boards or governing bodies (EEO, 2011). This practice is encouraged at best through the legislation, which prohibits discrimination on the basis of gender, but these do not encourage equal representation.

There is currently not any detailed information available about brain circulation between sectors. The labour market is in general very flexible in New Zealand and movements between sectors are not uncommon.

3.1.3 Open recruitment and portability of grants

New Zealand universities and CRIs have the ability to recruit internationally as current immigration policies lend themselves to skilled workers. Therefore, universities and CRIs have relative ease in employing and recruiting non-nationals for permanent research and academic positions.

Many New Zealand CRIs and universities seek to maintain international best practices in terms of recruiting and competition procedures. Both sectors are highly dependent on their ability to recruit internationally and work systematically. This is reflected in the recruitment procedures which are well designed to encourage participation of non-nationals. It is not uncommon for universities and CRIs to offer an extensive relocation support in terms of assistance with visa applications and contribution towards relocation costs.

Immigration New Zealand[2] has a simple, user-friendly system with a list of all recognised or exempt qualifications/foreign degrees which do not require review. Graduates from these institutions simply need to provide documentation regarding the qualification and it will be recognised in New Zealand in line with domestic degrees. Many European institutions are included on the list.

Most academic positions and research vacancies are advertised internationally through relevant media and conferences.

Research grants are only locally portable to a limited extent. Research grants tend not to be internationally portable as there is a real focus on research performed in New Zealand by New Zealand research entities.

3.1.4 Enhancing the training, skills and experience of researchers

Universities in New Zealand are increasingly considering collaborative arrangements regarding doctoral education with overseas institutions, but the current number of actual joint programmes or participation in the Erasmus Mundus scheme is still relatively limited.

Researchers employed by universities in New Zealand most commonly have access to 6 months research and study leave after each 3 years of employment. The research and study leave arrangement is associated with a travel grant and is widely used by researchers employed by universities to spend time at universities abroad. The research and study leave is seen as an important instrument to maintain and enhance research productivity and maintain and develop interaction and collaboration with the international research community.

There are no national level instruments or policies aimed at inter-sectoral mobility. Instead, these are left to the individual institutions. A strong emphasis on research commercialisation means that some universities seam to encourage staff to engage in e.g. science based new ventures and there is anecdotal evidence that such inter-sectoral mobility has had positive impact on individual careers.

3.2 RESEARCH INFRASTRUCTURES

There is a network or intranet that links all 8 of New Zealand's universities. In February 2011, the Government announced that it is investing in a network of high-performance computers to keep New Zealand researchers at the cutting edge of science. Over the next four years the Government will invest more than €14m in the National eScience Infrastructure (NeSI) network.

The network will be made up of linked super-computers and associated services, such as software and data storage. Access to these services will be prioritised to areas supporting the Government's agenda for economic growth. Some of New Zealand's top research organisations are co-funding NeSI, adding nearly €10m over four years to the Government's investment. They are the Universities of Auckland, Canterbury and Otago, and Crown Research Institutes NIWA, AgResearch and Landcare Research. The intranet is not accessible for non-national institutions.

[2] Immigration New Zealand is the government body in charge of all immigration matters in New Zealand.

In addition the government is investigating and encouraging the development of Innovation Parks. The concept is similar to other international initiatives and is primarily aimed at clustering research providers, innovative firms, start-ups in the same geographic location. The Wynyard Quarter ICT Precinct in Auckland, the IRL Gracefield Campus in Lower Hutt and the CBD rebuilt in Christchurch are among the latest projects supported by the Government ("Building Innovation ", 2012).

3.3 STRENGTHENING RESEARCH INSTITUTIONS

3.3.1 Quality of National Higher Education System

There are eight universities and two institutes of technology currently in New Zealand. There are currently no privately owned universities. Each university is a public entity and therefore governance is managed by the Crown or the New Zealand government. Therefore there is one main governance model, with very little deviation from it.

Tertiary Education Organisations (TEOs) undertake a sizable proportion of New Zealand's RS&T activity. Funding comes from both government RS&T and education, as well as from private sector sources. The government invests (HERD) €209m in Higher Education, whereas education imparts €92m and businesses €10m.This investment provides for the development and maintenance of research capability in the country and underpins the provision of quality tertiary education. The allocation of funds made through Vote Education is determined by the institutions themselves and, as a result, the tertiary institutions and the scientists which these institutions employ play an important role in determining what RS&T is undertaken in New Zealand.

In 2008 TEC reported there were 115,000 degrees awarded by all education providers in New Zealand. Out of these, over 40,000 of those were awarded by Universities. In 2009 TEC reported that universities had almost 200,000 students enrolled in studying across the 8 universities. In 2009 the number of female students obtaining science and technology degrees of a Bachelors level or higher is just over 10,000 people. Males represent closer to 8,000 people according to the 2010 Scorecard. Furthermore, the 2010 Scorecard demonstrates that there are approximately 15,000 students participating in natural and physical sciences, around 20,000 students participating in health, 10,000 in engineering and related technology. Also, there are about 5,000 students represented in the architecture and building area, 10,000 students in IT and around 3,000 students in agriculture, environment and related courses. Finally, there are approximately 10,000 students on a society and culture pathway. This is representative of a total of approximately 65,000 students obtaining science and technology degrees of a Bachelors level or higher.

Mission of Higher Education Institutions

The New Zealand higher education institutions all subscribe to the classic three missions of teaching, research and development of the society. The 8 New Zealand universities also aim at meeting international best practice standards. Currently, there is also a focus on providing commercialisation to meet economic growth goals. New Zealand universities are made up of relatively well-established institutions and are limited in number.
The University of Auckland states in the Vice Chancellor's address that the University is dedicated to its mission to nurture scholars who will contribute to society by advancing knowledge and imparting it to new generations of students. This sort of mission is generally reflected across all 8 Universities in New Zealand with a desire to promote life-long learning and a contribution to the broader community.
Universities in New Zealand are active participants in Framework Programme 7.

Performance Rankings and Measures

According to the Shanghai top 100 higher education index the Universities of Auckland and Otago are in the top 300 ranked universities in the world.

New Zealand universities actively encourage international student enrolment and The University of Auckland in particular has high foreign student numbers.
In terms of quality assurance mechanisms, New Zealand uses performance based funding to incentivise excellence. This is known as the Performance Based Research Fund (PBRF) which is managed by the Tertiary Education Commission. The fund is accessed by universities, Institutes of Technology and Polytechnics, wānanga (Maori education providers) and Private Training Establishments and will distribute €129m in the period 2010-2011. The primary purpose of PBRF is to ensure that excellent research in the tertiary education sector is encouraged and rewarded. PBRF is assessed every 6 years and funds are distributed annually based on this assessment. This entails assessing the research performance of tertiary educational organisations and subsequently funding them on the basis of their performance.

According to the 2006 Evaluation the University of Auckland was ranked first in the categories of quality evaluations, research degree completion and external research income. Therefore, The University of Auckland received the highest gross total of €35.7m (NZ$69.9m) of competitive funding, followed by the University of Otago with €24.8m (NZ$48.6), Massey University €17.7m (NZ$34.7m), the University of Canterbury €12.1m (NZ$ 23.6m) and Victoria University, Wellington with €10.6m (NZ$20.7m).

3.3.2 Academic autonomy

Academics employed in New Zealand universities in principle have full academic autonomy in terms of their own research and projects. It does however look like PBRF puts pressure on academics to add more weight to the ability to publish their research in high level, internationally top-ranked journals than to other criteria.
Within universities in New Zealand the appointment or promotion of academics follows a rigorous process that includes continuation of employment, which is an assessment of performance following a 3 to 4-year period upon employment.
As universities and CRIs in New Zealand are public entities, they possess very little financial autonomy. Each entity is subject to performance review and evaluation and often salaries for academics are pre-determined by collective agreements with universities on behalf of the Government. Universities and CRIs do, however, have high degrees of autonomy regarding hiring and recruiting and selecting researchers in New Zealand and this is actively encouraged through immigration policies and seeking a skilled workforce in New Zealand.

Governance

Tertiary Education Organisations (TEOs) are governed by the Education Act 1989. Each TEO is administered by a Council which is responsible for establishing and implementing a Charter approved by the Minister of Education. A Charter is a short document that shows how the provider contributes to the Tertiary Education Strategy and is one of the provider's key accountability documents. A key element of these Charters is to strengthen research, knowledge creation and uptake and foster a close relationship between research and teaching, particularly in universities.

The Council is the main governing body of Universities in New Zealand. It includes external, staff and student members and is chaired by the University's Chancellor. Council controls the affairs, concerns and property of the University. On academic matters the Council is required to seek the advice of the Senate. This body includes all the professors, as well as representatives of sub-professorial staff and students. The Senate takes advice from a range of committees such as Research, Education, Academic Programmes, and Library committees.

It also takes advice from the faculties. Vice-Chancellor is the chief academic and administrative officer and head of the management team.

CRIs are governed primarily by the New Zealand Government, more specifically by two Cabinet Ministers - the Minister of Science and Innovation and the Minister of Finance. Through these titles they each hold all the shares in the eight CRIs. The Cabinet also appoints a board for each CRI to manage the day-to-day operation. Each board is intended to have a business function and a science function with expertise across the board. CRIs in New Zealand are governed by the Companies Act 1993, and the CRI Act 1992. Day-to-day management is performed in accordance with the Acts and a statement of strategic intent which is approved by the shareholders. Each board must produce annual report and report to the Crown Company Monitoring Unit (CCMAU) which is a part of Treasury on behalf of the shareholders. Parliament also has the right to access these reports on an on-going basis.
In accordance with the Education Act 1989 and in conjunction with the TEC and the Minister of Education's directions universities in New Zealand are governed via statute and government funding regulations. Using The University of Auckland as an example, the general governance structure in New Zealand is that the day-to-day governance of the university is taken care of by the Vice Chancellor, who, in turn, reports to Council.

3.3.3 Academic funding

The latest available data regarding funding is from 2008 and it covers the 2007/2008 period. The New Zealand Government through the new Ministry of Science and Innovation (MSI) supplies the majority of research funding to research institutes, universities and other research bodies.
Of the €1.107m national research funds, €472m came from the government. This constitutes 43% of the total funding and makes the Government the most important funder. The New Zealand Government funds research through Vote RS&T and Vote Education.

There are two main channels for competitive funding of research in New Zealand.
One is the Marsden Fund was established in 1994 and is administered by Royal Society New Zealand. The fund supports excellent fundamental research. In 2010/11 the Marsden Fund invested €30m in research. This represents 7% of the government's 'Vote Research, Science and Technology' and includes a €4m increase as compared to 2009. The Marsden Fund provides funding for projects for researchers employed at universities, Crown Research Institutes, private research organisations or as private individuals.
The other one is the Performance Based Research Fund (PBRF) which is managed by Tertiary Education Commission, will distribute €129m in the period 2010-2011. The primary purpose of PBRF is to ensure that excellent research in the tertiary education sector is encouraged and rewarded. PBRF is assessed every 6 years and funds are distributed annually on the basis of this assessment. This entails assessing the research performance of tertiary educational organisations and subsequently funding them on the basis of their performance.

3.4 KNOWLEDGE TRANSFER

3.4.1 Intellectual Property (IP) Policies

Universities and CRIs in New Zealand are entirely publically owned entities and all intellectual property generated in the course of employment are attributed to the employer. For example, The University of Auckland's policy on Intellectual Property in relation to staff states that "Where staff members create any form of intellectual property other than an excluded copyright work in the course of their employment or using University resources the University is acknowledged as having rights to that intellectual property unless those rights are specified by the terms of a contract". This ownership right also extends to

commercialisation both within the University but also with third parties (*The University of Auckland HR Policies*, 2011).

Students do not relinquish their intellectual rights by enrolling in a course of study offered on behalf of or by one the Universities. However, universities may require students to assign their intellectual property rights to either the university itself or a third party as a condition of participation in a particular research project or assessment. In such a case the student will be advised of the necessity for such an assignment and given the opportunity to seek independent legal advice.

Universities in New Zealand manage and protect the intellectual property of both staff and students almost exclusively through contractual rights and obligations. Often this involves standard form contracts that require any research conducted under employment to be considered property of the respective university.
Negotiation regarding intellectual property issues raised during interaction with industry would normally be referred to the knowledge transfer organisations (KTOs) that hold the authority to negotiate on behalf of the university.

Each individual institution will have its own incentives policy in place, however, it appears most often that these are relatively generalised. The largest university in New Zealand, The University of Auckland, outlines its policy for sharing the revenue from research commercialisation as follows. The University states within the Intellectual Property Created by Staff and Students policy that net benefits of commercialisation with the creator on a case by case basis will be shared, however, the decision as to whether or not to exercise these rights lie with the University (*The University of Auckland HR Policies*, 2011). Academics within higher education institutions are encouraged to go through KTO's when negotiating with third parties.

New Zealand has well established KTOs which are identified as Technology Transfer Offices (TTOs). The focus of TTOs is to commercialise research and promote and organise it in such a way that it can be utilised by the public and business sector.
Each of the 8 universities in New Zealand appears to have some sort of TTO attached in order to achieve regional development and growth. Ultimately these entities collaborate and are actively promoted and organised within the universities and create broader linkages and economic opportunities throughout New Zealand.

In 2005 the 8 New Zealand Universities set up the University Commercialisation Offices of New Zealand (UCONZ) to help promote the tertiary sector. UCONZ further provides a forum for the exchange of ideas on how to advance research commercialisation and the benefits it brings to New Zealand as a whole. This is in keeping with the Government's vision as articulated in the Tertiary Education Strategy for the years 2007-2012. One of the priority outcomes indicated is to improve research connections and linkages to create economic opportunities for New Zealand.

KTOs often act as an extension of the university or CRI they are attached to. Therefore, rather than pursuing an independent strategy formulation, they align with the strategy of the university or CRI to which they are attached. Therefore, in support of increasing research capabilities and in sitting with the current policies of furthering economic growth in New Zealand, KTOs are focused on commercialising research in order to continue economic growth.

Some KTOs are more proactive than others in identifying intellectual property with commercial potential. KTOs promote inventions through initiatives and activities such as open days and events and inviting technology scouts to visit the respective university or CRI. One such example is the AgResearch Diary Farm Research Open Days that took place in 2009 or university events at each of the 8 universities to promote invention through TTOs.

New Zealand appears to be following the Commission recommendations to a certain extent with strong links between universities and KTOs. However, in terms of offering incentives for R&D, there seems to be a disparity in terms of a lack of real support for R&D financially. The management of intellectual property seems to align with international best practice in terms of focusing on research commercialisation.

3.4.2 Other policy measures aiming to promote public-private knowledge transfer

Involvement of private sectors in the governance bodies of HEIs and PROs

The boards of CRIs are appointed by the Minster of CRIs and the Minister of Finance, both of whom are primary shareholders. Advisory boards at universities and City Councils have representatives from industries and sectors within the community with the vision that each entity shall serve and represent the community within which it operates.

Inter-sectoral mobility

One instrument for mobility between sectors is through contractual means. Institutions have the option to employ staff short term on fixed term contracts, thereby allowing moment across academic and private sectors through consulting or projects and contracting. Many universities in New Zealand also enable their staff to take unpaid leave with relative ease, which in turn also allows employees the freedom to pursue business interests or projects for a given time with job security.
There is also active promotion of inter-sectoral mobility. Using The University of Auckland as an example, it is apparent that staff is encouraged to set up companies and participate in and contribute to the business community with research that has the potential to be commercialised or services which can promote business or industry improvement. Many researchers and academics actively participate in the SPARK initiative and entrepreneurial challenge and incubation within The University of Auckland.

Promoting research institutions - SME interactions

Traditionally New Zealand Trade and Enterprise (NZTE) is responsible for funding business incubators and science parks. NZTE utilised a cluster policy that developed regional growth, particularly in regions where there was an industry focus such as fisheries or vineyards. NZTE is primarily focused on providing research or incubators and funding assistance for businesses or industries that exhibit high potential internationally. In Auckland NZTE in conjunction with The University of Auckland support the ICEHOUSE and the biotechnology incubator Chiasma, whereas in the Waikato region, Waikato-Link is a science park that is more focused on agriculture and development.

Spin-offs

In general New Zealand universities are relatively advanced in evolving their local innovation systems. One of the most committed universities to research commercialisation, The University of Auckland, has engaged in a wide range of activities such as establishing a business incubator the ICEHOUSE that also includes aspects including business growth programmes for small or medium enterprises, supporting access to Angel Investors, running entrepreneurship competitions for both staff and students.

Other Universities throughout New Zealand apply at different levels models similar to the one practiced by The University of Auckland. Waikato University has Waikato-Link which is aimed at similar outcomes in promoting spin-offs and entrepreneurial endeavour within the

university community. Furthermore, WaikatoLink seeks to make links with agricultural industries and broader regional development in the Waikato region. Otago University is running a similar entrepreneurial strategy with the Centre for Entrepreneurship, as is Victoria University through its VictoriaLink in Wellington.

Regional Development Policy

Whilst there are some aspects of regional development policy in place, these are mostly in terms of city council involvement such as through Auckland City Council and science incubators, which are mostly located around a university.
Recently, in conjunction with NZTE, the Ministry of Science and Innovation (MSI) has introduced a Regional Business Partners scheme. This scheme is comprised of 14 organisations nationwide and is the first point of contact for businesses seeking government assistance. The network is based on regional council boundaries and partners support business growth and innovation in their regions. The network makes it easier for SMEs to take steps to grow their business and offer assistance. The NZTE MSI Regional Business Partner network is the result of MSI and NZTE joining forces to expand the previous network of 9 regional partners.

3.5 ASSESSMENT

Since the beginning global financial crisis in 2008 New Zealand' government is facing budgetary pressures. Some of the measures taken in order to keep government spending under budget generated questionable results for businesses. As an example of such measure, the cancelation of the tax credit scheme for R&D may have a negative impact on business driven Innovation. Although necessary, the government is now analyzing if the measure had a negative impact on business spending on R&D. Although BERD is low compared to EU countries, 2010 data showed the highest levels of all times (0.54% of GDP)

The creation of the a super ministry of Business Innovation and Employment (MBIE) involved the amalgamation of the Economic Development Ministry, the Department of Labour, the Science and Innovation Ministry and the Department of Building and Housing This can disrupt or at least have some impact in R&D policies specially because the creation of the super ministry was followed by two very recent and sequential alterations in the government R&S&I structure. First the government merged of the Foundation for Research, Science and Technology (FRST) with the Ministry of Research, Science and Technology (MoRST) to create the MSI (ministry of Science and Innovation). Then, just one year after this major change happened (the creation of the MBIE).

However, despite some arguable moves, the government seems to be genuinely committed to invest in Science and innovation in order to improve New Zealand's economy. For example the budget for the PBRF is increasing to $300 million per year. Some areas for research such as High-value manufacturing and service; Biological science; Energy and minerals; Hazards and infrastructure; Environment; Health and society will receive extra research funding through yearly science investment rounds. Furthermore the creation of the Callagham institute and the office of the Prime Minister's Science Advisor can also demonstrate the government's overall intention to favor innovation, science and R&D policies.

4 International R&D&I Cooperation

4.1 MAIN FEATURES OF INTERNATIONAL COOPERATION POLICY

New Zealand's, remarkably liberal trade policies, is seen by the Ministry of Science and Innovation (MSI) as a great opportunity, to leverage its international S&T cooperation agenda (MSI, 2012). In 2011, MSI sustained joined efforts with other government bodies such as MFAT, NZTE, MED and the Prime Minister's Chief Science Advisor. Central to this cooperation is the prioritisation of mutual efforts towards a set of priority partners. At the same time, this combined effort aims to foster S&T cooperation, Trade and diplomacy interests (MSI, 2012). New Zealand is an active promoter of Free Trade Agreements and the advantages of trade liberalisation.

Since the signature of the Closer Economic Partnership (CEP) with Australia in 1983, the country went through a long period without signing other Trade Agreements. However, since 2001, when New Zealand signed the CEP with Singapore, another 5 bilateral or multilateral agreements were signed. As of 2011, New Zealand concluded negotiations with Thailand, TPP (P4), China, ASEAN, Malaysia, and Hong Kong. In addition, there are 8 additional agreements being negotiated (MFAT, 2012). Thus it is possible to conclude that New Zealand's international cooperation policies in R&D&I, are intertwined with its broader Trade and Foreign policies.

On July 2010, the International Relationship Fund (IRF) came into effect. The IRF supports global links which foster innovations and research ties and aims to further and deepen these links. In 2011-12 a number of initiatives showcased the joint efforts of government bodies.
Whilst involving elements of New Zealand's broader foreign and trade policies, these initiatives also aimed to nurture elements of cooperation and mutual development of S&T. For example, MSI led a delegation to China, with a specific intent to boost bilateral research collaboration. In June 2011, New Zealand and India signed a protocol for Cooperation on Science and Innovation, during the Prime Minister's visit to that country. Furthermore, the country has also orchestrated new partnerships with Australia and USA respectively featuring cooperation in geothermal and marine research. During this period of time, a number of smaller/punctual initiatives were also taken in order to foster connections, linkages and the adoption of best practices from overseas partners. For example the Chief Science Advisor is actively working on strengthening of the relationships with his counterparts' from Australia, the UK, Ireland, Israel, Malaysia as well as the CSA to the US (Gluckman, 2012).

4.2 NATIONAL PARTICIPATION IN INTERGOVERNMENTAL ORGANISATIONS AND SCHEMES

New Zealand has an open economy that places few barriers in the way of foreign services providers or importers. New Zealand is currently a member of the OECD, WTO and APEC. In addition the country has been actively promoting multilateral or bilateral Trade Agreements. To date New Zealand has signed the following trade agreements:
New Zealand also has signed a co-operation agreement with CERN and participates in the consortium of countries operating the Square Kilometre Telescope, which is established in Australia and South Africa.

- New Zealand-Hong Kong, China Closer Economic Partnership entered into force on 1 January 2011
- New Zealand-Malaysia Free Trade Agreement entered into force on 1 August 2010
- ASEAN-Australia-New Zealand Free Trade Agreement - 2010
- New Zealand-China Free Trade Agreement - 2008

• Trans-Pacific Strategic Economic Partnership (P4) - 2005
•New Zealand-Thailand Closer Economic Partnership - 2005
•New Zealand-Singapore Closer Economic Partnership - 2001
•Australia-New Zealand Closer Economic Relationship - 1983

New Zealand has also he following Agreements under Negotiation:

•Anti-Counterfeiting Trade Agreement (Concluded and signed, but not yet ratified)
•New Zealand-Australia Closer Economic Relations Investment Protocol Subject to Parliamentary Treaty Examination, expected to enter into force in 2012
•New Zealand-Gulf Cooperation Council Free Trade Agreement (concluded but not yet signed)
•New Zealand-Russia-Belarus-Kazakhstan Free Trade Agreement
•New Zealand-India Free Trade Agreement
•New Zealand-Korea Free Trade Agreement
•Trans-Pacific Strategic Economic Partnership
•New Zealand-Hong Kong, Closer Economic Partnership Investment Protocol

4.3 COOPERATION WITH THE EU

4.3.1 Participation in EU Framework Programmes

The formal relationship between New Zealand and the EU dates back to 1991 when a non-binding Science and Technology Cooperation Arrangement was established. In 2009 there was another milestone, namely entering into force of the *New Zealand-EU Science and Technology Cooperation (STC) Agreement*. This milestone has upgraded substantially the RS&T multilateral relationship as it allows for formal discussions and interaction, notably through a Science and Technology Cooperation Committee (JSTCC) meeting between MoRST and the European Commission (EC). This meeting is aimed at discussing and agreeing on a programme of activity and debating and confirming priority fields for research collaboration.

The first of these meetings under the Agreement took place in 2009 and identified six FP7 themes as priorities for enhanced NZ-EU collaboration: Health, ICT, Environment, Energy, and Food/Agriculture/ Fisheries/ Biotechnology, and People (researcher mobility). The second JSTCC meeting was held the following year, in 2010, (International Staff Research Exchange Scheme, people/mobility, health, ICT, knowledge-based biological industries; international cooperation for global challenges; and industrial technologies).

Because of the significance of the collaboration with the EU to New Zealand, a number of steps have been undertaken in New Zealand to facilitate it. The key initiatives in this direction include:

- Establishing and enacting *FRENZ* with the main objective to provide information and support to the New Zealand research community to promote the effective participation in FP7. FRENZ is co-funded by MoRST and the EC.
- Establishing the International Research Staff Exchange Scheme by the EC under the "People Specific Programme" of FP7. This new scheme is aimed at allocating funds to support the New Zealand research, science and technology sector to utilise the available opportunities in the framework of this new initiative. The total funding is approximately €29m (NZ$ 50m).
- Allocating €29,000 (NZ$ 50,000) towards establishing a reciprocal scheme with the *Cooperation in Science & Technology (COST)* organisation. The idea behind this

scheme is to assist New Zealand researchers to engage in the large trans-national networking fora known as "COST Actions".

Considering the relative size of New Zealand's economy and research activity on a global stage, the country's Participation on EU-FP7 programs has been relatively pronounced in some areas of collaboration. To date, from a total of almost €205m of successful budget approvals almost half (96.8m), is related to the SP1 Knowledge Based Bio Economy (KBBE) programs. The HEALTH and ICT SP1 programs also received a considerable proportion of the approved budget with €39.8m and €30.5m respectively. The following table gives a comprehensive view of the number of proposals, approvals and respective budgets related to the SP7 programs New Zealand Scientists are engaging.

		All submitted		Mainlisted			Success Rate: applicants in mainlisted proposal/ applicants in all submitted proposals - applicants from New Zealand
Proposal SP Description2	Proposal Program	Number of Proposals	Number of Applicants	Number of Proposals	Number of Applicants	Total budget of the successful proposals	
SP1-Cooperation	ENERGY	1	1				
SP1-Cooperation	ENV	8	8	2	2	14,251,114	25.00%
SP1-Cooperation	HEALTH	9	9	6	6	39,831,290	66.67%
SP1-Cooperation	ICT	32	32	8	8	30,455,512	25.00%
SP1-Cooperation	KBBE	41	43	19	19	96,783,572	44.19%
SP1-Cooperation	NMP	2	3				
SP1-Cooperation	SPA	2	3	1	1	2,626,263	33.33%
SP1-Cooperation	SSH	10	10				
SP1-Cooperation	TPT	1	1	1	1		100.00%
SP2-Ideas	ERC	6	7				
SP3-People	PEOPLE	147	156	58	66	9,094,352	42.31%
SP4-Capacities	INCO	4	9	4	9	5,930,989	100.00%
SP4-Capacities	INFRA	5	5	3	3	5,720,067	60.00%
SP4-Capacities	SiS	3	3				
SP4-Capacities	SME	1	1				
	Sum:	272	291	102	115	204,693,158	39.52%

4.3.2 Bi- and multilateral agreements with EU countries

New Zealand maintains a number of bilateral and multilateral relationships with other ERA countries and organisations. These occur at both the government and scientist level. The basis for the overall relationship between the EU and New Zealand is outlined in the Joint Declaration on Relations and Cooperation between the European Union and New Zealand

New Zealand-France RS&T links and activities

These links and activities date back to 1977 when a New Zealand-France Cultural Agreement confirmed their mutual desire to facilitate and encourage cooperation and exchanges between the two counties in the field of science. The key areas of research collaboration are marine research, geosciences and biological productivity.

In 2005, another agreement was signed with the objective was to promote and enhance research collaboration between the two countries, particularly in the areas of biotechnology, nanosciences and renewable energy. Both parties allocate approximately €90,000 per annum each to a multi-year travel grant scheme, the Dumont d' Urville Programme, as an explicit support of the Arrangement. The administration of this initiative is carried by the Royal Society of New Zealand and the Égide agency in France.

New Zealand-United Kingdom RS&T links and initiatives

The UK has traditionally been among New Zealand's key research partners. The science links between the two countries can be traced historically back to the 1760-1770s. Various analyses and forecasts show that the UK is likely to remain as one of New Zealand's most important partners in relation to RS&T. The UK is often the country that serves as a source of 'best practices' in relation to science and higher education policy in New Zealand.

The collaboration activities between UK and NZ researchers are rather intensive. Following MoRST statistics, approximately 30% of New Zealand researchers have a UK partner (as compared to 7% with French partners). The main collaboration areas include biological sciences, education, medical and health, biotechnology, and the physical sciences. A survey conducted by the New Zealand Ministry of Foreign Affairs and Trade found that there are more than 150 Memoranda of Understanding signed between New Zealand Tertiary Education institutions and their British counterparts.

It is interesting to note that there are no formal bilateral arrangements signed by the two governments to support RS&T links and initiatives. One useful and actionable collaboration platform is the NZ-EU STC Agreement. Much of the bilateral research relationship has resulted in significant collaboration through the European Framework programmes. The officials appointed by MoRST to act as a Science Counsellor for Europe also takes care of the New Zealand – UK research cooperation. Visits by both New Zealand and UK officials and experts to the other country are rather regular. There is also a UK Science promoter who is based in and funded by the British High Commission in Wellington. Additionally, MoRST has a desk-officer responsible for New Zealand - UK linkages.

New Zealand-Germany RS&T links and initiatives

In 1977 the two countries signed a bilateral Science and Technology Cooperation (STC) Agreement. The SCT Agreement was reviewed in 2006. The two implementing agencies, BMBF and MoRST, were instrumental in initiating the review process with the idea that steps and actions should be identified in order to enhance the bilateral RS&T relationship. The overall conclusion reached was that both the breadth and the depth of the bilateral research collaboration are at a very high level and had positive outcomes for research.

In 2007 the then New Zealand's Minister for RS&T and the German Federal Minister for Research and Education reached an agreement that a range of initiatives based on the STC Agreement Review would be implemented. The ones that deserve particular attention are better use of EU-Programmes, particularly the FP7, better coordination of funding (for instance through simultaneous applications to New Zealand and German based funding bodies), enhancing exchanges and supporting research workshops in prioritised areas, supporting reciprocal staff secondments to enhance policy linkages.

Other official documents that support the bilateral research collaboration are the Memoranda of Understanding which MoRST has signed with the Germany's leading university research funder and the Alexander von Humboldt Foundation, the world-leading international researcher exchange and development organisation. These memoranda are supported by small funding programmes.

Six research areas are defined as priority areas in the New Zealand – Germany bilateral research collaboration. These are: Health; Food / Agriculture / Biotechnology; Information and Communication Technologies; Environment (especially climate change), Marine; and Antarctic research.

4.4 COOPERATION WITH NON EU COUNTRIES OR REGIONS

4.4.1 Main Countries

Because of New Zealand's geographical location, Asia has been and is increasingly important as the region providing potential attractive research collaboration partners. Among these countries China, Japan and to a certain extent South Korea are important partners. A number of agreements and joint programmes have been initiated, primarily bilateral ones.
Asia Pacific Economic Cooperation (APEC) is also of increasing importance to New Zealand in this respect. Among the 21 countries that are APEC members, are several countries that are in New Zealand's list of identified priority countries. APEC's structure includes 10 working groups, with New Zealand having a particular interest in the Industrial Science & Technology Working Group which meets twice a year. Current specific projects include work on climate issues, sustainable development and participation of women in the science workforce and earthquake simulation. The Life Sciences Innovation Forum and the AgBiotech Policy Dialogue in APEC are closely monitored by New Zealand in order to make sure potential research opportunities are not missed.

New Zealand does participate in some coordination schemes with non-European countries. Among these countries is Australia with which New Zealand has close research links, particularly in the areas of biotechnology, forest research and horticulture research. New Zealand has signed biotech cooperation agreements with New South Wales, Queensland and Victoria and has formed a Biotech Alliance with Australia. These initiatives offer the prospect of pursuing broader trans-Tasman business and R&D alliances.

New Zealand's bilateral science and technology links with Japan are also well established and continue to grow steadily. This has been achieved through a number of activities such as delegations of New Zealand scientists' visits to Japan in relation to specific areas of focus, joint workshops, and funding schemes to facilitate and advance collaboration particularly focused in funding the exchange of scientists.
Japan is an important science and technology partner for New Zealand. The relationship between the two countries is built on shared strengths and mutual interest in research areas such as biological sciences, functional food, biotechnology, and nanotechnology. Among the many advantages of this partnership, New Zealand benefits from Japan's advanced national capabilities, research facilities and potential and commercialisation knowledge.

In 2005 MoRST and the Japan Society for the Promotion of Science (JSPS) signed a Memorandum of Understanding establishing the NZ-JSPS Bilateral Cooperation Programme. The scheme provides funding for and promotes exchange of scientists and post-doctoral fellows. It also funds joint research projects and workshops. On behalf of New Zealand the Programme is managed by the FRST and the Royal Society of New Zealand. In 2009 New Zealand negotiated a new funding scheme with the Japan Science and Technology Agency under the framework of this Agency's Strategic International Cooperative Programme. This

scheme supports joint research projects between New Zealand and Japanese researchers with an overarching theme of "biosciences and biotechnology". Japan and New Zealand are currently exploring the possibility of concluding a Science and Technology Cooperation Agreement (STCA), with negotiations between officials from the two countries being in progress.

China is rapidly gaining the status of one of New Zealand's most important bilateral partners. A formal STC Agreement between New Zealand and China has existed since 1987 and was updated in 2003. The agreement particularly addressed the areas of forestry, agriculture, geology, seismology, volcanology, Antarctic research, meteorology, horticulture and environmental protection. The bilateral relationships were confirmed and solidified further during official visits in 2004 and 2006. The areas currently prioritised are strategic collaborations and alliances to assist in the development of commercially viable technology, establishing a stronger New Zealand RS&T presence in China, improved access by New Zealand researchers to Chinese research infrastructure, closer partnerships between New Zealand and Chinese researchers and closer people-to-people linkages in targeted areas.

In February 2009 the New Zealand Ministry of Research, Science and Technology (MoRST) and the Chinese Ministry of Science and Technology (MOST) signed an arrangement to encourage and facilitate greater understanding and development of research linkages between New Zealand and China. The arrangement provides for that support to be provided through the New Zealand-China Scientist Exchange Programme.

The objectives of the scientific exchange programme are to encourage and facilitate greater understanding and development of research linkages for up to 10 early- to mid-career researchers of New Zealand and China (up to 5 each), to facilitate access to expertise in each country, and to extend cooperation in jointly agreed priority research fields for collaboration. It is considered that an early- to mid-career researcher would have at least 5 years research experience post receiving their PhD degree

4.4.2 Main instruments

Ministry of Business, Innovation and Employment is the main funder for international collaboration through its umbrella instruments the International Relationships Fund. The Royal Society of New Zealand administers parts of the programme. The IRF provides funding through several programmes and initiatives:

- The East Asia Pacific Summer Institutes Programme (EAPSI) provides US science and engineering graduate students first-hand experience conducting research in New Zealand laboratories.
- The International Mobility Fund provides funding for New Zealand researchers to travel to the US or for US researchers to travel to New Zealand to work on joint research projects.
- The New Zealand-China Scientist Exchange Programme supports the exchange of early to mid-career researchers of New Zealand and China.
- The New Zealand-Japan Scientist Exchange Programme supports postdoctoral fellowships, exchange visits between New Zealand and Japan and organisation of joint Workshops in New Zealand and Japan.

In addition the Royal Society of New Zealand has set up ad-hoc instruments for supporting students and young scientist to participate in specific international scientific symposia and fora such as the SCAR Biology Travel Award, the New Zealand Ecohydraulics Trust Travel Award and the James G Hay Travel Awards.

4.5 OPENING UP OF NATIONAL R&D PROGRAMMES

New Zealand's research programmes are in general; open to individuals willing to move to the country and to conduct the research within the national borders as long as the applicant meet the requirements set by the institution conducting the research and by the immigration New Zealand. Non-nationals may be granted work permits and even residency prior to their arrival. Non-nationals may be entitled to research mobility schemes.

4.6 RESEARCHER MOBILITY

4.6.1 Mobility schemes for researchers from abroad

Programmes which provide funding to non-national researchers are programmes primarily aimed at researcher mobility. The programmes are managed by Royal Society NZ:

- European Cooperation in Science and Technology (COST) Travel grants for New Zealand researchers travelling to Europe, and European researchers travelling to New Zealand involving COST Actions.
- International Mobility Fund. Funding for New Zealand researchers to travel overseas or for overseas researchers to travel to New Zealand to work on joint research projects.
- International Mobility Fund for Germany. Funding for New Zealand researchers to travel to Germany or for German researchers to travel to New Zealand to work on joint research projects.
- International Mobility Fund for Spain. Provides funding for New Zealand researchers to travel to Spain or for Spanish researchers to travel to New Zealand to work on joint research projects.
- Julius von Haast Fellowship Award. Fund German researchers to spend time working collaboratively with their New Zealand colleagues, and to establish, or enhance collaborative research of benefit to both countries.
- New Zealand-EU International Research Staff Exchange Scheme (IRSES). Funding for staff exchanges between New Zealand and European research institution.

4.6.2 Mobility schemes for national researches

These mobility schemes are typically incorporated into the bilateral arrangements and relationships that New Zealand maintains at both the government and scientist level. Inward mobility is supported by the Ministry of Science and Innovation through a sub-programme of the International Relationship Fund and usually supports travel related costs rather than direct research costs (e.g. conference, seminar or workshop attendance). The programme supports all new, emerging and existing international relationships, in particular Australia, China; Europe (less France and Germany because of separate funding programmes); India; Japan; Korea; and the USA. The key objectives are to develop international opportunities and utilise overseas advances in research, science and technology that are of economic benefit to New Zealand; promote international recognition of New Zealand as a centre for innovation; positively influence regional and international RS&T linked activities that advance New Zealand's national interest; and increase the level of funding, scientific skills and technological capabilities that New Zealand is able to source from other countries.

5 CONCLUSIONS

The election of the national party in 2008 happened in parallel with the deepening of the current financial crisis.
At the same time the New Zealand government is facing budgetary, performance and societal pressures that may be generating some questionable results for businesses. For example the cancelation of the tax credit scheme for R&D may have a negative impact on business driven Innovation. Also the two very recent and sequential alterations in the government R&S&I structure may also create managerial problems and lack of continuity. First the government merged of the Foundation for Research, Science and Technology (FRST) with the Ministry of Research, Science and Technology (MoRST) to create the MSI (ministry of Science and Innovation). Then, just one year after this major change, the government announced the creation of MBIE(Ministry of Business, Innovation and Employment). A super ministry encompassing Economic Development Ministry, the Department of Labour, the Science and Innovation Ministry and the Department of Building and Housing.
However, despite some arguable moves, the government seems to be genuinely committed to the transform New Zealand in a wealthy nation also internationally recognised as being smart, modern and innovative. Proof of this willingness is the establishment of distinct priority areas for research such as High-value manufacturing and service; Biological science; Energy and minerals; Hazards and infrastructure; Environment; Health and society. Furthermore the creation of the office of the Prime Minister's Science Advisor or more recently, the announcement of the creation of the ATI may well be interpreted on the same way. The ATI will be a Crown institute, intended to stimulate firms especially the ones taping the high value manufacturing and services sector. Its major functionality is basically to establish better connections of businesses with the broader network of R&D&I providers in New Zealand. Interestingly, as a part of the "Business Growth Agenda", the government has, for the first time communicated a target for businesses' investments in R&D to reach more than 1% of GDP.
Also, New Zealand is one of the most prolific FTA promoters in the world. The government has explicitly communicated its intention to coordinate its organisations to facilitate and promote innovative kiwi firms to explore international markets. This combined effort is primarily aimed to generate better quality jobs, processed and higher value-added exports. On the same lines, recent policies have been focused in strengthening its economic ties with its major trading partners also by promoting R&D collaboration. With the increasing significance of bilateral trade with Asian countries, it is possible to foresee an increasing trend in innovation and R&D collaboration with these countries. To date the country is developing collaboration activities with major economic powerhouses such as China (and Hong Kong), India, Korea, Japan.
In conclusion, despite the current economic scenario, the government and firms have been maintaining the levels of investment in R&S&I. These investments, despite being comparably low; they have not been reduced in order to ease government spending. Instead, examples of initiatives trying to promote innovation thrive. There appears to be a very strong inclination to favour combined policies and mechanisms aimed at generating the more returns from the current investments and infrastructure in New Zealand. With this in mind it is possible to assume that New Zealand is well positioned and inclined to improve its Science and Innovation systems, at least to closer average levels of OECD countries.

6 References

Building Innovation Report (2012). *Business Growth Agenda - Progress Report*: New Zealand Government.

Equal Employment Opportunities. (2011)

Gluckman, S. P. (2012). Annual Report: Office of The Prime Minister's Science Advisory Committee.

Ministry of Research, Science and Technology (2010). Report: Igniting *Potential*

John Raine, M. T., Philip O'Reilly. (2011). Powering Innovation, Improving access to and uptake of R&D in the high value manufacturing and services sector: Ministry of Science and Innovation

Joyce, H. S. (2012). New Ministry to drive business growth agenda, from *http://www.beehive.govt.nz/release/new-ministry-drive-business-growth-agenda*

Karlson, B. (2011). *University-industry relationship: from the perspective of small firms*.

MFAT. (2012). Trade Relationships and Agreements

MSI. (2012). Ministry of Science and Innovation, Annual Repport (2011-2012).

Nana, G., Stokes, F., & Lynn, A. (2010). Academic Workforce Planning, Towards 2020. : Universities New Zealand.

Crown Research Institutes(2010).Task Force report

Statistics New Zealand. (2011). Research and Development in New Zealand Wellington.

Tertiary Education Commision. (2011). *briefing for the incoming minister*.

The University of Auckland HR Policies. (2011).

7 List of Abbreviations

BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
COST	European Cooperation in Science and Technology
ARC	Auckland Regional Council
CRI	Crown Research Institute
CCMAU	Crown Company Monitoring Advisory Unit
ERA	European Research Area
ERA-NET	European Research Area Network
ERP Fund	European Recovery Programme Fund
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
FP	European Framework Programme for Research and Technology Development
FRENZ	Facilitating Research Co-operation between Europe and New Zealand
EU	European Union
EU-27	European Union including 27 Member States
FDI	Foreign Direct Investments
FP	Framework Programme
FP7	7th Framework Programme
FRST	Foundation for Research, Science, and Technology
FTE	Full Time Equivalent
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HES	Higher education sector
HRC	Health Research Council
IP	Intellectual Property
IRF	International Relationship Fund
IRD	Inland Revenue Deaprtment
KTO	Knowledge Transfer Organisation
MoRST	Ministry of Research, Science, and Technology
MSI	Ministry of Science and Innovation
NSP	National Science Panel
NZTE	New Zealand Trade and Enterprise
PRO	Public Research Organisations
OECD	Organisation for Economic Co-operation and Development
R&D	Research and development
RI	Research Infrastructures
RSNZ	Royal Society New Zealand
RTDI	Research Technological Development and Innovation
SF	Structural Funds
SME	Small and Medium Sized Enterprise
TEC	Tertiary Education Commission
S&T	Science and technology
PBRF	Performance Based Research Fund
TEO	Tertiary Education Organisation
TAMU	Tertiary Advisory Monitoring Unit
TTO	Technology Transfer Organisation
VC	Venture Capital