

## **BACKGROUND NOTE 1**

### **SKILLS FOR INNOVATION – COUNTRY STRATEGIES**

#### **OECD/Germany Workshop on “Advancing Innovation: Human resources, education and training”**

##### **Session 3: International experiences: Case studies of national strategies**

Human resource development is an area of continuous policy focus and action and has important consequences for innovation and economic activity. However, while many OECD countries have implemented a variety of policies to improve the development of human resources, these are not necessarily linked to broader innovation goals. Similarly, while innovation strategies may cover the human resources issues of educational attainment and the formation of scientists and engineers, they may not look to wider human capital issues.

This note outlines how human capital is included in recent national innovation strategies that encompass all or most government ministries. This will allow reflection on differences and commonalities in approaches and what the OECD innovation strategy might usefully address.

The note collates information from countries’ strategy documents according to the following questions:

- What themes does the country’s innovation strategy cover in addition to human capital?
- What is the main focus of the human capital discussion in the strategy? (for example, is it types of skills required, suitability of training providers...?)
- What has spurred the inclusion of human capital issues in the innovation strategy document?
- What types of policies are being used or being suggested by the strategy?
- What ministries and institutions are responsible for implementing human capital policies?
- What are the implications for the education sector and for innovation in general?

This material will be used by the Secretariat in 2009 to analyse the commonalities and differences between countries in their approaches to innovation and human capital.

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## AUSTRALIA

### *The strategy*

From 2001, Australian policy on innovation has been aligned to the *Backing Australia's Ability* innovation package (ultimately a 10 year package to 2010-11). The package focused on three key themes: the generation of new ideas (R&D); the commercial application of ideas; and developing and retaining skills. Thus, human capital was the third plank of the package.

With a change of government in late 2007, an independent review of Australia's National Innovation System was commissioned. The review report, *Venturous Australia*, was released in September 2008, and focused on the following key areas: strengthening people and skills; building excellence in national research; enhancing market facing innovation; innovation by the government; and governance (including setting national priorities for innovation) ([www.innovation.gov.au/innovationreview](http://www.innovation.gov.au/innovationreview)). Human capital was identified as a key feature of an effective innovation system. The Australian government will consider the findings and recommendations of the review in drafting a 10 year framework for innovation in the form of an innovation white paper.

### *Main human capital focus*

The review has a strong focus on improving the system for generating human capital. The goal is to equip people with the skills to innovate, defined not only as generating and applying new knowledge but also using and adapting knowledge produced elsewhere. This requires attention at all levels of education, from early childhood education through to the workplace, and requires collaboration across portfolios, jurisdictions, sectors and disciplines.

### *Impetus for inclusion of human capital in innovation strategy*

According to the Review report, the significance of human capital to innovation was a common theme raised throughout the review consultation process. A number of issues were identified, including:

- the increasing share of jobs requiring familiarity with maths, science and technology (along with evidence that teenagers' maths skills are at 1960s levels, that there is declining participation in maths and physical sciences at the upper secondary and tertiary level, and that there are fewer teachers of these subjects);
- the increasing need to integrate creativity, cultural studies, the arts and design into curriculum;
- evidence that the academic aptitude of school teachers has fallen over recent decades;
- concerns that Australian workplaces are not adequately nurturing and tapping into the creativity and skills of all workers (with particular concerns about neglect of management training and leadership skills, systemic cultural problems that block innovation, and neglect of the role of crafts and trades in innovation); and
- the need to provide more flexible pathways to professions.

### ***Types of policies used or suggested***

The review supports efforts being undertaken under the COAG national reform agenda<sup>1</sup>, including reforms on delivering early childhood services, raising teacher quality, and improving competition, contestability, quality assurance and consumer information in the Vocational Education and Training (VET) sector. It also expressed strong support for having innovation considered within the current review of Higher Education in Australia (the Bradley Review), which will report in December 2008.<sup>2</sup>

More specifically, the review supports: processes to review funding models for tertiary training in the creative arts; an examination of innovative educational reforms in other countries in order to benchmark Australian efforts; aligning immigration policy with innovation policy to facilitate Australia's access to the global talent pool; and establishing a program to support professional bodies to provide flexible pathways for entering professions, especially those experiencing skill shortages (eg maths and science teachers).

It should be noted that the findings and recommendations mentioned above are of an independent Panel and have not been endorsed by Government. Australia's innovation strategy will be articulated in the Government's 10-year innovation white paper.

### ***Range of ministries and institutions responsible for policies***

The breadth of policy areas identified in the review suggests a wide range of ministries and other bodies would be involved in subsequent policy. Key federal ministries include the Department of Education, Employment and Workplace Relations, the Department of Innovation, Industry, Science and Research, the Department of Immigration and Citizenship, and the Department of the Environment, Water, Heritage and the Arts. Departments and bodies at State, Territory and Local level would also be involved.

### ***Implications for the education sector and for innovation in general***

#### **Reference documents**

Bradley, D. (2008), *Review of Australian Higher Education: Discussion Paper*, June, Australia.

Cutler, T. (2008), *Venturousaustralia: Building Strength in Innovation*, Review of the National Innovation System, August, Australia.

See <http://backingaus.innovation.gov.au/> for further details on the Backing Australia's Ability package.

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<sup>1</sup> COAG – the Council of Australian Governments – has responsibility for initiating, developing and monitoring the implementation of policy reforms that are of national significance and which require co-operative action by Australian Governments (Federal, State, Territory and Local). See [www.coag.gov.au/](http://www.coag.gov.au/).

<sup>2</sup> The discussion paper for the Bradley Review identifies two key areas of linkage with the review of the National Innovation System: increasing research collaboration between the public and private sectors; and the development of skills as a supply-side infrastructure issue for the knowledge economy.

## AUSTRIA

### *The strategy*

In November 2007, the Austrian Federal Government held its Innovation Summit and endorsed two major initiatives to prepare a *Fronrunner Strategy 2020 for Science, Technology and Innovation*: a) the Austrian Research Dialogue and b) an evaluation on the national STI system.

The Austrian Research Dialogue was a nation-wide discourse process, assembling fresh ideas and the strategic needs of STI stakeholders with a focus 2010-2020. The findings were presented in summer 2008 and resulted in 10 strategic fields of activity for the Austrian Fronrunner Strategy 2020 being put forward by the Austrian Minister for Science and Research. These measures include: making Austria a research front runner in Europe, supporting more careers in research, strengthening of basic research, advancement of the higher education sector, launch of an excellence initiative, science as service for society, enhancing interactions between industry and academia, support for industrial/business research, positioning of Austria in the global knowledge society, enhancement of efficiency and effectiveness of the research system.

The results of the Austrian evaluation on the national STI system are planned to be presented in March 2009. Hence, the Fronrunner Strategy 2020 for Science, Technology and Innovation is planned to be presented in mid 2009.

### *Main human capital focus*

The results of the Austrian Research Dialogue have shown the need for strategic actions both in a national context and internationally – this also includes international mobility: supporting careers in STI and scientific excellence, positioning Austria in the global STI environment, advancement of the higher education sector and enhancing the efficiency of the research system. Moreover, enhancing the interest of the younger population in STI and encourage them to pursue a scientific career in order to meet the challenges of the future is an issue.

### *Impetus for inclusion of human capital in innovation strategy*

The documentation of the results of the “Austrian Research Dialogue” states that “technology-based growth can only be realised by the creation of new products and processes which can only be achieved by highly qualified and well educated human capital. Austria’s share of university graduates and especially the share of graduates in science and technology is below the OECD average”. Thus, the training and promotion of human capital is expected to play a crucial role in the Fronrunner Strategy 2020 in order to meet the demands of the future.

Moreover, the communication “Better careers and more mobility: a European Partnership for Researchers” launched in May 2008 by the European Commission has proposed several actions to ensure the availability of researchers for the European Research Area.

### *Types of policies used or suggested*

According to the outcome of the Austrian Research Dialogue top level research, modern universities and excellent researchers are key factors for an internal successful research landscape. Thus, the following policies with a special focus on human capital are suggested in the strategic fields of activity for the Austrian Fronrunner Strategy 2020 by the Austrian Minister for Science and Research:

- Supporting careers in STI include supporting new career paths (e.g. tenure-track); support of independence of PostDocs in research, higher share of women and measures for equal opportunities in research, increase of researchers in STI, sparking the interest of pupils in STI, supporting immigration of highly qualified, increasing the numbers of students with international experience.
- Scientific excellence should be guaranteed by scientific competition. Moreover, excellence centres should be created and structured doctoral schools should be set up and preferably installed within excellence clusters. Establishment of scientific excellence should be further enhanced by supporting excellent single researchers and creating top research teams by international headhunting. Support of “early stage researchers” should be guaranteed by grants.
- Positioning Austria in the global STI environment means to increase the mobility of students and researchers, define strategic international focus regions and establish partnerships by supporting strategic research co-operations. Legal framework for transnational exchange programmes should be enhanced and immigration barriers for top level students and researchers from non-EU-countries should be abolished.
- Enhancing the efficiency of the STI system means also to improve the framework for research at universities – e.g. competitive recruitment for career paths, creation of a family friendly work environment.

#### ***Range of ministries and institutions responsible for policies***

The bodies currently (November 2008) involved for policies are the Ministry of Science and Research, the Federal Ministry for Transport, Innovation and Technology, the Federal Ministry of Economics and Labour, the Austrian Council for Research and Technology Development and the Austrian Science Board.

#### ***Implications for the education sector and for innovation in general***

In order to guarantee the supply of highly skilled workers in STI several initiatives have been launched to increase the interest of children science, engineering and research, e.g.:

In December 2007, a new Programme called „*Sparkling Science*” has been launched by the Federal Ministry of Science and Research. This programme combines high-level research with science promotion in schools by bringing together pupils and researchers in order to inspire pupils to pursue a career in science and technology ([www.sparklingscience.at](http://www.sparklingscience.at)).

In 2008, the Federal Ministry for Transport, Innovation and Technology launched a Programme called “Forschung macht Schule” (science at schools) which offers innovative education in science and technology and gives pupils the possibility to interact with engineers already working in industry. A special focus is given on the promotion of girls and young women (<http://www.forschungmachtschule.at/>).

#### **Reference documents**

The Austrian Research Dialogue: [http://www.bmwf.gv.at/submenu/forschung/oesterr\\_forschungsdialog/](http://www.bmwf.gv.at/submenu/forschung/oesterr_forschungsdialog/)

Messages for the Future by the Austrian Research Minister - 10 strategic fields of activity for the Austrian Front

Runner Strategy 2020:

[http://www.bmwf.gv.at/fileadmin/user\\_upload/forschung/forschungsdialoG/ZUKUNFTSbotschaften\\_des\\_FORSCHUNGSministers\\_0808bmwf.pdf](http://www.bmwf.gv.at/fileadmin/user_upload/forschung/forschungsdialoG/ZUKUNFTSbotschaften_des_FORSCHUNGSministers_0808bmwf.pdf)

“Better careers and more mobility: a European Partnership for Researchers; communication from the European Commission to the Council and the European Parliament, COM(2008)317, 23.5.2008

## BELGIUM

### *The strategy*

Belgian Authorities at federal and federated level are fully committed to the Lisbon objectives. R&D policy is given a high status in the National Reform Programme. In Belgium, each federated entity and the federal authority defines its own STI-policy. The federal authority is responsible for research related to its own competencies, for scientific research in particular areas (space and nuclear research), and for the federal scientific and cultural institutes. The regions put their own emphasis on various objectives and policy dimensions in relation to the 3% goal.

#### *Flanders:*

- the introduction of an integrated approach to innovation as a cross-cutting dimension;
- the strengthening of the building blocks for science and innovation (public funding, human resources, public acceptance of science and technology, research equipment and infrastructures);
- the efficient use of existing policy instruments for basic, strategic basic and industrial research;
- the reinforcement of tools for knowledge transfer and valorisation of research results (IPR, risk capital);
- continued attention to policy-oriented research and evaluation of existing policy measures;
- a strong emphasis on international cooperation, both in the bilateral and the multilateral context.

#### *Wallonia:*

- improve the innovation capacity of enterprises ;
- maintain the richness and quality of the scientific patrimony,
- In order to stimulate and sustain innovation and research in the Walloon region, DGTRE disposes of a number of resources, which find their legal base in the decree of July 5, 1990. Besides traditional aid towards enterprises (subventions, loans, ...), universities (subventions, centres of excellence) and research centres (subventions), specific mechanisms have been set up for SME's. DGTRE works also with calls for proposals for its FIRST programmes, mobility programmes and programmes for research centres and, since 2006, for the competitiveness poles.

### *Main human capital focus*

Three main priorities:

- the demand for highly trained researchers in Belgium's knowledge economy is expected to rise over the coming years: the pool of possible candidates should indeed be enlarged both for the private and the public sector
- researchers' careers must be made more attractive. Researchers need to be appreciated and supported in their professional career and to be valued for their efforts, financially or with regard to the contents of their job (or both, of course). More young graduates must be given the chance to pursue postgraduate research and later capitalise on their research in economic or social terms.
- stimulating international and intersectoral mobility

### *Impetus for inclusion of human capital in innovation strategy*

If government and private sector keep their engagement to reach the Lisbon goal and to spend 3 percent of the GNP on research and development, both the rise in public spending and the growing innovation

capacity of enterprises will contribute to this increasing need. Also the proportional rise in the ageing population will put even more pressure. If Belgium wishes to remain a proficient knowledge-based economy, sufficient researchers of high quality need to be attracted and employed. It is to be expected that certain sectors will feel the need for good researchers even more in the near future.

### ***Types of policies used or suggested***

- Improve career prospects for researchers: number of (PhD) grants has been raised systematically over the past few years, doctoral schools support doctoral students during their PhD and prepare them for the outside world by training their transversal skills, Methusalem programme intends to provide experienced Flemish researchers with structural long-term financing, introduction of a tenure track system in Flanders, higher spending on fundamental research in the French community, ...
- partial exemption of advance payment of taxes: employers who employ researchers are exempt from paying the Belgian Treasury part of the advance payment they deduct each month from the remuneration paid to the researchers they employ. Very recently this exemption was raised to 65% for all those qualifying (universities, university colleges, registered scientific institutions, certain companies). By thus lowering the labour costs of researchers employers are stimulated to create job opportunities.
- increase intersectoral mobility:
  - o new doctoral programme Baekeland in Flanders: Basic principles will be the cooperation between doctoral students, the supervising academic institution and the enterprise, the commitment by the non-academic partner to cofund 50 % of the salary and the continuing high standards of the doctoral research.
  - o FIRST programmes of the Walloon region (1999-2008) : 3 objectives
    - Growth of scientific and technological potential of research units at university level;
    - valorisation and knowledge transfer into the Walloon network ;
    - formation of young researchers in emerging technologies, in order to enable them to diffuse their knowledge towards Walloon enterprises, where they should pursue their further careers.Between 2004 and 2007, 572 research mandates have been created in the framework of this programme.
- International mobility:
  - o trigger mobility into Belgium by supporting incoming researchers with a start-up project, including the development of a research group where appropriate, aimed at opening up new lines of research: Ulysse, Odysseus, Federal return grants
  - o Euraxess, mobility centres + mobility portal

At the moment we are developing a Belgian action plan on research careers and mobility, for early 2009, in the framework of the European Commission's partnership with Member States, which are:

- systematically open recruitment;
- meeting the social security and supplementary pensions needs of mobile researchers;
- providing attractive employment and working conditions; and
- enhancing the training, skills and experience of researchers.

### ***Range of ministries and institutions responsible for policies***

- Federal Science Policy

- Flemish ministry:
  - Ministry for Economy, Science and Innovation (Department of Economy, Science and Innovation, Research Fund – Flanders, Institute for the Promotion of Innovation by Science and Technology in Flanders)
  - Ministry for Education and Training (Department of Education and Training)
- Ministre de la Recherche, des Technologies nouvelles et des Relations extérieures de la Région wallonne – Mme Marie-Dominique Simonet:
  - Ministère de la Communauté française – Direction générale de l’enseignement non obligatoire et de la Recherche scientifique (DGENORS)
  - Service Public de Wallonie, Direction générale 6 : Economie, emploi et recherche (ex-Direction générale des technologies, de la recherche et de l’énergie DGTRE)
  - Fonds de la recherche scientifique (FNRS)

<b>Reference documents</b>
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## CHILE

### *National Innovation Strategy: Context and Pillars*

Chile has recorded an impressive economic performance over the last decades. The country managed to double its per capita GDP between 1988 and 2004, while during the 1990s the average growth was around 6%. As a result Chile has reduced the gap in per capita income with advanced countries, and it has been the top performer in Latin America over the last two decades. Chile is considered then as a high middle income country. The remaining income differential is to some extent due to lower utilisation of labour, but its main source by far is a productivity gap. The overarching objective of Chile's economic policy is to achieve sustainable, high and equitable growth in order to close the gap while further reducing poverty and the persistent inequality in income distribution. Government has declared as a national objective to double Chile's per capita income in the next 15 years, which means keeping the growth rate at around 5% per year.

As a result of several assessment of Chile's economic performance (including two Economic Surveys by the OECD), there is a consensus that the country requires a long term shift in the sources of growth, complementing factor accumulation with sustainable productivity growth. In this scenario *Innovation* is seen as a major route for boosting productivity growth. The growing political awareness and consensus around *innovation* resulted in three decisions aligned with international best-practices:

- The creation of a National Innovation Council for Competitiveness ([www.cnic.cl](http://www.cnic.cl)), its mission being to propose guidelines for a long term *national innovation strategy*;
- The increase of public funding to support the national innovation strategy through the introduction of a new mining tax;
- The encouragement of the business sector to engage in this strategy through a R&D tax incentive.

In March 2008 the National Innovation Council for Competitiveness made public its conclusions, establishing what is now the National Innovation Strategy. The strategy conceives *Innovation* as a systemic and multi-dimensional problem that requires a joint effort both from the State and the private sector. According to the strategy, the role of the State goes beyond ensuring adequate macro-economic stability and includes correcting market and systemic failures preventing the country from realising its full innovation potential.

The Council proposed a roadmap for a development process based on competitiveness supported by human capital and knowledge. With an emphasis on selected economic and regional clusters, the strategy fosters the creation of value fuelled by innovation starting from Chile's natural resources. The strategy is structured around three pillars: (i) business innovation; (ii) human capital for innovation and (iii) science with strategic orientation.

*Business Innovation.* The purpose is to consolidate a business system aimed at the creation of value by means of innovation – in all its forms and aspects – as a competitiveness strategy in global markets. Main components of the strategy are:

1. Dissemination and commercialization of technology. Creating bridges between scientific and technological capacity and the productive and service sectors; Defining Management Policies for Intellectual Property at Universities and Institutes; Re-structuring incentives for academic careers

evaluating the impact of research on the country, on social policy and on business ventures; Creating Management Association structures for innovation and technology commercialization with specialized professionals and executives.

2. Strengthening the formation of innovation management capacities.
3. Providing support for the development of innovative business cycle.

*Human capital.* The aim is to establish an accessible, demand-driven and top-quality lifelong learning system which allows the country to rely on the relevant human capital the Knowledge Economy requires. Main priorities for the 2008 – 2011 period are:

1. To scale-up and to institutionalize a Competency-based Certification System, making sure all economic clusters have competency standards validated by employers and set-up incentives for the demand of certification
2. Strengthening the quality and relevance of Vocational Education and Training
3. Setting-up a Qualification Framework suitable for the Chilean education system and organized around competency standards to promote multiple and flexible pathways
4. Reducing inequality in access to tertiary education introducing a more diversified and robust loan and scholarship systems focused on student from the lowest income quintiles
5. Develop information systems on higher education and on labour market supply and demand.

*Science with Strategic Orientation.* The purpose is strengthening a platform for the creation, dissemination and application of knowledge in a permanent and consistent research effort coherent with the country's productive and social problems. Main priorities for the 2008 – 2011 period are:

1. Determining productive and social priorities in order to give a direction to R&D in universities and other centres.
2. Developing scientific skills and long-term research programs based on priorities deriving from clusters and the most important social preoccupations.
3. Strengthening and/or developing scientific infrastructure for science: shared scientific service centers and access to international infrastructure.
4. Strengthening advanced human capital based on scholarships, attracting researchers, and supporting the reinsertion of researchers in the academic and industrial areas.

### ***Main Human Capital focus***

The Council has defined Human Capital as a crucial component of the National Innovation Strategy. Chile has implemented major educational reforms over the last twenty years. As a result participation in initial education (primary, secondary and tertiary) has improved. Unfortunately quality of learning outcomes (as measured by large scale assessments like PISA, TIMMS and IALS) remains unsatisfactory. There are several initiatives going on for improving the quality of the school system, most of them oriented to introduce learning performance standards and to improve and monitor teaching practices.

The Council considered these efforts as part of the “business as usual” activity of the public policy & implementation in education and decided to widen the human capital agenda introducing a lifelong learning approach as the main focus of its recommendations. Within the lifelong learning approach most issues have to do with building up a coherent system of learning opportunities hopefully relevant for the economic clusters and the world of work in general. Relying in a Competency Certification System that has been piloted by the Fundación Chile with 15 strategic sectors of the economy over the last 8 years, the Council proposes to scale this initiative up and to make it the cornerstone of a new Qualification and Quality Framework for VET provision. The Council expects that this system should be focused on identifying and solving the main human capital gaps and shortages that are making difficult for the economic clusters prioritised by the National Innovation Strategy to fulfil their innovative potential.

### ***Impetus for inclusion of human capital in innovation strategy***

As it was remarked before, Chile has implemented several education reforms and has increased both the private and public investment in education in the country. An evaluation against standard indicators shows a heterogeneous picture of Chile’s human capital. Overall education attainment has improved steadily over the past decades reaching almost universal coverage in primary (98%) and secondary education (94%). In this respect Chile compares well with developed economies and is far ahead several other Latin American countries. Outcome based evaluations have demonstrated that despite the significant improvements in the learning environment at the school level (infrastructure, level of investment, learning resources, etc.), the quality of learning outcomes is low in both relative and absolute terms (PISA, TIMSS). There are severe gaps among income groups as well. On the other hand, despite the expansion of the enrolment in pre-primary and tertiary education, participation rates are still low in both levels. Access continues to be unevenly distributed across income levels. A similar situation is found in the training system as mostly highly educated workers from large companies (representing less than 14% of the workforce) are being up skilled through training programs. Labour market training and other publicly subsidized programs focused on unemployed, low skilled over 16 years old population and other groups under risk of social exclusion have had a limited remedial impact.

To sum up, the challenge goes beyond giving the generation still in school the skill foundations to enter the world of work and giving low skilled and qualified adults a “second chance”; it involves an overall up-skilling or re-skilling effort of the current active population lacking the new workplace competencies underpinning the knowledge economy.

In terms of a Lifelong Learning agenda, the main bottlenecks the country faces are:

- a human capital *stock* problem, as most of the current labour force does not possess the skills and competences required by the knowledge economy
- a *flow* problem, as the education reform on progress has slightly impacted on learning outcomes
- pervasive inequalities in terms of learning outcomes distribution at the basic school level
- tertiary education and training systems not centred in the learner, in terms of giving him the opportunity to follow flexible progression paths across the life-cycle (disjointed systems providing lifelong learning)
- lack of a clear policy linking secondary and post-secondary vocational education (vertical disintegration)

- a supply driven technical-vocational education and training system. Outdated pedagogical approaches and inexistent quality frameworks
- a job market signalling problem affecting competent workers without qualifications and raising transaction costs involved in companies' human resource management
- lack of efficient and customer-driven information systems and counselling services for the lifelong learning learner but especially for young people in the transition from education to work

There are also significant opportunities for the country to start developing a lifelong learning system:

- priority given to education and human resource development in the public agenda
- level of awareness regarding the skill gap in the country
- raising demand for learning, especially in tertiary education
- level of awareness of the relevance of ICT skills and political will to implement a strategy to raise levels of ICT literacy
- pilot experiences of competency standards development, assessment and certification developed jointly by the government and leading companies in the business sector
- coordination between different ministries to put in place a lifelong learning initiative

### **Types of policies used or suggested**

The National Innovation Strategy is very much oriented to develop a systemic approach to lifelong learning based on the following principles:

- All publicly funded education and training for innovation has to be based on industry endorsed competency standards and should be responsive to the demand side
- Industry endorsed Competency Standards are to be seen as a public good and it is the State role to support their existence and diffusion
- Learning outcomes (hopefully externally assessed) are to be crucial for judging quality and relevance of investments in human capital
- Learning opportunities should be organised in a coherent way making possible flexible pathways between different options including VET, university education and on-the-job-training.
- Funding should be available particularly for those actors that usually under-invest in human capital, particularly self-employed and small and medium size companies
- Market failures, particularly information asymmetries, make relevant the development of information systems providing companies, workers, student and families with transparent and useful information to make better human capital investment decisions

The strategy is a mixture of policies oriented to design new institutional arrangements according to these principles and to provide new funding opportunities to make learning accessible to all. Because VET

is mostly provided by private education and training institutions it is also stress in the strategy to counterbalance the market dynamic with clear State regulations on quality issues.

### ***Range of ministries and institutions responsible for policies***

The nature of the National Innovation Strategy on human capital makes relevant the participation of several stakeholders who usually do not work together. Within the State, the strategy assumes coordination among the Ministry for Economic Development (the government body in charge of implementing the Innovation Strategy); Ministry of Education, Ministry of Labour & Social Affairs and the Ministry of Finance. Other agencies involved are those in charge of implementing R&D, training and support to SME. Finally, the strategy has a regional emphasis involving in the implementation several local public and private stakeholders.

As the strategy defines a crucial role of industry associations and employers as key contributors to define what the most relevant human capital bottlenecks should be addressed, building up a public-private partnership is crucial. This is in part solved at the level of the National Innovation Council for Competitiveness, a body appointed by the Presidency of the Country which includes in its board business leaders and economic clusters representatives.

### ***Implications for the education sector and for innovation in general***

For the education sector the National Innovation Strategy has introduced a new emphasis in Vocational Education and Training, a sector usually dismissed from previous reforms of the education system. The Innovation Strategy can contribute to re-position VET as a very relevant sector for the development of human resources for innovation, as far as it manages to improve its relevance and to re-design the way learning opportunities are offered to a wider audience.

#### **Reference documents**

Araneda, H. (2003) *Lifelong Learning in Chile: Meeting the Challenge of the Knowledge Economy*. Country study submitted to The World Bank. 2008 updated version.

Consejo Nacional de Innovación para la Competitividad (2008) *Hacia una estrategia nacional de innovación para la competitividad. Volumen II*. Santiago, Chile: CNIC.

OECD (2007), *Review Of Innovation Policy: Chile*. Paris:OECD.

OECD (2007) *Economic Survey of Chile*. Paris: OECD.

## FINLAND

### *The strategy*

A proposal for Finland's national innovation strategy was issued in June, 2008. In October, on the basis of the proposal, the government gave a special Report on Innovation Policy to the Parliament. Finland's proposed National Innovation Strategy aims to create broad-based and multi-faceted innovation policy that helps Finland to: (1) achieve innovation-based, sustainably targeted productivity improvements that increase wellbeing; and (2) be a pioneer in innovation activity. The strategy sets out ten key sets of measures/policy actions that are most important to Finland's success. As well as human capital, the measures encompass: governance of the innovation system; development of regional/sectoral centres of innovation; financing of innovative activity; market incentives for innovation; and enhancement of the research capacity of Finnish universities and institutions. Ensuring that policy suits the needs of a demand/user-oriented innovation system is also a theme.

### *Main human capital focus*

Three sets of measures detailed in the strategy have especially clear human capital dimensions. These relate to human capital developed both within Finland and abroad, in particular: creating a learning environment for motivating innovation on a broad basis; revising taxes and other factors that weaken Finland's attractiveness to experts; and developing management training.

### *Impetus for inclusion of human capital in innovation strategy*

The draft strategy sums up the impetus for including human capital with the statement, "Ultimately, the production of innovations depends on individuals" (p. 9). The document points to several areas of concern in Finland, including the ageing population, low inflows of skilled workers, low interest in entrepreneurship, and a lack of incentives to top individuals.

### *Types of policies used or suggested*

Particular policies suggested in the strategy are aimed at:

- Improving mobility and the attractiveness of Finland as a location for experts (for example, developing the operating principles around public research and innovation financing so as to support open innovation and collaboration, creating an active immigration policy, reviewing personal taxation, and setting ambitious goals for the internationalisation of researchers and teaching staff at universities and other research bodies);
- Developing individuals and entrepreneurship (for example, including entrepreneurship, creativity and innovation in the curricula of all stages of education, providing incentives for training and continuous learning in working life, establishing a top level development environment for learning so as to become an international pioneer in developing teaching methods and technical tools, and supporting reforms of organisational environments to improve the quality of working life); and
- Management of change (in particular, developing Finnish management training to meet top international standards, as well as developing management skills within Finnish enterprises and public organisations).

More broadly, greater international participation and influence is a target of the strategy, which implies a greater need for skills related to communication, collaboration, negotiation and management.

***Range of ministries and institutions responsible for policies***

Some of the bodies mentioned in the strategy include the Ministry of Education, the Ministry of Employment and the Economy, the Academy of Finland, Tekes, and the Science and Technology Policy Council/Research and Innovation Council.

***Implications for the education sector and for innovation in general***

The Finnish strategy aims to spread innovation more widely through the economy, drawing in low productivity branches of trade and industry and the public sector that have not yet systematically utilised innovation activity in the development of their operations and to improve their productivity.

**Reference documents**

Aho, E. et al (2008), *Proposal for Finland's National Innovation Strategy*, June, Helsinki.

## GERMANY

### *The strategy*

The Federal Government introduced three Cabinet resolutions regarding innovation or aspects thereof during the last few years in a coherent way:

An innovation strategy was developed under the title “**High-Tech Strategy**” in August 2006 in a joint effort by all federal government departments. Germany perceives the consequences of globalisation, on one hand as leading exporter, on the other hand German companies move their production facilities abroad. Competitive advantages and growth opportunities can only be developed through innovation – with new products, procedures and services, framework conditions and government regulations.

In this High Tech Strategy 17 objectives for cutting-edge fields were identified. These relate to three areas: innovations for healthy and safe living, innovations for communicative and mobile living and innovations through cross-sectional technologies. The aim of the High Tech Strategy is to accelerate knowledge production and application by

1. pooling the resources of sciences and economy,
2. advancing the preconditions for high-tech foundations and innovative SMEs,
3. supporting faster distribution of new technologies,
4. strengthening the international position of Germany,
5. investing in knowledge and people.

Those last two points are also flanked by particular Cabinet resolutions: the **Internationalization Strategy**, adopted in February 2008, which is focused on the following four objectives:

1. Strengthening research cooperation with global leaders
2. International exploitation of innovation potentials
3. Intensifying the cooperation with developing countries in education, research and development on a long-term basis
4. Assuming international responsibility and mastering global challenges,

and the **Qualification Initiative**, adopted in January 2008 and agreed by the federal government and the prime ministers of the Länder in October 2008. Its focus is set on modernizing and enhancing education, training (“Promotion via Education”).

### *Main human capital focus*

One area in the High Tech Strategy is the further development of the educational system, which includes all links in the education chain – early childhood support, school, vocational training, higher education and continuing education, for example: developing future-oriented vocational training systems, life long learning, promoting women, strengthening human resources, promoting excellence in education and research. These strategy elements are further specified in the Qualification Initiative, which focuses on human resources, as well as the Internationalization Strategy, which aims to increase mobility of German students and to attract more qualified students and researchers to Germany.

### *Impetus for inclusion of human capital in innovation strategy*

Innovation largely depends on the qualifications and motivation of the population. This holds true especially for countries with few natural resources like Germany.

It is clear from the current demographic trend that the number of young people entering the job market will decline in the future, posing the danger of an increased shortage of skilled labour – the key resource for

high-tech locations. This may have serious consequences for small and medium-sized enterprises in particular. Therefore, top political priority is being given to ensure that Germany has an education and training system that fosters the potential of every individual in the best ways possible – and in both directions: advancement of excellence as well as inclusion of disadvantaged and low achievers.

Also structural change mainly of high-tech branches that employ workers with above-average levels of training will continue at an ever-faster pace. This will fuel the need for permanent updating of education and training strategies, including life long learning and continuous training.

### ***Types of policies used or suggested***

Among the suggested policies for implementing the High Tech Strategy are:

- broadening of qualification potentials and quality enhancement in all education sectors
- individual advancement and diversification of learning opportunities, day care and financial aid
- advancement of excellence as well as inclusion of disadvantaged students
- improvement of the quality of study programmes and accreditation based on international developments (Bologna Process)
- implementing life long learning
- advancing qualification for teachers, trainers and kindergarten teachers
- suitable high-level continuing training options also for older employees and job-seekers
- career counselling and guidance
- further development of systems of initial and continuing vocational training
- revision of standards
- stronger outcome orientation
- funding according to requirements and performance
- support of relevant internationalization strategies of universities and research establishments in cooperation with the Länder
- encouragement for students to acquire experience abroad
- assistance for young entrepreneurs in entering the market
- support for companies in establishing contacts with the scientific community and in translating their own research findings into products
- streamlining of funding policies for small and medium-sized enterprises
- contributing to the enhancement of education, training, science and technology in the European Union an in bi- and multilateral cooperation.

### ***Range of ministries and institutions responsible for policies***

At the Federal level, responsibilities for innovation are shared between different ministries: the Federal Ministry of Education and Research, the Federal Ministry of Economics and Technology, the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth, the Federal Ministry of Labour and Social Affairs, the Federal Foreign Office, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and the Federal Ministry for Economic Cooperation and Development. Also involved are social partners and research organizations.

Both the High Tech and the Internationalization Strategy were developed as joint (cross-ministerial) strategies.

Competencies in the area of education policy are shared between the Federal Government and the *Länder*.

### ***Implications for the education sector and for innovation in general***

The federal and Länder governments want to increase the education budget (public and private expenditure) to 10% of the GDP – this goal should be reached by 2015, 7% of which will be invested in education and 3% in research.

The education system is undergoing permanent modernization and adaptation. In the future as in the past it will be important to clarify and implement further modernization steps with the help of external experts. This is already happening in committees like the “Innovation Circle on Vocational Education and Training” and the “Committee on Innovation in Continuing Training for a Strategy for Shaping Lifelong Learning”.

Still it is important to not only adjust the education system to the requirements of the economy. The education system has also pristine goals: advancement of individual potentials, enhancing social cohesion, encouraging awareness about global challenges (climate, health, migration, security, sustainability) and promoting good citizenship and peace. This way the education system contributes to the framework for the “innovation system”. It encourages acceptance for innovation in a society, as innovation always contains two elements: creation and destruction (Schumpeter).

Among the implications for innovation in general are also to enhance and accelerate cooperation between the economic sector and science, framework conditions (including the human resource base) that are more in favour of research and innovation and also cross-ministerial cooperation.

#### **Reference documents**

High Tech Strategy ([http://www.bmbf.de/pub/bmbf\\_hts\\_en\\_kurz.pdf](http://www.bmbf.de/pub/bmbf_hts_en_kurz.pdf))

Internationalization Strategy (<http://www.bmbf.de/pub/Internationalisierungsstrategie-English.pdf>)

Aufstieg durch Bildung – Die Qualifizierungsinitiative für Deutschland  
([http://www.bmbf.de/pub/beschluss\\_bildungsgipfel\\_dresden.pdf](http://www.bmbf.de/pub/beschluss_bildungsgipfel_dresden.pdf))

## NEW ZEALAND

### *The strategy*

A number of strategy documents on human capital dimensions in innovation have been released by New Zealand government agencies during the last year. The broadest of these is the *New Zealand Skills Strategy Action Plan* (SSAP). The SSAP sets out actions that the government, the Council of Trade Unions, Business New Zealand and the Industry Training Federation believe will ensure that New Zealand has the skills necessary to drive economic growth. The SSAP represents a coordinated approach to make sure that skills development is focused on the needs of industry and the economy. The SSAP emphasises the importance of supporting skill development for raising productivity in New Zealand.

Another important strategic document is the government's overall RS&T strategy: *From Strength to Strength: Government's Agenda for Research, Science and Technology* (the Research Agenda). This document sets the direction for public investment in research, science and technology (RS&T) for the next decade. With a strong focus on innovation this document lays out a strategy to ensure RS&T contributes effectively to our social, economic and environmental needs.

*An Advanced Skills Action Plan for Research, Science and Technology* (ASAP) was developed to complement the Research Agenda's focus on sustaining New Zealand's science base. The actions in the ASAP will add to a broader range of system-wide initiatives that have been introduced over the past three years. These initiatives are designed to improve the stability and attractiveness of RS&T careers. The ASAP aligns with the SSAP priority to enhance the relationship between the supply of skills and the demand for them. It also delivers to the proposed action in the Skills Strategy on the 'development of industry-specific action plans'.

### *Main human capital focus*

The SSAP sets out five key goals to guide the way we use skills to transform the economy. These are:

- improving the use and retention of skills to transform work and workplaces;
- increasing employer and worker awareness of their skills needs;
- influencing the supply of skills through a more responsive education and training system;
- developing a unified approach to defining, valuing and measuring skills; and
- making the most of the available workforce by supporting everyone to work, through skills development and supportive workplace practices.

The ASAP identifies four key areas for action in the RS&T space:

- supporting talented individuals;
- maintaining the RS&T workforce;
- developing skills; and
- providing an enabling culture.

### ***Impetus for inclusion of human capital in innovation strategy***

Current government strategies emphasise that New Zealand's continued wealth and economic transformation will depend on the skills of its workers and how firms and industry support New Zealanders to work to the best of their potential. The SSAP's focus on enhancing skills for productivity gains, and demand/supply mismatches is one part of New Zealand's innovation strategy. However, the ASAP places a more specific focus on improving New Zealand's ability to compete in a global market for its RS&T workforce.

Recent improvements to the New Zealand RS&T system have focused on strengthening the system and its research organisations. However, the next step is to recognise that the RS&T system is also an investment in people and the ASAP strengthens the role of people in New Zealand's RS&T innovation strategy.

### ***Types of policies used or suggested***

In addition to the actions proposed by the SSAP, the ASAP will focus on a number of policy actions. Actions for immediate progress in 2008 financial year are to:

- evolve the current mix of fellowship programmes to improve support for top talent across the RS&T system;
- reduce the administrative complexity of RS&T scholarships and fellowships; and
- review the Terms of Reference for the Marsden Fund (completed).

Actions for medium term are to:

- clarify criteria for Vote RS&T support for training scholarships; and
- develop a new experiential leadership programme.

Actions for implementation over the longer term are to:

- improve access to RS&T careers advice;
- strengthen engagement between RS&T employers and young people;
- assess ways to improve the attractiveness of RS&T careers to Māori and Pacific peoples; and
- review incentives for the participation of post-doctoral researchers in Vote RS&T projects.

The Royal Society of New Zealand has recently established the Rutherford Trust, partly funded by the government, and is exploring ways that it might use it as a vehicle to progress some of the actions outlined in the ASAP, especially those initiatives focused on supporting top talent.

### ***Range of ministries and institutions responsible for policies***

The SSAP is a whole of government initiative in cooperation with the Council of Trade Unions, Business New Zealand and the Industry Training Federation. The ministers of tertiary education, labour, and social development and employment have overseen the development of the SSAP and will support the proposed actions through their portfolios. The ASAP is a Ministry of Research, Science and Technology-lead initiative with responsible partner organisations being the Foundation for Research, Science and Technology, the Health Research Council, the Royal Society of New Zealand, and New Zealand's Tertiary Education Institutes and Crown Research Institutes.

### *Implications for the education sector and for innovation in general*

The government plans to implement both structural and human capital focused policies to ensure innovation is well supported in New Zealand and that RS&T careers are attractive to people at different life stages. While the SSAP has a strong focus on building foundation skills such as literacy and numeracy, the RS&T workforce is dependent on the supply of advanced skills, which receive less emphasis in the SSAP. Together the actions in the SSAP and ASAP represent complementary strategic approaches to ensuring New Zealand has the requisite skills, that the demand and supply of human capital is appropriately balanced for New Zealand's innovation needs, and that there are sufficient career opportunities available for its RS&T workers. This will underpin the Research Agenda's explicit goal of maintaining our science base.

#### **Reference documents**

New Zealand Skills Strategy 2008 Discussion

<http://www.skillsstrategy.govt.nz/assets/Uploads/NZSkillsStrategy08.pdf> Document, April 2008

New Zealand Skills Strategy Action Plan, July 2008

<http://www.skillsstrategy.govt.nz/assets/Uploads/NZ-Skills-Strategy-Action-Plan-2008.pdf>

An Advanced Skills Action Plan for Research, Science and Technology, July 2008

<http://www.morst.govt.nz/Documents/publications/consultations/Advanced-Skills-Action-Plan.pdf>

From Strength to Strength: Government's Agenda for Research, Science and Technology, July 2008

<http://www.morst.govt.nz/Documents/publications/policy/Governments-Agenda-for-RST.pdf>

## NORWAY

### *The strategy*

The Government will present the first Norwegian White Paper on innovation policy later this year. The White Paper will give a policy foundation for sustainable wealth creation in a long-term perspective.

Among the focus areas in the White Paper are:

- Innovation and sustainability
- Innovation in the Nordic model
- Innovation in the public sector
- Growth must be environmentally sustainable. Eco-innovation will be given special attention in the White Paper.

Human capital is regarded as a cornerstone to maintain and increase innovation.

### *Main human capital focus*

The main human capital focus is on basic skills and lifelong learning, enhancing recruitment and quality in MST related education and research, and policies to prepare for and changes in demand and supply of labour due to future changes in the demographic structure.

### *Impetus for inclusion of human capital in innovation strategy*

Human capital is the key factor in economic growth. Businesses and public services ability to adjust to changes in demand and needs over time, is dependent on lifelong learning and human capital. Human capital is the key factor to absorb, create and make use of knowledge and technology.

### *Types of policies used or suggested*

The policies will be articulated later this year in the White Paper on innovation policy.

### *Range of ministries and institutions responsible for policies*

Because of the wide span of policy areas included in the forthcoming White Paper, there will be numerous ministries and institutions responsible for the policies. With regard to Human Capital, the most salient are The Ministry of Education and Research, The Ministry of Trade and Industry, Norwegian Directorate for Education and Training, The Norwegian Research council and Innovation Norway.

### *Implications for the education sector and for innovation in general*

**Reference documents**

Forthcoming: The White Paper on innovation policy, The White Paper on future competence needs and The White Paper on research

## UNITED KINGDOM

### *The strategy*

The United Kingdom's White Paper on innovation – *Innovation Nation* – sets out policy directions to promote innovation across the UK's society and economy and “unlock the talent of all its people”. The aim is to make Britain the best country in the world to run an innovative business or public service. In addition to human capital, the strategy discusses: the role for government in promoting and supporting innovation; the demand for innovative products and services; supporting business innovation; maintaining a strong and innovative research base; the international face of innovation; innovation in public services; and the urban/rural and regional aspects of innovation.

### *Main human capital focus*

Underlying the strategy is the assertion that “the UK's capacity to unlock and harness the talent, energy and imagination of all individuals is crucial to making innovation stronger and more sustainable”. The focus points for policy are raising skill levels (at both a specific level, in particular in STEM subjects, and at a general level, with a particular focus on adult skills, since 70% of the 2020 workforce has already left compulsory education), increasing links between business and the education/training sector (supporting a “demand-led” approach to skills), and expanding the higher education sector.

### *Impetus for inclusion of human capital in innovation strategy*

Productivity levels in the UK continue to lag leading countries and a key driver of this is posited to be skill deficiencies, including a lack of basic literacy and numeracy skills, a “long tail” of poor management in firms, a lack of “employability” skills (such as team working, problem solving, analytical skills and so on) and concerns about participation in STEM subjects. The White Paper also points to the contribution of participation in education and training to wider social cohesion. This is a linkage also made in the skills report (DIUS 2007), which has an emphasis on inclusion and creating a culture of learning. It additionally identifies intergenerational aspects of up-skilling – reducing child poverty and increasing children's prospects by improving parents' skills and jobs.

### *Types of policies used or suggested*

The White Paper's chapter on “Innovative People” discusses policies related to 5 human capital themes: further education; employers; higher education; science, technology, engineering and maths (STEM) skills; and young people. A key influence on the policies was the Leitch Review of Skills in England (see DIUS 2007), which set a goal of world-class skills by 2020, as measured against the upper quartile of the OECD, and which advocated a “demand-led” approach, where the skills system responds better to employers' and learners' needs. The policies for human capital included:

- Piloting a fund to build the capacity of the further education sector to increase innovation in firms through knowledge transfer;
- Establishing a “National Skills Academy” in every major sector of the economy;
- Increasing funding for “Train to Gain”, where employers work with a “skills broker” to identify their business needs and training priorities;
- Reforming Sector Skills Councils to identify skill gaps that inhibit innovation;

- Establishing a UK Commission for Employment and Skills, which will increase employer “voice” and will pursue work on “high performance working practices” to increase value added in business;
- Opening or agreeing development of 20 new universities or higher education centres in the next 6 years;
- Developing a “Higher Level Skills Strategy” to increase the number of graduates and to raise the skills and capacity for innovation and enterprise of those already in the workforce; and
- Identifying labour market needs for STEM skills and increase the numbers of students taking STEM subjects at school and in further/higher education institutions.<sup>3</sup>

### ***Range of ministries and institutions responsible for policies***

In addition to education and training providers, there are a wide range of bodies involved in implementing the human capital policies outlined above. Central ministries include the Department for Innovation, Universities and Skills and the Department for Children, Schools and Families, both of which have been recently created. Other ministries/bodies include: the Learning and Skills Council; the Higher Education Funding Council for England; and the Department for Work and Pensions. Trade unions, regional development agencies, job-search agencies and industry bodies are also involved.

### ***Implications for the education sector and for innovation in general***

The policies imply growth in the education sector and a change in the way course content is determined, with more employer and worker leverage.

#### **Reference documents**

Department for Innovation, Universities and Skills (2008), *Innovation Nation*, Presented to Parliament by the Secretary of State for Innovation, Universities and Skills, the Chancellor of the Exchequer and the Secretary of State for Business Enterprise and Regulatory Reform by Command of Her Majesty, March, United Kingdom.

Department for Innovation, Universities and Skills (2007), *World Class Skills: Implementing the Leitch Review of Skills in England*, Presented to Parliament by the Secretary of State for Innovation, Universities and Skills by Command of Her Majesty, July, United Kingdom.

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<sup>3</sup> Some other policies, described in the response to the Leitch review, included: raising participation in full-time education among 16-18 year olds; improving adult literacy and numeracy; increasing the proportion of tertiary-qualified adults; increasing the proportion of public funding that is “demand led”; increasing employer training funds; integrating employment, careers and training services; and boosting apprentice numbers.