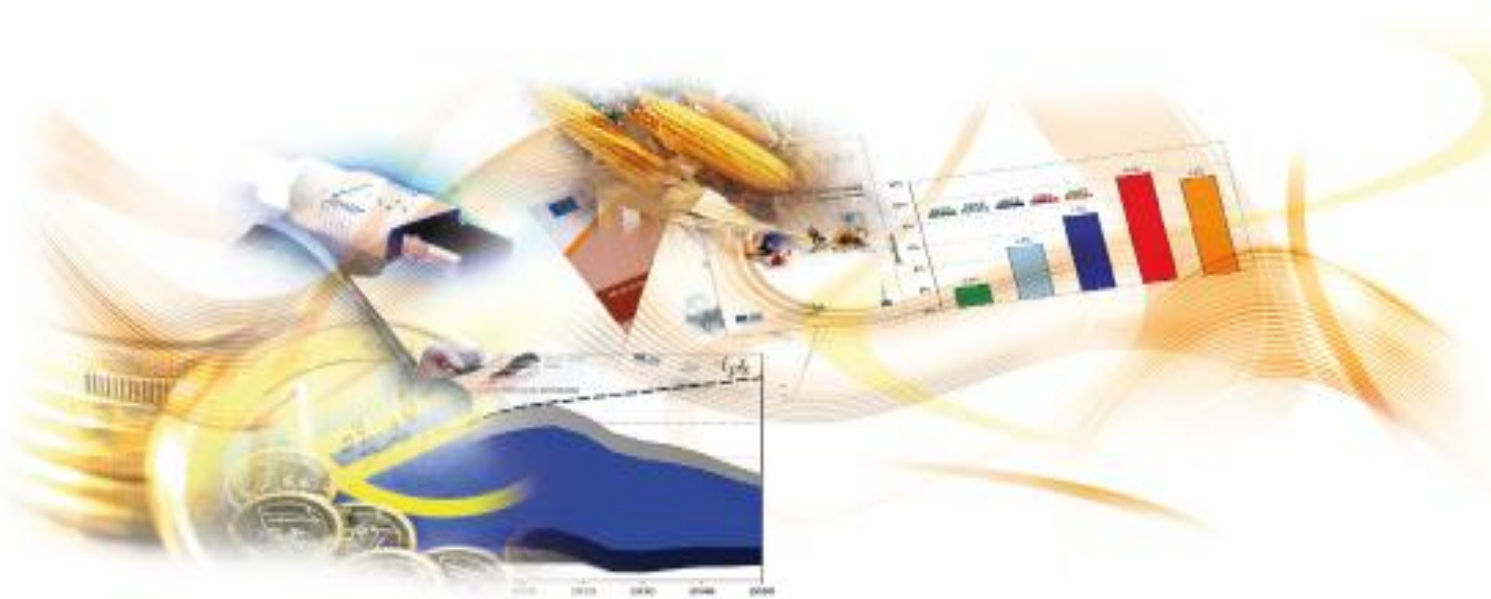


# JRC SCIENTIFIC AND POLICY REPORTS

## ERAWATCH Country Reports 2012: Israel

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based on the 2011 Country Report by Y. Fisher  
and M. Eilan

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The Country Report 2012 builds on and updates the 2011 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context.

Prepared by Abraham Garcia, this report is a comprehensive revision and update of the ERAWATCH Country Report 2011 for Israel by Yacov Fisher and Michael Eilan. The first draft of this report was produced in December 2012 and was focused on developments taking place in the previous twelve months. The report has also benefited from comments and suggestions of Mark Boden from JRC-IPTS who reviewed the draft report. The contributions and comments from Mr. Marcel Shaton of Israel Europe R&D Directorate are also gratefully acknowledged.

The report is currently only published in electronic format and is available on the [ERAWATCH website](#). Comments on this report are welcome and should be addressed to [jrc-ipts-erawatch-helpdesk@ec.europa.eu](mailto:jrc-ipts-erawatch-helpdesk@ec.europa.eu).

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## EXECUTIVE SUMMARY

So far the economic crisis has had less effect on Israel, which has continued growing at a moderate rate. During 2012, GDP grew by 3.3 %, slightly below that in the last two quarters of 2011 when growth was already lower than its long-term average. The moderation of growth in business activity during the current period was to a large extent the result of the crisis in the Eurozone and the slowdown in global growth.

However GERD, measured as a percentage of GDP, has been constantly declining, from 4.49% in 2009, to 4.38% in 2011 despite a market increase in government expenditure (GEBOARD), highlighting the very high exposure of the research and innovations system to global financial conditions, which stems from the very high share of business in funding R&D, 80 % of the total GERD.

There have been no recent major changes in the governance of the government funded RDI. At the end of 2011, four research areas were designated as national priority fields: brain science, supercomputing and cyber security, oceanography and alternative transportation fuels. The two main RDI bodies are – the Council of Higher Education (CHE) through its Planning and Budgetary Committee (VATAT) and the Office of the Chief Scientist (OCS) in the Ministry of Industry, Trade and Employment (MOITAL). Also important are the strong collaborations with the Ministry of Finance as can be seen in the programmes launched in collaboration with the rest of RDI bodies.

The OCS published the structure of the RDI incentives in Israel. The different domestic programmes are classified according to the development of the innovation: Pre-seed and seed programmes focusing on innovation at a very early stage, and offering the protection of the technological incubators; pre-competitive and long term programmes for encourage collaboration among industrial companies, and between the companies and researchers from academic institutions; and the competitive R&D gives grants to “approved R&D programmes”, which are programmes lasting one or more years, resulting in the development of innovations.

The academic year 2011-12 is the second year in which VATAT’s six years plan to revive Israeli higher education and university based research has been implemented. The plan calls for a 30% increase in budgets over the course of the plan, and nearly doubling the funding for competitive grants.

The decision of the cabinet to increase the Science and Technology Ministry’s budget for its regional research and development centres can be understood as an instrument for Smart Specialization. The budget was increased by €1.8 million, effectively a tripling of the budget for the eight centres located in the periphery ranging from Kiryat Shmona and the Golan Heights in the north to Negev desert in the south. The Ministry is a partner in the establishment of these centres, in guiding its scientific activity and substantially participates in their funding. They were established in the periphery to draw young, leading scientists into these areas.

The Israeli RDI system faces three major structural challenges that require systematic solutions. These are as follows:

1. Reviving research in Israeli universities: Budgets for Israeli universities essentially stagnated during the first decade of the century despite a growth in the student body, causing a decline in available funding for research, deterioration of teaching and research infrastructures and an accelerating brain drain.

2. Over-reliance on ICT: Companies dealing with computing and communications technologies are one of the mainstays of the Israeli economy. However the period of explosive growth for ICT is over globally and policymakers have been trying for a number of years through several instruments to find new engines of growth.

3. The precarious state of Venture Capital: Returns on VC investments in Israel by and large match returns in the US, where results have been disappointing compared to other financial investments during the past decade. The total funds available for investments are at a low level, and Israeli fund management companies urgently need to raise new funds to continue their important role in funding Israeli start-ups.

Israeli RDI governance does not have a tradition of formally articulating priorities as part of an open policy making process. Nevertheless, the new Vatat six-year plan does lay out a clear vision, by implication, of a set of priorities chiefly calling both for a higher degree of excellence and a higher degree of specialisation in university research.

The priorities of the OCS, though rarely articulated as such, are evident from the changing nature of measures issued over the years. A major shift during the past few years has been the inclusion of priorities with a societal/economic slant beyond the traditional OCS approach of encouraging technological excellence wherever it happens. These priorities range from measures to improve innovation in traditional industries to measures to encourage technology firms to set up operations in peripheral parts of the country.

In terms of venture capital the priorities are very clear. If the Israeli fund management companies do not manage to raise new funds during the next two years a highly important part of the innovation funding mechanism in Israel will be in jeopardy. The Finance Ministry decision to insure a quarter of the risk of Israeli institutional investors, who join funds as limited partners, is a direct reaction to this priority.

Looking at the match between the challenges, priorities and means used to address the needs of the RDI system, Vatat's six year plan, coupled with the I-CORE project, seems to be a comprehensive approach that looks towards creating foci of research excellence while reviving the entire academic research sector.

The need to diversify beyond ICT is a far more complex challenge because it involves creating an infrastructure not only of research but also of human skills and the financial means to realize commercial potentials. The creation of the government backed biotech VC fund is a step in the right direction as are a number of OCS measures intended to stimulate non-ICT innovation issued during the past few years. But the challenge is deeper because of the breadth of the scientific and technological infrastructure needed to create new areas of high added value for Israel's knowledge intensive industries.

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# 1 INTRODUCTION

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Israel is a small country with a population of 7.9 million as of January 2013. GDP per capita reached €23,355 in 2011, and GDP growth reached 3.3% in 2012. During this year, business activity in Israel continued to grow at the moderate rate to which the economy had converged during the second half of 2011. During 2012, GDP grew by 3.3 percent, slightly below that in the last two quarters of 2011 when growth was already lower than its long-term average. Growth in business sector output during the first quarter slowed markedly relative to the second half of 2011 and stood at 2.8 percent. The moderation of growth in business activity during the current period was, to a large extent, the result of the crisis in the Eurozone and the slowdown in global growth. (Bank of Israel)

Research and innovation are central pillars of the economy. GERD reached 4.4% of GDP in 2011 compared to the EU average of 2.09% in 2011, with the business sector playing a major part in funding R&D. BERD accounted for 80.2% of GERD compared to the EU average of 62.4% in 2011 and for 3.51% of GDP compared to the EU average of 1.26%. The government's role in funding university-based research is commensurately smaller with R&D performed by HEIs reaching 12.6% compared to the EU average of 24%

As for human resources for S&T, the total number of recipients of second degrees in science and engineering grew by 7.3% compared to the EU average of 4% between 2000 and 2008. However, in the near future the situation might be less promising owing to the lower levels of educational attainment among Arabs and ultra-orthodox Jews who make up 20 and 10% of the population respectively. Vatat programmes to make higher education more accessible to these population groups was discussed in the ERAWATCH 2010 report<sup>1</sup>, but it is still too early to judge the effectiveness of these programmes.

A major input problem is in research infrastructures, which were largely neglected between 2000 and 2010 with the exception of the area of nanotechnology, which was addressed by the Israel Nanotechnology Initiative, funded partly by the government and partly by donors. The Vatat six-year plan is supposed to address this issue, partly through the I-CORE centres, but it has not yet published the full plan, which is said to be roughly equivalent to the European RI roadmap.

Output as measured by scientific publications declined from 1.1% of the global total in 2000 to 0.9% in 2009. In terms of EPO patent applications per GDP Israel is the best performing country, as it is in PCT patent applications for health technologies. In high-tech EPO patent applications it is third after Finland and Sweden. In terms of ERC grants, Israel is ranked sixth in terms of the absolute number of grantees after Germany, the UK, France, Italy and the Netherlands. There are three Israeli universities in the ranking of the top 20 winners of ERC grants.

Latest figures, as October 2011, from the European Commission CORDA database, show that 1,102 Israeli researchers were participating in 900 signed agreements under FP7 and benefiting from €420 million: 40% from ERC grants; followed by 20% in ICT and 10% from Marie Curie Actions. Israel's top five European collaborators were Germany, UK, Italy, France and Spain. Just over 70% of the funding went to institutes of higher education. The most active organizations in terms of funding received were the Weizmann Institute, the Hebrew University and the Technion.

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<sup>1</sup> ERAWATCH Network (2010): Israel Country Report.

The main players in Israel's national research and innovation system, responsible for policy-making and governance, remain the Office of the Chief Scientist (OCS) in the Ministry of Industry, Trade and Employment, responsible for industrial R&D, and the Planning & Budgeting Committee (known as the Vatat) of the Council for Higher Education, which covers academic R&D. However, since 2011, the Ministry of Finance, the ultimate source of funds for R&D initiated by the government and academe (GBAORD and HERD respectively), has become much more involved in innovation policy making. The heightened involvement of the Finance Ministry has helped increase the cooperation and coordination between all entities involved in innovation policy, including the OCS and Vatat.

A lesser player both in budget and influence is the Ministry of Science and Technology which funds some small thematic research centres, runs 10 small regional research centres and is responsible for some aspects of international scientific cooperation. Under the Ministry's aegis is the National Council for Research and Development, a body that has statutory authority to devise policy and advise the government, but has been largely ineffective in recent years.

Outside of government, most academic research is carried out in seven research universities. PROs do not play a central role except in the field of agriculture. R&D in the business sector is divided between indigenous firms, many of which went public on NASDAQ, subsidiaries of multinational, mainly American corporations, and a large number of technological start-up companies. Many of the local subsidiaries of multinationals were set up after the acquisition of local start-ups. One of the problems of Israel's relatively large venture capital industry, (see section 2), is that it has become far more difficult to float Israeli companies on NASDAQ, the preferred option in terms of liquidity and visibility, meaning that most of the prevalent strategy for Israeli start-ups is through M&A.

In terms of specialisation, there are two main fields of expertise, one which has been translated into noted commercial success and another which has only partially delivered on expectations. There is a broad range of distinct successful ICT clusters in Israel with expertise ranging from semiconductors through communications to data security and various kinds of software. Academically, life sciences are another strong suit but this has been translated into notable success only in the field of medical devices. Persistent government efforts to stimulate commercial success in pharmaceutical biotechnology have won only partial success (excluding Teva Pharmaceutical Industries – a humongous international firm based in Israel). Another major area of expertise in knowledge intensive industries is defence exports, about which most information is classified. Press reports estimated the total volume of defence exports in 2010 at more than €5.7b. About 80% of the output of Israel's defence industries goes to exports, since the Israeli army cannot on its own finance the immense costs involved in developing modern weapons systems.



## 2 RECENT DEVELOPMENTS OF THE RESEARCH AND INNOVATION POLICY AND SYSTEM

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### 2.1 National economic and political context

As mentioned above, the national economic context of Israel is characterised by a slowdown in the pace of growth, 3.3 percent during 2012. (The previous years was growing at an average higher than 4%). According to the Bank of Israel, this is due largely as a side effect of the situation in Europe and in the rest of the world. Activity in manufacturing slowed as a result of the decline in the export of goods at all levels of technology intensity. Nonetheless, the level of exports has remained high in historical terms. (Bank of Israel)

Israel is a small and relatively knowledge-intensive country, with a strong business sector. Israel's main strength is the research intensity of its private sector, as indicated by a very high business expenditure on R&D and strong patenting activity. In 2012, business activity in Israel continued to grow at the moderate rate, to which the economy had converged during the second half of 2011. During 2012, GDP grew by 3.3 percent, slightly below that in the second semester of 2011 when growth was already lower than its long-term average. Growth in business sector output during the first quarter slowed markedly relative to the two previous quarters and stood at 2.8 percent. The slowdown in the growth of business activity during 2012 was, to a large extent, the result of the crisis in the eurozone and the slowdown in global growth. In addition, activity in manufacturing slowed, as a result of the decline in the export of goods at all levels of technology intensity. Nonetheless, the level of exports remained high in historical terms. (Bank of Israel)

In April 2012 a major change occurred in the Minister of Science and Technology when Professor Ehud Gazit was named chief scientist of the Ministry by Daniel Herschkowitz. Prof. Ehud Gazit is a world-renowned researcher in the field of nanotechnology. He will replace the outgoing chief scientist, Professor Danny Weiss. The chief scientist had hoped to receive an additional 60 € million, as he claimed in interviews with the media to have run out of budget. This is not the first time the chief scientist's budget for grants has run out in the middle of the year - in fact it has been happening regularly in recent years. Demand for grants has grown as the global economic crisis and slowdown has worsened and other funding sources have dried up.

The two main highlights related to the innovation policy discussed in the media in 2012 are: brain drain, the incapacity of Israel to attract and maintain top researchers; and the risk of being a start up nation with need to build larger companies for the long run and creation of jobs.

Concerning brain drain, the State of Israel made a strategic decision to promote the return of researchers who are Israeli citizens based outside of Israel to academia and industry in Israel. In March 2010 the Israeli Government decided to establish a series of Academic Excellence Centres that would create appropriate professional opportunities for scientific researchers. At the same meeting, the Government decided on another measure, with efforts to be made to promote the return of Israeli academics in general to Israel, and in particular of researchers to the business sector, thus helping industry deepen its competitive edge: applied innovation. The programme is inter-ministerial, with partners – the OCS, Ministry of Immigration absorption, the Council for Higher Education/Vatat and the Ministry of Finance. It is led by the OCS and will include: creation of an information centres, employment opportunity leads and work placement assistance, financial assistance to selected R&D projects, meeting the established OCS

requirements. MATIMOP, serving as the international arm of the OCS at the Ministry of Industry, Trade and Labour, is in charge of the programme's execution.

## 2.2 Funding trends

	2009 (a)	2010 (a)	2011 (a)	EU average 2011 (b)
GDP growth rate	0,84	4,85	4,75	- 0.3 (2012)
GERD (% of GDP)	4,49	4,34	4,38	2.03s (2011)
GERD (euro per capita)	824,12	872,56	880,34	510.5s (2011)
GBOARD - Total R&D appropriations (€ million)	857,88	961,71	1003,32	91,277.1 (EU27 total 2011)
R&D funded by Business Enterprise Sector (% of GDP)	3,58	3,44	3,51	1.26 (2011)
R&D performed by HEIs (% of GERD)	13,08	13,26	12,60	24% (2011)
R&D performed by Government Sector (% of GERD)	3,82	3,90	3,74	12.7% (2011)
R&D performed by Business Enterprise Sector (% of GERD)	79,58	79,21	80,25	62.4% (2011)
GDP growth rate	0,84	4,85	4,75	- 0.3 (2012)
GERD (% of GDP)	4,49	4,34	4,38	2.03s (2011)

Sources: (a) OECD, (b) EUROSTAT

The global economic crisis has had a definite impact on R&D funding in Israel as can be seen in the table above. GERD, measured as a percentage of GDP, has been in constant decline, falling from 4.49% in 2009 to 4.38% in 2011, despite a marked increase in government expenditure (GBOARD). This highlights the very high exposure of the research and innovation system to global financial conditions, which stems from the very high share of business in funding R&D. The total GERD figures relate only to civilian R&D, as there are no unclassified data on the total expenditure of the large defence related R&D system. The government has never set out specific targets for R&D expenditure, and is unlikely to do so in the future.

The contribution of the business sector to the funding of R&D, keeps on rising, with its share of GERD reaching 80.2% in 2012, with a total expenditure of €6156.47 million. These levels, although normal for Israel, are surprisingly high, especially when compared with the EU 2011 average, where BERD contributes to 64.4% of the GERD.

In 2011, the ratio of BERD to GDP in Israel is twice the EU average, with 3.51% although this is a lower proportion than in 2009. However, it seems to have recovered from the situation of 2010 (3.44%). In general, however, funding from the private sector has been relatively unaffected by the global crisis.

The evolution of the public sector contribution is weaker. The proportion of contribution to GERD by the High Education Institutions (HEI) has shown a slow down due to budget cuts. The assignment of funding by the public sector does not seem to be keeping pace with economic growth.

In reaction to the global crisis that started in 2008 funding for innovation through the OCS increased in 2010 by 20% compared to 2007, but from 2001 to 2011, the budget has declined 35% in real terms. A large part of the OCS budget is predicated on co-financing by the private sector, ranging from 50-70% co-financing by the private sector in R&D Fund grants to 15% co-financing in the incubator programme.

Most of the thematic civilian research in Israel is carried out under the funding of the Seventh Framework Programme (FP7), which is of central importance to the Israeli R&D system. In 2010, before the beginning of the Vatat six-year plan, FP7 funding of university based research was actually higher than funding for competitive funds from the ISF. This proportion is likely to change over the next six years as the ISF budget grows, but the Framework Programmes will remain of central importance to the national research system.

## 2.3 New policy measures

At the Chief Scientist's Annual Conference for Research and Development held on 3 May 2012, the Ministry of Industry, Trade and Labour's Chief Scientist announced the launching of new OCS programmes. These include:

A new early stage technology programme created as a response to a decline in early stage investment. The OCS already devotes a large part of its budget to supporting seed ventures, but the sector has had an unusually hard time raising funds because of the global economic environment. The new programme will be designed to leverage private capital invested in seed companies. The OCS plans the creation of a dedicated post for supervising it.

Kamin, part of the pre-competitive and long term programmes, is intended to promote applied research and provide an additional bridge between basic and applied research for those not yet ready for commercial investment. It is intended to encourage academics to pursue research in areas of potential commercial interest. Although managed by the OCS' Magnet Organization it is launched in coordination with the Council of Higher Education and the Finance Ministry.

Tzatom is a grants programme for the purchase of R&D equipment intended for experienced companies specializing in providing research services in the field of life sciences. €7.2 million has been allocated for the project, over a three year period. An additional €7.2 million has been allocated specifically for stem-cell research equipment. Tzatom is a TELEM instrument. TELEM is a voluntary partnership between the four organizations that support R&D in Israel: Ministry of Industry Trade and Labour, the OCS of the Ministry of Science and Technology, the VATAT and the Ministry of Finance.

Meimad is a collaborative programme to promote new ideas and new technologies that can serve both commercial applications and military needs. It is launched between the Ministry of Defence, the OCS and the Ministry of Finance.

## 2.4 Recent policy documents

One of the most important policy documents is the list of R&D incentives in Israel published by the Ministry of Industry, Trade and Labour. The document structures the Domestic R&D incentives in the following blocks:

Competitive R&D: The R&D Fund is the main instrument of The R&D Law. It gives grants to "Approved R&D Programmes", which are programmes lasting one or more years, resulting in the development of a new product or process. A research committee, headed by the Chief Scientist, is the organ assigned with awarding the grants, according to a set of terms and conditions. Grants are from 20 percent to 50 percent of the total approved R&D expenditures of

the approved projects. The annual budget is approximately €300 million spent in the support of the R&D run by hundreds of companies. A special track is dedicated to traditional industries that move towards innovation, and to large companies that are based in the periphery of the industrial Israeli centres and commit to hiring employees living in that area.

Pre seed and Seed Programmes. The primary goal is to transform innovative technological ideas, that are too risky and at too early a stage for private investment, into viable start-up companies that, after the incubator term, are capable of raising money from the private sector and can operate on their own. For a period of up to two years (Biotech and Cleantech projects up to three years), the programme provides entrepreneurs, whose projects were approved by the Incubators Committee, with R&D and marketing grants, infrastructure, technological and business guidance, legal and regulatory advice, and administrative assistance.

Pre -competitive and long term R&D programmes, also know under the name of MAGNET (the acronym in Hebrew for Generic Pre-Competitive R&D), encourage collaboration among industrial companies, and between the companies and researchers from academic institutions, through several instruments that deal with innovative technologies. These instruments seek to develop Israel's industrial infrastructure by supporting the R&D activities and sharing technological knowledge among the participants. MAGNET works under the formation of consortia made up of industrial companies and academic institutions, in order to jointly develop generic, pre-competitive technologies. The duration of a MAGNET consortium is 3-5 years. Grants are up to 66% of the approved budget for industry and up to 80% for the academic institution.

Special Programmes: Institutional investments in Israeli High Tech, government supports is reflected by a partial protection of up to 25% of their losses, should such occur, of the institution's investment in Knowledge Intensive activities in Israel, allocated with €50million. Brain drain programmes (see 2.1 above) and the development of solutions for people with special needs, defined as “physical, psychological, mental or cognitive disability – permanent or temporary -- resulting in a fundamental disruption of essential daily functions”.

## **2.5 Research and innovation system changes**

Israel has never had formalized research or innovation policies in the sense of producing policy documents that lay out long term strategies for the entire system with strategic goals and numerate targets. Until fairly recently, research and innovation were not even considered by the same department in the Finance Ministry, and coordination between the two policy fields was on an *ad hoc* basis.

The level of coordination has improved to a certain degree during the past four years but functionally the research and innovation policies should be still considered separately. Research policy is made and enacted by the Council of Higher Education through its Planning and Budgetary Committee, commonly known by its Hebrew acronym, Vatav, while innovation policy is made and managed by the OCS in the Industry Ministry.

## **2.6 Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3)**

The decision of the cabinet to increase the Science and Technology Ministry's budget for its regional research and development centres can be interpreted as a measure for Smart Specialization. The budget was increased by €1.8 million, a tripling of the budget for the eight centres located in peripheral areas, ranging from Kiryat Shmona and the Golan Heights in the north to the Negev desert in the south. The Ministry is a partner in the establishment of these centres, in guiding its scientific activity and contributing substantially in their funding.

The Regional Research and Development Centers have been established in the peripheral areas to draw young, leading scientists into these areas. The centres were established to contribute to the improvement of local society and to raise the level of local education. Furthermore, the centres' research focuses on local challenges, conditions and resources to provide solutions for local needs. The Regional Research and Development Centers present a model that is unique to the State of Israel and is of a ground-breaking nature.

### 3 STRUCTURAL CHALLENGES FACING THE NATIONAL SYSTEM

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The Israeli research and innovation system faces three deep structural challenges that derive both from internal factors and from shifts in the global marketplace. These are long term challenges that predate the global economic crisis that started in 2008, even though the crisis may have highlighted their urgency. They require the kind of long term responses that have helped the Israeli research and innovation system excel in the previous two decades.

At least two of these challenges stem partly from this same success. The ability to attract private investment in R&D is what enabled Israel to achieve its top rank in the Innovation Union scoreboard of R&D intensity<sup>2</sup>. However, this same success led to underinvestment in other areas. Like most structural challenges, these challenges are extensively interrelated and touch on many other issues of concern to policymakers. However, they are sufficiently distinct to outline separately as follows:

1. Making up for the "lost decade"

Investments in Israeli higher education and research essentially stagnated during the first decade of the 21<sup>st</sup> century. From 2000 until 2010 budgets effectively declined compared to the growth in population. By the middle of the decade, investments per student had declined by 9% compared to 1995<sup>3</sup> and the average age of faculty in exact sciences departments was over 55. Investment in research infrastructures also fell behind, forcing universities to rely heavily on donations.

In output terms, the impacts of this stagnation were evident by the end of the decade, as evidenced by the decline in the country's share of world scientific publications which decreasing from 1.1% in 2000 to 0.9% in 2009,<sup>4</sup> proportionately a radical decrease for a small country highly dependent on research and innovation. As far as citation impact is concerned, the decline was less acute, Israeli scientists' publications dropped from 12<sup>th</sup> to 13<sup>th</sup> place worldwide.<sup>5</sup> This lower drop in citation index rankings was attributed to the impact of papers of older researchers many of whom have reached retirement age.

As a result of this stagnation, brain drain became an acute problem. While there are no up to date definitive comparative<sup>6</sup> figures on brain drain, a study published in 2007<sup>7</sup> showed that Israelis with tertiary degrees had proportionately the highest rate of emigration to the US in the world. In the higher tiers of scientific research this has become such a major problem that it has become a defining policy priority.

Stagnation is also evident in the government budget for industrial innovation as the OCS's budget decreased by 30% (in real terms) from 2001 to 2011. The effects of this reduction were somewhat off-set by private investments but still many good industrial R&D projects suffered from lack of funds.

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<sup>2</sup> Innovation Union Competitiveness Report, 2011 edition, page 49

<sup>3</sup> ERAWATCH Israel country report 2009

<sup>4</sup> Innovation Union Competitiveness Report, 2011 edition, page 137

<sup>5</sup> Research and Development Outputs in Israel, Samuel Neaman Institute, 2011 (in Hebrew)

<sup>6</sup>Recent Israeli CBS publications provide some complementary national data in Hebrew: [http://cbs.gov.il/reader/newhodaot/search\\_text\\_hodaot.html?input\\_hod=%f9%e4%e5%fa+%ee%ee%e5%f9%eb%fa](http://cbs.gov.il/reader/newhodaot/search_text_hodaot.html?input_hod=%f9%e4%e5%fa+%ee%ee%e5%f9%eb%fa)

<sup>7</sup> Israel's Brain Drain, Eric D. Gould and Omer Moav, Israel Economic Review Vol. 5 No. 1 (2007)

## 2. Over Reliance on ICT

The Israeli economy is heavily reliant on ICT based exports and clusters of industries based on a deep pool of talent that stretches from academe to small ICT based start-ups. The success of this industry is what enabled Israeli R&D based industries to attract substantial investment by business in ICT based industries, and this in turn was one of the reasons for the reduction of total government support of business based R&D by 36.3%<sup>8</sup> compared to inflation adjusted prices for the year 2000. (In the past few years budgets for commercial R&D have increased fairly dramatically from a nadir in 2007 in reaction to the global economic crisis, but Israeli government investment in business R&D, once highest in the world, now lags behind countries like the US, the UK or Korea.)

Policymakers have been aware of this over reliance for years, and have been encouraging Israeli industry to diversify through a variety of measures and initiatives. Yet they face a challenging dilemma: an in depth [study](#)<sup>9</sup> has shown that government support of mainly ICT based industries is critical for economic growth in a highly competitive world, even though the majority of funding for innovation comes from the business sector. This means that a decision to divert a major part of the government resources intended to support industrial R&D to other new fields would cause extensive economic damage. Technology based exports, predominantly based on ICT, account for close to half of Israeli exports. There are no data on exactly what percentage of these exports are based on government support programmes, but by definition, government support is extended to the riskiest R&D ventures, those that give Israeli ICT exporters their competitive edge. Hence, diversion of resources from ICT would deprive Israeli industry of an important element of its competitive capacity. Yet not diversifying is also not a good long range option. The overall returns on the heavily ICT based Israeli venture capital industry have been disappointing during the past decade. Since a major part of the Israeli innovation system is predicated on creating new ICT companies this is a strong indicator showing that the innovation system needs new engines of growth.

It is important to note that the distribution of government support, via OCS programs, across technological sectors have changed substantially in the last two decades. The main change is the rise of life sciences whose stakes are roughly 25% of all grants (compared to 10% a decade ago) on the expense of electronics which declined from 35% to 17% at that period.

During the past decade, the government largely abandoned the field of thematic university based research in all civilian fields except for agriculture and most of the thematic research conducted in Israeli universities is through the country's participation in the EU Framework Programmes. Extensive thematic research is carried out in the country's large and classified defence R&D system, and there is anecdotal evidence<sup>10</sup> of major spill-over effects to the civilian based ICT innovation system. This successful example shows that developing new areas of expertise requires not only extensive human and physical infrastructures, but also a judicious mix between thematic academic research and project-oriented R&D. Hence, the challenge to develop non-ICT based innovative industries must be cast not only in terms of the industrial policy, which is managed by the Office of the Chief Scientist in the Ministry of Industry Trade and Employment

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<sup>8</sup> Statement by Avi Hasson, Chief Scientist in the Ministry of Industry, Trade and Employment, October 2011

<sup>9</sup> The impact of government support to industrial R&D on the Israeli economy. (2008). Prof Shaul Lach, Dr. Shlomi Prizant, Daniel Wasserteil. Report Commissioned by the OCS

<sup>10</sup> *Eilam's Arc, How Israel became a Military Technology Powerhouse*, Sussex Academic Press, 2011

(OCS), but also in terms of research policy managed by Vatat (The Planning and Budgeting Committee of the council for Higher Education), and by the Israeli Science Foundation.

### 3. Precarious VC Environment

Venture Capital is an essential part of the Israeli innovation system. To put things in proportion, the total annual investment by VCs in Israeli technology start-ups during the past decade has usually been at least four times higher than the total government budget to support innovation in all firms from start-ups to major corporations.

The latest 2012 Q4 data from IVC-Online, inform that in 2012, 575 Israeli high-tech companies raised €1.38 billion from local and foreign investors, a 10 percent decrease from €1.54 billion raised by 545 companies in 2011. VC-backed deals in which at least one venture capital fund participated, accounted for €985 million from a total of €1.38 billion raised in 2012. These venture-backed deals were down 22 percent from €1.27 billion in 2011. Israeli VC fund investments amounted to €371 million in 2012, 19 percent below the €559 million invested in 2011.

However, investments by Israeli VCs now account for only 25-30% of total VC investment in Israel, with the rest coming from foreign funds. This means that investments at the seed stage, which are typically handled by Israeli VCs and not their foreign counterparts, are in jeopardy. In addition, the funds from foreign VC funds are not committed *a priori* to investments in Israeli firms and could dry up at the next instance of the global financial crisis or be moved to more promising pastures in the Far East.

The Israeli VC industry has been through several slumps since it was kick-started by the government in 1994 and has successfully bounced back. But the data for Israel correspond to a large degree with data from the US, because the industry as a whole has been delivering less than satisfactory returns (1.25% per year during the past decade compared to the 6.5% yield of the S&P index<sup>11</sup>.) The Israeli VC industry has become part of the system, and its diminishment could have a severe impact on company formation and the rest of the Israeli innovation system, thus presenting government with a major challenge

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<sup>11</sup> Cambridge Index of US venture capital



## 4 ASSESSMENT OF THE NATIONAL INNOVATION STRATEGY

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### 4.1 National research and innovation priorities

#### Research Priorities

In 2012 four research areas have been designated by the Ministry of Science and Technology as national priority fields<sup>12</sup>: brain science, supercomputing and cyber security, oceanography and alternative transportation fuels.

1. Brain science was chosen due to the rapid ageing of the population, which intensifies the need to find solutions for neuro-degenerative disorders (e.g. Parkinson's disease and Alzheimer's disease).
2. A supercomputer is a computer at the frontline of current processing capacity, particularly speed of calculation. ICT is advancing at a rapid pace and due to the cyber threat, this area of research was chosen as a priority. This priority will be under the responsibility of the recently established Israel National Cyber Bureau, in cooperation with the Ministry of Science and Technology. Investment in this field will focus particularly on topics in artificial intelligence, advanced computing and cloud computing.
3. Oceanography focus on extracting more extensive resources from the sea, e.g. fuel, food, drinking water and medicinal substances. The sea is thought to be an under-utilized resource with tremendous potential for research in such areas as maritime archaeology and artificial islands.
4. The investment in alternative transportation fuels is based on a desire to find options that will enable Israel to end its dependence on Arab fuel sources, in the wake of a government decision in this regard.

As mentioned above, up to the year 2012, there were no overarching research policy and no research priorities. Vatat viewed itself principally as a conduit for funds to universities and colleges. The introduction of a new six-year plan in 2010, gave higher education and research a 30% increase in budget over and above the usual formulas for growth in the student body, and added an increase of about 9% in the number of academic researchers, and a near doubling of the allocation to the ISF for research grants. However, in addition to the increased budget, this six-year plan for the first time laid the ground for a research policy.

The overall aim of the policy is to increase research excellence and increase targeted specialisation. The means to accomplish this is in the form of two initiatives. The first is a return to thematic funding through the I-CORE programme, under which up to 20 centres of excellence, funded partly directly by the government, are being set up as collaborations of Israeli

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<sup>12</sup> <http://most.gov.il/English/research/Pages/default.aspx>

researchers from universities, colleges, hospitals and research institutes. The I-CORE programme is based on the assumption that the Israeli research environment needs specific foci of excellence to compete in today's world. It has some departure from the previous approach, based on a tradition of very high university autonomy, under which policy makers made no thematic choices regarding areas to be funded. However, the topics for the I-COREs are selected via a wide consultation process with the entire academic community, and reflect its interests and priorities<sup>13</sup>. The second initiative is the change in the block funding formula, introduced in 2010, giving far higher priority to publications and rewarding institutions for having the best research performance in a specific field. The aim here was twofold, first to award funds for excellence and the second to encourage universities to specialise in specific areas in which they have a higher chance of excelling. The change here was less radical than the I-CORE programme, and was meant mainly to correct the errors of an old and inefficient block funding formula, but the impact of the new formula has already made several universities change their priorities.

### **Innovation Priorities**

Unlike research, government support of innovation has operated for the past two decades under consistent policies with clearly defined priorities. While these priorities have changed over the years, the key principles and instruments used to stimulate innovation have remained remarkably stable.

The key principle is that the role of the OCS is to reduce the risk of innovation in firms by shouldering part of the costs. In most cases, if the innovation project succeeds, companies repay royalties to the OCS. However, it is important to stress that the OCS does not regard itself as an investor, but rather as an agency that helps firms tread where they would not dare without some help. The three instruments currently in place are: the R&D Fund, which funds innovation projects in all firms; the incubator framework which supports start-ups; and the Magnet Organisation which deals with pre-competitive R&D through collaboration between the academic world and industry.

There have been two main shifts in priorities during the past few years. The first, which was taken by the OCS working with the Finance Ministry in 2011, was a government decision to invest in a dedicated [biotechnology venture capital fund](#).<sup>14</sup> The creation of the fund was based on the realisation that years of consistent support by the OCS of biotechnology based innovation were not enough, and the government needed to reduce the financial risk of investing in biotech and not only the commercial risk of biotech innovation. A smaller initiative, also intended to increase diversification beyond ICT, supported the creation of a venture-based novel alternative energy R&D activity.

The second major shift in priorities was the admission of many more priorities with mixed socio-economic objectives into the policy mix. This shift, which started in 2005, with the introduction of a measure to stimulate innovation in traditional industries became more marked over the past few years as the funds devoted to the measure increased. Further measures were introduced prioritizing support for innovation in peripheral parts of Israel that traditionally have been poorer and enjoyed less of the benefits of high technology industry. It is important to note that special state prioritisation of socio-economic objectives, was essential because companies that

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<sup>13</sup> In this process, over 1200 Israeli researchers from various disciplines and institutions took part and suggested topics for I-COREs.

<sup>14</sup><http://www.tamas.gov.il/NR/exeres/3C96E1CF-EDFA-4F16-BACE-216773805124.htm> (Only in Hebrew)

enjoyed support under these measures would not have normally met the OCS criteria for funding, which are based mostly on international competitiveness.

The last in-depth evaluation<sup>15</sup> of the effectiveness of OCS policy was published in 2008, and concluded that the traditional policy of fostering innovation was highly effective. A new study which is due to publish its findings in 2013 will examine the effectiveness of OCS support to traditional industries. Until this study is published there are no means of judging whether the new, more societal priorities in the OCS policy mix do indeed act effectively to stimulate industrial investment in innovation. It is likely to take many more years to learn whether the biotechnology fund had indeed succeeded.

### Venture Capital Insurance

In January 2012 the government launched a new programme intended to address the challenge faced by the venture capital industry by promising to insure 25% of the risk of Israeli institutional investors who invest in venture capital funds. The government plans to invest up to €40m in the programme, which is intended to stimulate investments of €160m by the Israeli institutional investors during the course of 2012, a critical year for Israeli VC funds. The fund sets guarantees on the IRR of up to 25% of the investment in the fund, so long as the fund invests in Israeli start-ups. This subsidy, or rather insurance, will be paid out as the fund winds down, at least seven years after its inception if the fund does not reach minimum targets on yield.

Israeli venture capital funds have traditionally raised nearly all of their funds from institutional and other investors abroad, mainly the US. Poor returns on VC investments in the US during the past decade and the impact of the global financial crisis have reduced the proportion of venture capital in global institutional investors' capital allocations schemes. If Israeli institutional investors respond favourably, this will give Israeli funds an important kick-start in their fund raising activities abroad.

## **4.2 Evolution and analysis of the policy mixes**

Until fairly recently, the only body in the research and innovation spheres of which it could be said that it had a policy mix was the OCS, where three main instruments were used in different ways to address a changing list of priorities. This has now changed. The introduction in year 2010 of the new Vatat six-year plan combined with heightened involvement by the Finance Ministry in all spheres of research and innovation policy is producing a new reality in which measures introduced in one sphere can or should interact with other initiatives in different spheres.

This new reality is best illustrated with a few examples. For many years Israel's vibrant ICT sector was the beneficiary of the very large defence R&D system. The sector enjoyed the benefits not only of technologies and a deep reservoir of thematic research, but most critically of human resources, young people intensively trained to develop and use cutting edge technologies under tight discipline. If one of the challenges outlined in section 3 points to the country's need to

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<sup>15</sup> The impact of government support to industrial R&D on the Israeli economy. (2008). Prof Shaul Lach, Dr. Shlomi Prizant, Daniel Wasserteil. Report Commissioned by the OCS

diversify beyond ICT, then this need must be addressed by creating the necessary infrastructure, both in skills and the backbone of thematic research which Israeli industry is adept at using.

The I-CORE programme can thus be seen in several dimensions. On the one hand it is intended to redress the damage of the "lost decade" in Israeli universities and act against brain drain, but it is also intended to create the research-based infrastructure of a new generation of competitive technologies that will act as a magnet to talented young researchers. This is a policy that goes beyond the immediate needs of the academic research system and touches on the entire innovation system.

In a similar vein, the programme to insure part of the investment by Israeli institutional investors in Israeli VC funds was launched by the Finance Ministry as part of its comparative advantage programme, which is not necessarily related to the OCS. But if successful, this programme will release some of the funding pressure from the OCS programmes. Smaller programmes like [Kamin](#) bear the same hallmark. Intended to encourage academics to pursue research in areas of potential commercial interest, the programme will be managed by the OCS' Magnet Organisation, but was launched in coordination with the Council of Higher Education and the Finance Ministry.

The apparent strength of this new coordination of policy mixes is that for the first time policymakers are looking at the entire range of issues that start with higher education through research to innovation policy. It is too early to look at actual weaknesses, but potential problems could arise from the fact that policy is being coordinated by a very small group of officials in the Finance Ministry and not by a body dedicated to the purpose. The main threat is that the new initiatives will not be sufficient to overcome the challenges outlined in section 2. The opportunity is based on the proven capacity of Israeli entrepreneurs to make use of the new technologies that hopefully will be developed as a result of the renewed vigour of the research sector.

### **4.3 ASSESSMENT OF THE POLICY MIX**

Two of the three challenges outlined above, the quality of university research and the precarious status of Israeli venture capital, have been addressed by actions intended to directly mitigate the problems in the country's research and innovation systems. The third challenge, the need to diversify the ICT-centric technology sector, has been addressed by a variety of measures, but this is a long term and complex challenge that defies simple solutions.

It is far too early to assess the effectiveness of the six-year Vatat plan and the I-CORE programme. The first indicators of success will be the number of new researchers retained by universities and the number of researchers who return to Israel to join I-CORE programmes. However, the real tests of the programme will be in general academic quality as measured both by bibliometric and other indicators, and by the commercial technologies that derive from this basic research. Both of these will take a long time to materialize. There has been some criticism in academic circles of the I-CORE programmes with academics saying that preferred status of I-CORE centres will be at the expense of other academic researchers. But there is so far little evidence to support this claim. In general, the response to the challenge of the "lost decade" seems comprehensive and integrative, especially since it does not seek to turn the wheel back but to create a research environment suited to the conditions of the 21<sup>st</sup> century.

The assessment of the response to save the Israeli VC industry from its current state will be far quicker and results should be apparent towards the end of 2012. However, the effectiveness of the response depends on so many extraneous factors that it will be hard to judge on its own merits. Israeli institutional investors, like their colleagues in other countries, are judged by harsh criteria such as performance per quarter. The decision whether to lock up capital for seven to 10 years because of the government's commitment to underwrite part of the risk depends to a large extent as much on current market conditions as on strategic considerations about the composition of each investor's portfolio. If Israeli investors do chose to enter the programme, this is only one part of each fund management company's struggle. They then have to persuade investors abroad, who should make up the majority of each limited partnership to invest in their fund despite the current tumultuous state of capital markets.

The challenge of diversification beyond ICT is both more complex and more intriguing. Proof that it is achievable can be seen in the development during the past decade of a substantial cluster of Israeli companies in the field of medical devices, which is based on the skills and entrepreneurial drive of researchers and technologists from a broad range of fields ranging from medicine to ICT. However, even if the various measures promulgated and enacted by the OCS from biotechnology through nanotechnology to cleantech are successful, and if the I-CORE programme does indeed lead to the development of skills needed for the next generation of technologies, this might not be enough. The various clusters of Israeli companies in ICT are predicated on two additional conditions. The first is markets in a state of rapid growth in which relatively small Israeli companies can make their mark. The second is the existence of a financial ecosystem that can develop these companies. Even if these issues have not been resolved now, it is clear that various government initiatives, if seen in concert, are trying to address the complexities of this problem.

**Table 1: Policy measures and assessments**

Challenges	Policy measures/actions <sup>16</sup>	Assessment in terms of appropriateness, efficiency and effectiveness
<b>Redressing the "lost decade" in academic research</b>	1. Six-year Vatat plan increasing research budgets and retaining more researchers 2. I-CORE programmes for centres of research excellence	The programme to repair and renew academic research appears to be both appropriate and comprehensive, but it is too early to appraise its effectiveness
<b>Over reliance on ICT-based innovation</b>	1. OCS programmes encouraging R&D in new fields including traditional industry. 2. Government participation in dedicated biotech VC fund.	OCS programmes are generally effective in addressing their immediate target. However the OCS cannot devote more of its limited budget devoted to non-ICT commercial R&D because the funds are needed by proven generators of jobs and wealth in ICT. The drive to diversify must go far beyond the immediate target of reducing the risk of commercial R&D. If the I-CORE programme does indeed produce both the knowledge and human skills needed to develop new fields, this is only part of the infrastructure needed for diversification.

<sup>16</sup> Changes in the legislation and other initiatives not necessarily related with funding are also included.

Challenges	Policy measures/actions <sup>16</sup>	Assessment in terms of appropriateness, efficiency and effectiveness
<b>Precarious state of Venture Capital</b>	Government measure to insure 25% of the risk of Israeli institutional investors who join funds as limited partners	The effectiveness of this measure is still too early to be judged, but success in re-funding the industry depends on many extraneous factors in world financial markets.

## 5 NATIONAL POLICY AND THE EUROPEAN PERSPECTIVE

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First and foremost, the brain drain of researchers particularly from the academic sector and the resulting short supply of such researchers have led to concrete measures to attract Israeli researchers working abroad back home. This is to be achieved by significantly increased budgets to HE and specifically to academic research, with improved research infrastructure as one of the targets. These policy changes are taking place within the new six-year plan for HE, whose implementation began in 2011.

Israel already has a wide network of international cooperation R&D agreements, with countries both in Europe and elsewhere. Expansion of this network is definitely considered a target – with supervision of the network in large part by the Ministries of Industry, Trade and Employment and of Science and Technology. At the same time, expansion of the network is not being carried out as a national programme, though Israel's approval as a member of the OECD in 2010 is a definite step in the right direction

Strengthening the universities in Israel is a national priority and the new six-year plan is the policy channel through which this target is to be achieved. It is recognized that strengthening academic research requires not only larger budgets – which the six-year plan will provide – but also more well-established ties between academia and the business sector.

Technology transfer has been for some time a feature of all seven Israeli universities, but there are various government programmes in place, some fairly recent, which are designed to strengthen the ties between the two sectors.

**Table 2: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)**

6	ERA dimension	Main challenges at national level	Recent policy changes
1	<b>Labour Market for Researchers</b>	<ol style="list-style-type: none"> <li>1. To increase the number of researchers in Israel, particularly in HE.</li> <li>2. To attract Israeli researchers working abroad to return home.</li> <li>3. To recruit researchers from abroad to work in Israel.</li> <li>4. To provide incentives to increase the number of science and technology university students and to stem the decline in technology track secondary schools.</li> </ol>	<p>Increased budget to universities in order to open more positions for researchers;</p> <p>Renewed budgeting model which rewards universities for an improved faculty/student ratio;</p> <p>Continuing establishment of up to 20 Excellence Centres, as part of the new six-year plan – whose implementation began in 2011 - to support university R&amp;D. The first four centres have already begun functioning in 2011. During 2013, eleven new centres will be established. The Centres aim at meeting all three main challenges: to increase the number of researchers, to attract Israeli researchers back home and to offer suitable research facilities to attract foreign researchers to work in Israel.</p>
2	<b>Cross-border cooperation</b>	<ol style="list-style-type: none"> <li>1. To expand the current list of bilateral R&amp;D agreements between Israel and various EU and other countries.</li> <li>2. To encourage R&amp;D entities to apply to Framework Programme 7</li> </ol>	<p>There are no national programmes for cross-border cooperation and no recent policy changes connected with such cooperation. Rather there is an ongoing target of enhancing existing connections between Israel and countries in the EU and elsewhere, via bilateral R&amp;D agreements on the clear understanding that such connections are crucial for bolstering Israel's innovation sector. A recent bilateral agreement, signed in 2011, is the Shanghai-Israel Programme for Industrial R&amp;D which aims at the development of products or processes leading to commercialisation in global markets.</p>
3	<b>World class research infrastructures</b>	<ol style="list-style-type: none"> <li>1. To radically improve the overall research infrastructure of Israel's HE sector.</li> </ol>	<p>Once the connection was made between the sorely lacking research infrastructure of Israel's universities and the growing brain drain of researchers, it was understood, within the new six-year plan for the HE sector, that the aim of attracting back to Israel researchers working abroad had as a necessary criterion for success a dramatic improvement in infrastructure. The implementation of the new plan began in 2011 and includes significant budgets for infrastructure improvement. Work is currently being done on the creation of an Israeli RI roadmap, not as part of the official ESFRI, but as a necessary tool for tracking the development of R&amp;D infrastructure in Israel.</p>



<u>6</u>	ERA dimension	Main challenges at national level	Recent policy changes
4	<b>Research institutions</b>	1. To increase the share of HERD in GERD.	The share of HERD in 2010 was 12.8%, down from 32% in 1990. The new six-year plan has set an increased share of HERD as one of its aims. It is true that the share of BERD has increased to compensate for the declining share of HERD over the past 20 years, but the effect of global crises on BERD in recent years has clarified the need to strengthen HERD, by providing both more finance and more human resources.
5	<b>Public-private partnerships</b>	1. To widen the connection between university R&D and industry.	The understanding here is clear: expanding academic R&D has to be accompanied by providing channels of connection with industry in order to guarantee commercialisation of research. More emphasis on non-ICT research and more thematic research (see Chapter 2 of this report) is being paralleled by strengthening of the ties between the academic sector and industry, with government programmes such as Magnet and Kamin aimed at achieving stronger ties.
6	<b>Knowledge circulation across Europe</b>	Not applicable to Israel	
7	<b>International Cooperation</b>	No specific challenges	Israel has a far-reaching network of international cooperation with many countries both in Europe and elsewhere, and works continually to expand the network.

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## 8 LIST OF ABBREVIATIONS

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BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
ERA	European Research Area
CHE	Council of Higher Education
COST	European Cooperation in Science and Technology
EPO	European Patent Office
ERA	European Research Area
ERA-NET	European Research Area Network
ESA	European Recovery Programme Fund
ERC	European Research Council
ESFRI	European Space Agency
FP	European Framework Programme for Research and Technology Development
EU-27	European Union including 27 Member States
FDI	Foreign Direct Investments
FP7	7th Framework Programme
GBAORD	Government budget appropriations on R&D
GDP	Gross Domestic Product
GERD	Gross 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
IP	Intellectual Property
ISF	Israel Science Foundation
M&A	Mergers and Acquisitions
OECD	Organisation for Economic Co-operation and Development
MOITAL	Ministry of Industry, Trade and Labour
OCS	Public Research Organization
PRO	Office of the Chief Scientist, Ministry of Industry, Trade and Employment
R&D	Research and development
RI	Research Infrastructures
RDI	Research Development and Innovation
RTDI	Research Technological Development and Innovation
S&P	Standard and Poor
SF	Structural Funds
SME	Small and Medium Sized Enterprise

S&T	Science and technology
Vatat	The Hebrew Acronym for the Planning and Budgeting Committee of the Council of Higher Education
VC	Venture Capital
BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
ERA	European Research Area
CHE	Council of Higher Education
COST	European Cooperation in Science and Technology
EPO	European Patent Office
ERA	European Research Area
ERA-NET	European Research Area Network
ESA	European Recovery Programme Fund
ERC	European Research Council
ESFRI	European Space Agency
FP	European Framework Programme for Research and Technology Development
EU-27	European Union including 27 Member States
FDI	Foreign Direct Investments
FP7	7th Framework Programme
GBAORD	Government budget appropriations on R&D
GDP	Gross Domestic Product
GERD	Gross 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
IP	Intellectual Property
ISF	Israel Science Foundation
M&A	Mergers and Acquisitions
OECD	Organisation for Economic Co-operation and Development
MOITAL	Ministry of Industry, Trade and Labour
PRO	Public Research Organization
OCS	Office of the Chief Scientist, Ministry of Industry, Trade and Employment
R&D	Research and development
RI	Research Infrastructures
RDI	Research Development and Innovation
RTDI	Research Technological Development and Innovation
S&P	Standard and Poor



SF	Structural Funds
SME	Small and Medium Sized Enterprise
S&T	Science and technology
Vatat	The Hebrew Acronym for the Planning and Budgeting Committee of the Council of Higher Education
VC	Venture Capital

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#### Abstract

This analytical country report is one of a series of annual ERAWATCH reports produced for EU Member States and Countries Associated to the Seventh Framework Programme for Research of the European Union (FP7). The main objective of the ERAWATCH Annual Country Reports is to characterise and assess the performance of national research systems and related policies in a structured manner that is comparable across countries.

The Country Report 2012 builds on and updates the 2011 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context. They further analyse and assess the ability of the policy mix in place to consistently and efficiently tackle these challenges. These reports were originally produced in December 2012, focusing on policy developments over the previous twelve months.

The reports were produced by independent experts under direct contract with IPTS. The analytical framework and the structure of the reports have been developed by the Institute for Prospective Technological Studies of the Joint Research Centre (JRC-IPTS) and Directorate General for Research and Innovation with contributions from external experts.

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new standards, methods and tools, and sharing and transferring its know-how to the Member States and international community.

Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security including nuclear; all supported through a cross-cutting and multi-disciplinary approach.

