



COUNTRY REPORT 2010: Jordan



**EUROPEAN COMMISSION**

# **ERAWATCH COUNTRY REPORTS 2010: JORDAN**

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ERAWATCH Network

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This analytical country report is one of a series of annual ERAWATCH reports which cover the EU Member States, Countries Associated to the EU Seventh Research Framework Programme (FP7) and, since 2011, selected third countries (ERAWATCH International).

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## Executive Summary

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Jordan is strategically situated at the convergence of the three continents: Europe, Asia, and Africa. It is therefore an ideal gateway for the Middle East and North Africa (MENA) region and beyond. With a population of 5.9 million that is growing at approximately 2.2% per year, Jordan boasts a relatively young population with almost 70% under the age of 30. Capitalising on its highly qualified graduate pool, Jordan has seen the emergence of several knowledge and skills centred industries such as ICT, outsourcing, pharmaceuticals, healthcare, clean tech and light manufacturing.

Jordan is classified by the World Bank as a "lower middle income country." According to Jordan's Department of Statistics, almost 13% of the economically active Jordanian population residing in Jordan was unemployed in 2008, although unofficial estimates cite a 30% unemployment rate. Education and literacy rates and measures of social well-being are relatively high compared to other countries with similar incomes. Jordan's population growth rate has declined in recent years and is currently 2.3% as reported by the Jordanian Government. One of the most important factors in the government's efforts to improve the well-being of its citizens is the macroeconomic stability that has been achieved since the 1990s. Jordan's 2008 and 2009 budgets emphasised increases in the social safety net to help people most impacted by high inflation, but these increases were not included in the 2010 budget because of fiscal austerity plans and the low inflation rates during 2009. The average rate of inflation in 2009 was -0.1%. The GDP real growth rate is 3.1%, Services account for 66.2% followed by industry 30.3% and agriculture for 3.4%.

The public sector in Jordan has the highest percentage expenditure on R&D with expenditures of about 13,260,000 Euros (13274586 JD) (58% of GERD) as compared to around 8,308,000 Euros (36% of GERD) by the private sector. Public administration, defence and compulsory social security account for 7,268,000 Euros (55%), followed by education expenditure equals 2,251,000 Euros (17%) and business services equalling 2,009,000 Euros (15.1%), the remaining 6% flows in from abroad. Within the private sector, manufacturing activities account for the highest share of R&D with an estimate of 5,149,000 Euros (62%) followed by business services at 17.2% and private education (13%)

The National Agenda sets ambitious targets to be achieved over the coming decade, among which are: Achieving an annual real GDP growth rate of 7.2 percent, reducing public debt from 91 percent to 36 percent of GDP, converting the public deficit of 11.8 percent of GDP into a surplus of 1.8 percent, increasing national savings from 13 percent to 27 percent of GDP, and reducing unemployment from 12.5 percent to 6.8 percent of the active population by creating nearly 600 thousand jobs.

The Kulluna al Urdun or "We are all Jordan" an initiative started on 2006 provides for a comprehensive policy framework for Jordan's future development. It targets in particular the "Higher Education and Scientific Research" field by proposing solutions for tackling unemployment among university graduates, e.g. through building and creating "technological incubators and business incubators". It targets also the "Scientific Research" field, by pointing out the necessity to increase the number of joint research projects between local researchers and their counterparts abroad, to motivate the private sector to participate in research and development projects, to

particularly support the research projects that may be developed into productive investment projects.

The Jordanian Government has always been aware of the importance of S&T and R&D in increasing the competitiveness of the country. Since the 1960's different institutional set ups to support S&T were tested culminating in 1987 with the creation of the Higher Council for Science and Technology (HCST). The mandate of the HCST was to contribute to national development by increasing awareness of the significance of R&D and by providing the necessary funding. The HCST was also entrusted with the establishment of specialised research centres, and the representation of the kingdom in regional and international S&T activities. Research is undertaken in the higher education, the Royal Scientific Society and public research organisations. There are 10 public universities, 19 private universities and 57 community colleges.

Business promotion agencies are highly recognised as tools to support firms in certain innovation matters and appear playing a relatively important role in Jordan. Jordan has started to stimulate technology transfer between researchers and industry by launching appropriate programmes like Faculties for Factory<sup>1</sup>. It aims to increase the industrial activities to become more competitive as well as to improve the technological infrastructure. In 2010, the Support to Research and Technological Development and Innovation Initiatives and Strategies in Jordan (SRTD) expanded the technology transfer centre at the Royal Scientific Society centre to be the Intellectual Property Commercialisation Office (IPCO) for the Kingdom and established eleven branch TT offices at universities, research centres and business organisations. King Abdullah II Fund for Development: KAFD seeks to justly distribute the gains of sustainable development among all governorates through establishing pioneering projects and encouraging creativity, on the backdrop of a true partnership with the private sector and civil society institutions.

Jordan has been on a roll.<sup>2</sup> Up to 2009 when it was hit, like others, by the global financial crisis, its GDP growth had averaged 6% and its export growth 15% annually. On the innovation front, while so far only a bit player, it has been ahead of many other Arab countries. But there is a shared sense in Jordan that even with the effects of the crisis behind it, the country has now reached a kind of plateau, and that innovation must now come to play a much bigger role if the country is going to sustain its growth performance and provide jobs to its throngs of young workforce

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<sup>1</sup> Faculty for Factory program was created and launched in 2003 from the University of Jordan as a concept aimed at strengthening the role of applied scientific research carried out by academic institutions to serve the national economy, strengthening the technological component of industrial development and enhance competitiveness. This is achieved by linking the industrial companies to academic institutions.

<http://henc-jordan.org/en/papers/Faculty%20for%20Factory%20-%20Dr.%20Yousef%20Abdallat%20-%20University%20of%20Jordan.pdf>

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entrants. Moreover, the country's considerable energy, water, food, and other social and environmental challenges ahead will more than ever call for innovation solutions.

A Scientific and Technological (S&T) cooperation agreement between the EU and Jordan was signed in November 2009. An EC-Jordan Joint Committee has been established with the aim to implement the S&T cooperation agreement.

The participation of Jordan in the Framework Programme is satisfactory considering the low number of inhabitants and researchers in comparison with other Mediterranean Partner Countries. Jordan shows the 4<sup>th</sup> highest number of applicant institutions after Egypt, Morocco and Tunisia.

### Knowledge triangle

The knowledge triangle is not fully operative in the case of Jordan. Although some coordination instances have aimed at increasing the dialogue and cooperation between the different agencies, only limited success has been achieved. As a whole, the education and research parts are significantly better developed and achieve more progress than innovation.

An appropriate awareness of needs for innovation policy exists on all levels of the Jordanian NIS. There is no written national innovation policy available yet. The HSCT is preparing the National Science and Technology and Innovation policy and strategy (2012-2016).

Policy practice is that the ministries involve follow each its own objectives and ways of intervention on the different components of the triangle. Competitive funding is becoming the standard intervention in the promotion of R&D and innovation (via HCST and SRSF), while block funding is the standard funding mode of research and education that concerns the public universities.

Hence, in parallel to the increasing budgets and efforts of research and education, more emphasis is needed to create bridges and reinforce the triangle.

	<b>Recent policy changes</b>	<b>Assessment of strengths and weaknesses</b>
Research policy	The HCST has since 2010 started to work on developing a National Science and Technology Innovation Policy and Strategy for the period 2012-2016.	<ul style="list-style-type: none"> <li>• Research and Development in Jordan is mainly focusing on the theoretical level, with little application of the research being put to use within Jordanian industry.</li> <li>• Inadequate science-industry dialog, therefore STI policy and strategy 2012-2016 aims at increasing productivity and competitiveness, and supporting the private sector in its Research and Development.</li> </ul>
Innovation policy	An appropriate awareness campaign concerning the needs for innovation policy exists on all levels of the Jordanian NIS. There is no written national innovation policy available yet. The HSCT started from 2010	<ul style="list-style-type: none"> <li>• The science, technology and innovation policy and strategy harvests a major national initiative, contributed to by a large cross section of institutions and individuals from the Jordanian S&amp;T community (ministries, governmental institutions, the private sector, universities and scientific</li> </ul>

	preparing the National Science and Technology and Innovation policy and strategy (2012-2016).	research centres) <ul style="list-style-type: none"> <li>Financing of innovative business is difficult due to the risk adverse nature of most banks, little in the way of seed capital.</li> </ul>
Education policy	<ul style="list-style-type: none"> <li>The recent education reforms started in the early 1990s. This reform process was accelerated under His Majesty King Abdullah II in early 2001 with a vision to make Jordan the regional technology hub and an active player in the global economy.</li> <li>In July 2003, the Government of Jordan launched an ambitious programme in the entire MENA region a 10 year multi-donor Education Reform for the Knowledge Economy Program (ErfKE). The goal of the programme was to re-orient the education policies and programmes.</li> </ul>	<ul style="list-style-type: none"> <li>Jordan has the third lowest illiteracy rate in the Arab world. The primary gross enrolment ratio has increased from 71 percent in 1994 to 98.2 percent in 2006. Jordan has achieved a 90 percent parity in literacy and full parity in primary and secondary enrolment.</li> <li>The Jordanian Ministry of Education is now making it mandatory for students to be computer literate and able to apply their studies in computers to their regular studies, most especially the scientific and mathematical courses.</li> </ul>
Other policies	The Kulluna al Urdun or “We are all Jordan” initiative provides for a comprehensive policy framework for Jordan’s future development. It targets in particular the “Higher Education and Scientific Research” field by proposing solutions for tackling unemployment among university graduates.	

## European Research Area

### Assessment of the national policies/measures which correspond to ERA objectives<sup>3</sup>

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
1	Ensure an adequate supply of human resources for research and an	<ul style="list-style-type: none"> <li>The government has, as a matter of policy, provided every village and community with 10 or more school-going</li> </ul>	<ul style="list-style-type: none"> <li>The Jordanian higher education system offers a differentiated system of higher education institutions (universities and</li> </ul>

<sup>3</sup> Of course non-ERA countries do not strive to achieve ERA objectives. This part of the report is simply to allow a comparison with the activities of ERA countries on these issues

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
	open, attractive and competitive labour market for male and female researchers	<p>children with a school.</p> <ul style="list-style-type: none"> <li>• Education is free for all primary and secondary school students, and compulsory for all Jordanian children through the age of fifteen.</li> </ul>	<p>community colleges) and patterns of ownership (public and private).</p> <ul style="list-style-type: none"> <li>• In Jordan, access to basic education has been emphasised in all the country's development plans.</li> </ul>
2	Increase public support for research	<ul style="list-style-type: none"> <li>• In 2007, Jordan started a Fund for Scientific Research/ Ministry of Higher Education and Scientific Research. The budget is defined by law as 1% of the net profits of all public limited companies (app. 10 million JD which equals 10,822,511€).</li> </ul>	<ul style="list-style-type: none"> <li>• A total R&amp;D pot of less than 0.5% of GDP, and there is only a trickle of Jordanian patents.</li> <li>• The public sector in Jordan has the highest percentage expenditure on R&amp;D (58% of GERD) as compared to around 36% of GERD by the private sector.</li> </ul>
3	Increase coordination and integration of research funding	<ul style="list-style-type: none"> <li>• A Scientific and Technological (S&amp;T) cooperation agreement between the EU and Jordan was signed in November 2009. An EC-Jordan Joint Committee has been established with the aim to implement the S&amp;T cooperation agreement and establish a roadmap between Jordan and EU.</li> </ul>	<ul style="list-style-type: none"> <li>• The HCST and Ministry of Planning and International Cooperation continue to actively support Jordanian participation in different European schemes (FP7, ENPI, etc)</li> <li>• The contribution of the private sector is not visible in the field of scientific research, neither directly carrying it out nor providing financial support.</li> </ul> <p>Since the 1950's, Jordan has made efforts to develop its indigenous science and technology capabilities, using its young, skilled labour force.</p>
4	Enhance research capacity	<ul style="list-style-type: none"> <li>• The EU offers a number of instruments to assist Jordan in implementing actions and reforms set in the Association Agreement and the Action Plan. The main financial support comes from the EuropeAid Development and Co-operation Directorate–General which instruments can be divided into “Geographical” and “Thematic”</li> </ul> <p>The HCST is preparing the Science and Technology and Innovation Policy and Strategy (2012-2016)</p> <p>HCST is preparing the National Scientific and Technological Requirements and Potential Study which provides precise information and realistic statistical data on the S&amp;T requirements (technical services, training and research) of various</p>	<ul style="list-style-type: none"> <li>• Europe Aid funded <a href="#">Support to Research and Technological Development and Innovation Initiatives and Strategies in Jordan (SRTD)</a> which aimed at integrating Jordan into the European Research Area</li> <li>• The national landscape of the universities appears to be complete.</li> <li>• Low investment on restructuring the university system.</li> <li>• There are existing barriers between universities and enterprises. Industry is not willing to spend money for research at universities.</li> </ul>



	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
		institutions as well as their potential for meeting such requirements.	
5	Develop world-class research infrastructures (including e-infrastructures) and ensure access to them	<ul style="list-style-type: none"> <li>• El Hassan Science City, Launched in April 2007, is a conducive Environment in which Scientists, researchers, academics, entrepreneurs and students are given the opportunity to promote a knowledge based economy by innovating and disseminating their intellectual wealth.</li> <li>• The Scientific Research Support Fund at MOHE: was established in 2007 upon Royal directives, with the aim of developing human research resources and infrastructure to boost the country's competitive environment in ecological, water, and technological applications domains.</li> </ul>	<ul style="list-style-type: none"> <li>• World-class international SESAME<sup>4</sup> synchrotron facility in Jordan</li> <li>• Jordanian Universities Network (JUNet) is the official NREN of Jordan, currently connecting 11 Universities via optical fiber and 14 Private Universities.</li> </ul>
6	Strengthen research institutions, including notably universities	<ul style="list-style-type: none"> <li>• Public universities are autonomous to a large extent, both from administrative as well as financial points of view. The new Law of higher education gave the universities more autonomy. Universities are entitled to develop their academic programmes, curricula, study and research plans, conduct exams, and grant degrees and certificates (including honorary degrees), in accordance with the policy of higher education</li> </ul>	<ul style="list-style-type: none"> <li>• Universities not only encourage research, but publishing quality papers is a prerequisite for tenure at the university. Universities differ in their promotion regulations, and hence level and quality of research varies</li> <li>• All universities have modest budgets for research</li> <li>• The Ministry of Higher Education and Scientific Research as well as the Higher Council for Science and Technology have research budgets that are also available to faculty members of the universities through competitive procedures</li> </ul>
7	Improve framework conditions for private investment in R&D	<ul style="list-style-type: none"> <li>• The Government of Jordan remains committed to further enhance the investment climate in Jordan and work towards introducing new measures aimed at implementing procedures related to starting a business, dealing with licenses, registering property, employing workers, and enforcing contracts.</li> <li>• STI policy and strategy 2012-2016 is considering Increasing</li> </ul>	<ul style="list-style-type: none"> <li>• It is a main problem for start-up companies and entrepreneurs, that no risk- capital is available. Even "normal" credits by banks require personal collaterals.</li> </ul>

<sup>4</sup> SESAME: <http://www.sesame.org.jo/directorate/directorate.aspx>



	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
		productivity and competitiveness, and private sector support for Research and Development	
8	Promote public-private cooperation and knowledge transfer	<ul style="list-style-type: none"> <li>• Jordan has also started to stimulate technology transfer between researchers and industry through the Commercialisation.</li> <li>• Launching a programme called Faculty for Factory. It aims at increasing the industrial activities to become more competitive as well as to improve the technological infrastructure.</li> <li>• A number of public-private initiatives have been launched to ensure that the outputs of the educational system meet the evolving demands of the global economy and that students are equipped with the tools to compete and excel in the market place.</li> </ul>	<ul style="list-style-type: none"> <li>• El Hassan Business Park is an example of public-private partnership between HCST and RSS contains iPARK (ICT Business Park), Queen Rania Centre for Entrepreneurship (QRCE), IPCO and Bedaya network.</li> <li>• Bedaya network connects Angel investors keen to invest in start-ups and early stage businesses with visionary entrepreneurs in need for funding to accelerate the growth of their companies</li> <li>• The Support to Research and Technological Development and Innovation Initiatives and Strategies in Jordan (SRTD) by expanding the technology transfer centre at the Royal Scientific Society centre to be the Intellectual Property Commercialisation Office (IPCO) for the kingdom and establishing eleven branch TT offices at universities, research centres and business organisations</li> </ul>
9	Enhance knowledge circulation	<ul style="list-style-type: none"> <li>• Scientific Research Support Fund (SRSF) is considering international dimension in some programmes.</li> </ul>	<ul style="list-style-type: none"> <li>• Most Jordanian universities have international research collaborations and exchange programmes with international institutions.</li> <li>• Most Jordanian universities have agreements with universities in the MEDA region; such agreements discuss mutual exchange of expertise, training and joint conferences.</li> </ul>
10	Strengthen international cooperation in science and technology	<ul style="list-style-type: none"> <li>• EU-JORDAN S&amp;T agreement considered the European Neighbourhood Policy (ENP) and EU strategy to strengthen the relations with the neighbourhood countries, in the frame of which the parties have met and agreed on action plan, one of which priorities was “to strengthen cooperation in science and technology”.</li> </ul>	<ul style="list-style-type: none"> <li>• Bi-regional cooperation is strengthened by The Monitoring Committee for Euro-Mediterranean Cooperation in Science and Technology (MoCo)</li> <li>• Bilateral cooperation: Cooperation is strengthened by number of agreements with Member States (Germany, France, Uk, etc)</li> </ul>

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
11	Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle	<ul style="list-style-type: none"> <li>• HCST is preparing the Science and Technology and Innovation Policy and Strategy (2012-2016) with the contribution of delegates from ministries and other governmental institutions alongside representatives from the private sector, universities and scientific research centres</li> </ul>	<ul style="list-style-type: none"> <li>• Little coordination is noticed among the institutions concerned with science and technology and innovation.</li> </ul>
12	Develop and sustain excellence and overall quality of research	<ul style="list-style-type: none"> <li>• The National R&amp;D priorities for the coming 10 years were determined in all scientific research fields by 14 sectoral committees. It is supposed that the funding agencies will fund R&amp;D projects that address these priorities.</li> <li>• The STI policy and strategy (2012-2016) focuses in three priorities: Water, energy and food security.</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing emphasis on prioritisation of research orientation.</li> <li>• There are significant efforts to strengthen quality in certain universities and research centres, but the large majority focuses on teaching and not high quality research.</li> </ul>
13	Promote structural change and specialisation towards a more knowledge - intensive economy	<ul style="list-style-type: none"> <li>• Introduction of sectoral policies</li> <li>• A special effort is given to establishing new technology based firms through the establishment of a network of incubators.</li> <li>• The Higher Council for Science and Technology has launched the Project for Preparation of the National Medical Biotechnology Strategy, which is one of the pillars of the "Development of the Life and Biotechnology Sciences in Jordan" initiative, launched by His Majesty King Abdullah the Second in 2005</li> </ul>	<p>The STI policy and strategy (2012-2016) is taking into consideration the Drivers of Change, with a view to help people identify and explore leading factors that will affect our world in the future. Three main drivers of change are water, energy and food security.</p> <ul style="list-style-type: none"> <li>• Jordan's National ICT Strategy outlines a number of objectives for the country to reach within the next three years, including encouraging the development of 35,000 jobs and pushing the Internet penetration rate towards 50%.</li> </ul>
14	Mobilise research to address major societal challenges and contribute to sustainable development	<ul style="list-style-type: none"> <li>• HCST has identified challenges- water, energy and food security; Water and environment technologies, Sustainable energy technologies are the main areas of cooperation between Europe and Jordan</li> <li>• King Abdullah II Fund for Development: KAFD seeks to justly distribute the gains of sustainable development among all governorates through establishing pioneering projects and encouraging creativity, on the backdrop of a true partnership</li> </ul>	<ul style="list-style-type: none"> <li>• The Royal Scientific Society's International Centre for Water, Energy and Environment brought researchers from the United States and Jordan together to elaborate proposals for the development and commercialisation of new EWE technologies.</li> </ul>

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
		<p>with the private sector and civil society institutions.</p> <ul style="list-style-type: none"> <li>• EDAMA initiative is a private-sector led initiative, which means 'sustainability' in Arabic. It is comprised of eight task forces whose participants represent a wide range of private and public sector institutions in Jordan. Their goal in EDAMA is to develop a comprehensive strategy that aims to enhance and develop the energy, water and environment sector (EWE) in Jordan, with the objective of making it a regional leader in EWE productivity</li> </ul>	
15	Build mutual trust between science and society and strengthen scientific evidence for policy making	<ul style="list-style-type: none"> <li>• National R&amp;D priorities were determined by 14 sectoral committees, each comprises a group of experts representing various national institutions such as public and private universities, scientific centres, ministries and public institutions, private sector and civil society.</li> </ul>	<ul style="list-style-type: none"> <li>• In formulating STI policy and strategy, the HCST achieves high level goals by adopting a participatory approach with the involvement of all S&amp;T stakeholders through multi-disciplinary and multi-institutional teams and national and international networking.</li> </ul>

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## 1 Introduction

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*The main objective of the ERAWATCH International Analytical Country Reports 2010 is to characterise and assess the evolution of the national policy mixes for the non-EU countries in the perspective of the Lisbon goals and of the 2020 post-Lisbon Strategy, even though they do not pursue these policies themselves. The assessment will focus on the national R&D investments targets, the efficiency and effectiveness of national policies and investments into R&D, the articulation between research, education and innovation. In doing this, the 15 objectives of the ERA 2020 are articulated.*

*Given the latest developments, the 2010 Country Report has a stronger focus on the link between research and innovation, reflecting the increased focus of innovation in the policy agenda. The report is not aimed to cover innovation per se, but rather the 'interlinkage' between research and innovation, in terms of their wider governance and policy mix.*

## 2 Performance of the national research and innovation system and assessment of recent policy changes

*The aim of this chapter is to assess the performance of the national research system, the 'interlinkages' between research and innovation systems, in terms of their wider governance and policy as well as the most recent changes that have occurred in national policy mixes in the perspective of the Lisbon goals. Each section identifies the main societal challenges addressed by the national research and innovation system and assesses the policy measures that address these challenges. The relevant objectives derived from ERA 2020 Vision are articulated in the assessment for comparison reasons.*

### 2.1 Structure of the national research and innovation system and its governance

*This section gives the main characteristics of the structure of the national research and innovation systems, in terms of their wider governance.*

Jordan is strategically situated at the convergence of the three continents: Europe, Asia, and Africa. It is therefore an ideal gateway for the Middle East and North Africa (MENA) region and beyond. Jordan realises the importance of capitalising on its abundant human resources to foster economic growth and development. With a population of 5.9 million that is growing at approximately 2.2% per year, Jordan boasts a relatively young population with almost 70% under the age of 30. Capitalising on its highly qualified graduate pool, Jordan has seen the emergence of several knowledge and skills centred industries such as ICT, outsourcing, pharmaceuticals, healthcare, clean tech and light manufacturing.

The public sector in Jordan has the highest percentage expenditure on R&D with expenditures of about 13,260,000 Euros (58% of GERD) as compared to around 8,308,000 Euros (36% of GERD) by the private sector. Within the private sector, manufacturing activities account for the highest share of R&D with an estimate of 5,149,000 Euros (62%) followed by business services at 17.2% and private education (13%)

The National Agenda sets ambitious targets to be achieved over the coming decade, among which are: Achieving an annual real GDP growth rate of 7.2 percent, reducing public debt from 91 percent to 36 percent of GDP, converting the public deficit of 11.8 percent of GDP into a surplus of 1.8 percent, increasing national Savings from 13 percent to 27 percent of GDP, and reducing unemployment from 12.5 percent to 6.8 percent of the active population by creating nearly 600 thousand jobs.

The government supports scientific research through two main umbrellas. The first being the Higher Council for Science and Technology (HCST), offers a myriad of programmes to support manufacturers and researchers in the country at large. The HCST aims at building a national scientific and technological base, and assisting in achieving economic, social and cultural development in the Kingdom. The HCST has been given the authority to ratify the general policy of science and technology in the



Kingdom by defining its priorities, drawing up the programmes and plans arising thereafter as well as following up on their implementation and evaluation. The second umbrella is the Scientific Research Support Fund (SRSF) at the Ministry of Higher Education and Scientific Research which was established in 2007 upon Royal directives, with the aim of developing research skills and infrastructure to boost the country's competitive environment in ecological, water, and technological applications.

Jordan's ability to undertake scientific research was enhanced through the creation of private and public scientific institutions, of which 193 are involved in science and technology. Of these institutions, 82 have laboratory facilities totalling 379 laboratory units.

The Kulluna al Urdun or "We are all Jordan" initiative provides for a comprehensive policy framework for Jordan's future development. It targets in particular the "Higher Education and Scientific Research" field by proposing solutions for tackling unemployment among university graduates, e.g. through building and creating "technological incubators and business incubators". It targets also the "Scientific Research" field, by pointing out the necessity to increase the number of joint research projects between local researchers and their counterparts abroad, to motivate the private sector to participate in research and development projects, to particularly support the research projects that may be developed into productive investment projects.

The National R&D priorities for the coming 10 years were determined in all scientific research fields by 14 sectoral committees, each comprising a group of experts representing a range of national institutions such as public and private universities, scientific centres, ministries and public institutions, private sector and civil society. The total number of participants was 147 experts, in addition to the members of the steering and technical committees.

The National Science and Technology and Innovation policy and strategy (2012-2016) is under preparation, as a follow up of the National Science and Technology and Innovation policy and strategy (2006-2010). The Higher Council for Science and Technology is in the process of reviewing it and preparing for the new policy and strategy for the years (2012-2016) with financial assistance from the Japanese government through UNESCO. The STI policy and strategy (2012-2016) is taking into consideration an initiative called "Drivers of Change" which is a campaign that seeks to raise public awareness of local, regional and global issues that affect the future. The main drivers of change include water, energy and food.

An appropriate awareness of needs for innovation policy exists on all levels of the Jordanian NIS. There is no written national innovation policy available yet.

### **Main research performer groups**

The major research performers in Jordan include universities, El-Hassan Science City which includes the Higher Council for Science and Technology (HCST), the Royal Scientific Society (RSS), the Princess Sumaya University for Technology (PSUT) and El Hassan Business Park, in addition to R&D centres.

The number of public universities has reached (10), besides (19) universities that are private and (51) community colleges; this is in addition to the World Islamic Sciences and Education University. This progress in numbers of universities accompanied by significant increase in number of students enrolled to study in these universities.

The main research centres include the [National Centre for Human Resources Development](#), [National Centre for Diabetes, Endocrine and Inherited Diseases \(NCDEG\)](#), and National Centre for R&D which are affiliated to the HCST, in addition to the [National Centre for Agricultural Research and Extension \(NCARE\)](#) which is affiliated to the Ministry of Agriculture.

**Main actors and institutions in the research and innovation system**

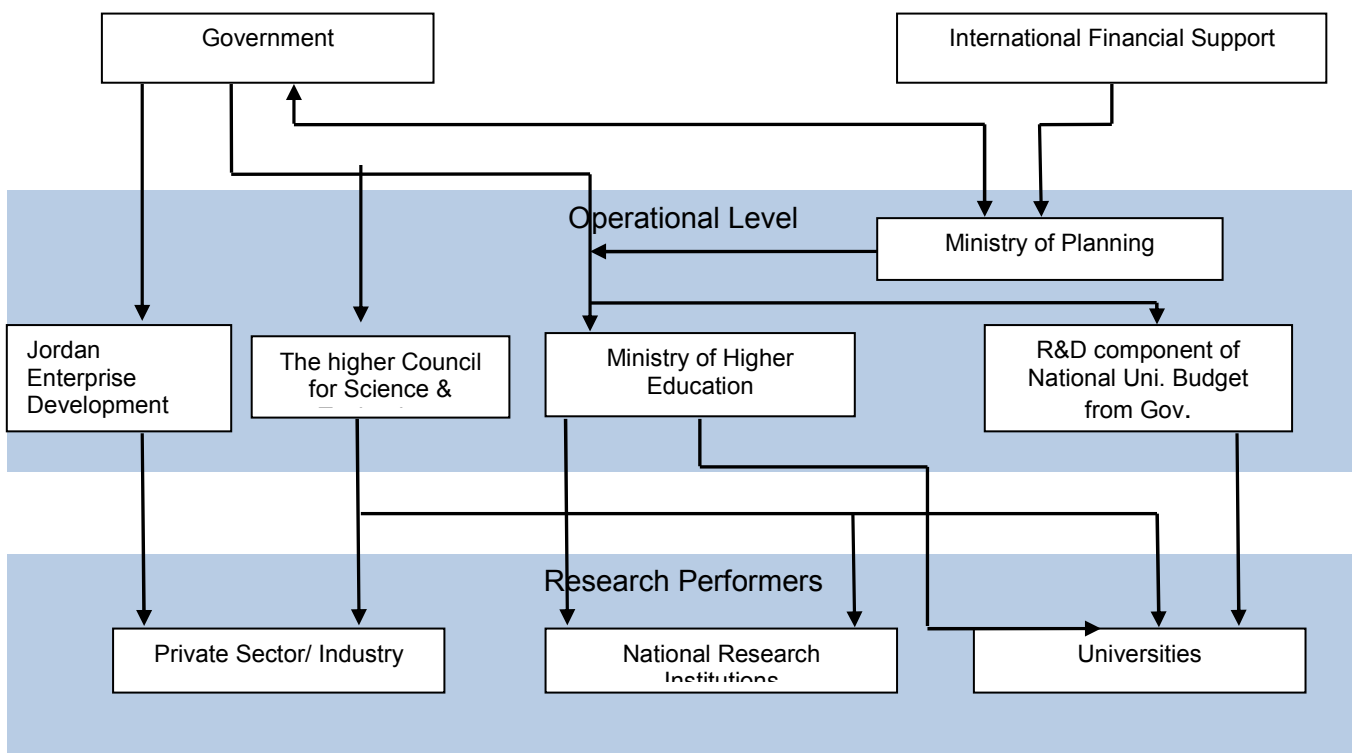
The main players for setting scientific research policies, strategies, and coordination in Jordan are [The Higher Council for Science & Technology](#) and [the Ministry of Higher Education & Scientific Research](#).

On behalf of the government, the Higher Council for Science and Technology (HCST) develops national research strategies for five-years-periods. All relevant ministers and stakeholders are involved in the development of the strategy (Ministry of Planning and International Cooperation, Ministry of Industry and Trade, Ministry of Finance, Jordan Enterprise for Development Corporation (JEDCO), etc).

The responsibilities of the Higher Council for Science and Technology included the ratification of the National Science and Technology and Innovation Policy for the Kingdom, defining its priorities, establishing the related programmes and plans and following up on their implementation and evaluation. The policy is in accordance with the direction of the Jordanian developmental plans, and their definitions of target sectors for national science and technology policy and related strategies.

The Ministry of Higher Education and Scientific Research is responsible for the institutional set up of education and scientific research and supervises universities. Lately it is also directly intervening in research through the Scientific Research and Support Fund.

**Figure 1: Structure of the Jordanian research system**



## The institutional role of regions in research and innovation governance

One fifth of the inhabitants live in Amman and desert covers most of the country. One third of the Jordanian population is living in Zarqa and Irbid and about half of the Jordan industry is situated in Zarqa. Both cities are situated in the north of Jordan. Regional innovation policies for Amman, Zarqa-Irbid region as well as for the rest of the country are strongly needed in order to implement regional-specific and demand oriented innovation policies. However, as yet policies remain strongly centralised.

Besides, Jordan has established "Qualified Industrial Zones" (QIZ), where laws provide for tax and tariff exemptions and other economic issues. In these zones, foreign companies find suitable economic frameworks. This is done mainly by the influence of the United Nations to ease conditions for Palestinian refugees. These QIZs could become an important part of the NIS, especially supported by regional innovation policy in the future.

There are no regional R&D policies. There are universities and incubators in the whole territory but they are supervised and funded by the national authorities.

### 2.2 Resource mobilisation

*This section will assess the progress towards national R&D targets, with particular focus on private R&D and of recent policy measures and governance changes and the status of key existing measures, taking into account recent government budget data. The assessment will include also the human resources for R&D. Main assessment criteria are the degree of compliance with national targets and the coherence of policy objectives and policy instruments.*

#### 2.2.1 Resource provision for research activities

In Jordan Governmental funding of S&T and R&D activities is through two main governmental sources; the first is directly from the Ministry of Finance and goes to universities and other organisations such as the Higher Council for Science and Technology in the form of institutional funding. In the past few years there has been very little, if any, growth in the funds that the Ministry of Finance is allocating because of the pressures caused by rising energy costs and other external factors. The second source of financing for R&D activities is through the R&D fund of the Ministry of Higher Education and Scientific Research. This fund is using a special levy of publicly traded companies by 1% of their annual profits. This source of funding is distributed via competitive calls. Other less significant sources are funds allocated to R&D through international and bilateral agreements as well as donors' programmes.

The Higher Council for Science and Technology (HCST) funds R&D projects on a case-by-case basis. After evaluation of the proposal and its approval, funding is provided with a pre-defined project plan and deliverables. Water, energy and food security are the main priorities that HCST considers in evaluating the submitted proposals.

The Scientific Research Support Fund (SRSF) at the Ministry of Higher Education and Scientific Research was established in 2007 upon Royal directives, with the aim of developing human research resources and infrastructure to boost the country's competitive environment in ecological, water, and technological applications' domains.

SRSF has financed research projects in the fields of energy, water, and healthcare. The fund's financing also covered programmes to determine Jordan's scientific research priorities and to document nomadic heritage.

## 2.2.2 Evolution of national policy mix geared towards the national R&D investment targets

The policy mix, as in all emerging economies, focuses mainly on direct public support to R&D with a secondary mission aiming at enhancing the cooperation between universities and the industry. Public incentives are used to increase R&D companies (whether they are R&D performers or not) A special effort is given to establishing new technology based firms through the establishment of a network of incubators. National development policies in conjunction with those of the National Agenda envisage primarily the creation of critical mass.

Recognising the cost disadvantage to the industry, the Prime Minister in 1999 exempted manufacturers of all customs fees on imported raw, packaging and other inputs. In addition, the industry benefits from a tax holiday on 4% universities tax. Despite the numerous tax incentives, R&D is not consistently incentivised through tax breaks. Only 17% of companies indicated that R&D tax incentives exist. Overall, current tax rates appear to be in line with international levels in the industry, hovering between 25 and 30% tax on profit.

In spite of several bright spots, Jordan's overall business environment is constraining business growth and investment. Reform is much slower than other countries in the region. As highlighted by the World Bank "Doing Business Indicators", the specific weaknesses in Jordan include: protecting investors, registering property, enforcing contracts, and starting a business. Compared to top global performers, Jordan's business environment imposes many risks, delays and transaction costs. Jordan's score in the Economist Intelligence Unit's business environment ranking rises from 5.91 (2004-2009) to 6.13 in the forecast period (2010-2014), however, its global ranking dips slightly, where its regional ranking is unchanged.

In Jordan, the private sector accounts for only 3 per cent of research funding. Research is largely supported by the government (70 per cent) and through university fees (27 per cent), according to the World Bank's annual report for 2006.

And the 1% R&D Tax law is a first step towards increasing BERD. The share of 36% of GERD implemented by the business sector is indicative of the total private performance, but is not identical to intramural.

A large number of laws and regulations were amended and investment related laws were streamlined. The regulatory environment seeks to open and improve integration, reduce bureaucracy, simplify procedures, as well as facilitate services offered to local, Arab, and foreign investors to come and invest in Jordan. The Government of Jordan remains committed to further enhance the investment climate in Jordan and work towards introducing new measures aimed at implementing procedures related to starting a business, dealing with licenses, registering property, employing workers, and enforcing contracts.

Foreign direct investment in Jordan increased 81% on average from 2001 to 2005. FDI is reported to have doubled in 2006 from USD \$1.5 billion in 2005. Domestic credit grew by 40% from 2005 to 2006.

It is a main problem for start-up companies and entrepreneurs, that no risk- or venture capital is available. Even "normal" credits by banks require complete guarantees. These guarantees have to be given by the entrepreneur himself or his family. This is a very strong barrier for entrepreneurs.

Business promotion agencies are highly recognised as tools to support firms in certain innovation matters and seem to play a comparable strong role in Jordan. Also innovation service providers are assessed to be further developed than the other institutional innovation supporters. The Jordanian government, partly supported by external donors, spent significant efforts to support business promotion agencies and certain innovation service providers in the past years.

There is hardly any direct extramural R&D expenditure. There are however programmes in place, to encourage the private sector to utilise Jordanian research organisations in conducting relevant research and development on their behalf.

### 2.2.3 Providing qualified human resources

Jordan invests heavily in its human resources development (HRD), and in the attempt to stimulate economic and social development through HRD, Jordanian planners and decision-makers, have long built the foundation of its economy on a well-educated population. This policy has been reflected by the frequently cited saying of His Majesty the Late King Hussein, "Our precious resource is our people".

The education system of the Hashemite Kingdom of Jordan has improved consistently since the mid-1900s. The role played by a good education system has been significant in the development of Jordan from a predominantly agrarian to an industrialised nation. [Nature journal](#) reported Jordan having the highest number of researchers in research and development per million people among all the 57 countries members of the Organization of the Islamic Conference OIC. In Jordan there are 2,000 researchers per million people, while the average among the members of OIC is 500 researchers per million people.

In 2003 the share of budget dedicated to education was 6.4 percent of total government expenditure; education spending as a percentage of GDP was 13.5 percent in the same year<sup>5</sup>. At 8.9 percent, Jordan has the third lowest illiteracy rate in the Arab world. The primary gross enrolment ratio has increased from 71 percent in 1994 to 98.2 percent in 2006. Transition rate to secondary school, during the same period, has increased from 63 percent to 97 percent and transition rates to higher education have varied between 79 to 85 percent of secondary school graduates. Along with these high enrolment and transition rates, Jordan has achieved a 90 percent parity in literacy and full parity in primary and secondary enrolment.

According to the [United Nations report 2006](#), Jordan is ranked 90 out of 177 in the Human Development Index.

Jordan has forged a comprehensive, high-quality system to develop the human capital of its citizens. The government has, as a matter of policy, provided every village and community with 10 or more school-going children with a school. As a result, the rapid spread of facilities enabled citizens in poor and remote areas to gain access to education. Education is free for all primary and secondary school students, and compulsory for all Jordanian children through the age of fifteen. There is a very small disparity in primary school attendance rates between urban and rural areas. Similarly unusual, there is almost no drop off of enrolment rates in gross secondary school

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<sup>5</sup> [http://en.wikipedia.org/wiki/Education\\_in\\_Jordan](http://en.wikipedia.org/wiki/Education_in_Jordan), <http://www.virtualcampuses.eu/index.php/Jordan>



enrolment. Women comprise a large percentage of Jordan's higher education attendees.

Students in the secondary education level are required to take 9 subjects; Arabic, English, Mathematics, Social Studies, Computer Studies, Earth Science, Chemistry, Biology, and Physics. Islamic studies are also mandatory for all students except for Christian students. The Secondary Education level consists of two years' study for students aged 16 to 18 who have completed the basic cycle (10 years) and comprises two major tracks:

- 1- Secondary education, which can either be academic or vocational. At the end of the two-year period, students sit for the general secondary examination (Tawjihi) in the appropriate branch and those who pass are awarded the Tawjihi (General Secondary Education Certificate). The academic stream qualifies students for entrance to universities, whereas the vocational or technical type qualifies for entrance to Community Colleges or universities or the job market, provided they pass the two additional subjects.
- 2- Vocational secondary education, which provides intensive vocational training and apprenticeship, and leads to the award of a Certificate (not the Tawjihi).

Queen Rania Center for Entrepreneurship (QRCE) conducts on yearly basis "Made in Jordan Competition-MIJC" with training courses involving Jordanian professionals and senior university students in the fields of technology engineering and information technology.

Intrinsic Management Services signed an agreement with the Jordanian Engineers Association (JEA) to provide project management training and certification programme to Jordanian Engineers.

The MIJC aims to extract innovations from Jordanian universities and researchers focusing on graduate and postgraduate research projects and theses with the goal of developing industrial and software prototypes that will solve challenges and problems for different industries in Jordan and the region. The MIJC has three major categories: graduation projects of undergraduate students in their final year, university and research staff (holders of Higher Diploma, Master, PhD, and researchers, and finally professionals representing themselves, provided they are not being funded from their employers. The MIJC winning prototypes receive cash awards and in-kind that aims to commercialise and introduce them to the global market as products with high value.

Trends in International Mathematics and Science Study (TIMSS) Report in 2003, ranked Jordanian students scores to be 22 points above international average in science and mathematics.

In 2001, His Majesty King Abudallah II proposed a visionary initiative, to revamp the quality of human resource performance in most government sectors. In particular, he wished to raise the HEI level to be on a par with the international standards. Since then, this process is underway with regards to ICT in the field of education. The integration of ICT not only changes the characteristics of implementing new teaching or learning forms, but also results in innovations at the micro-, meso- and macro-

levels. The micro-level is the level of teaching and learning. The structure of the university is considered to be the meso-level. The macro-level is the policy level. This caused succeeding governments to establish different plans and agendas in an attempt to increase the quality of higher education and its handling of scientific, economic, technological and social challenges.

The Ministry of Higher Education and Scientific Research worked on bridging the gap between higher education output and labour market in order to respond to the present and future needs of qualified and specialised cadres in various areas of knowledge; and to compensate for the lack of natural resources in the region by creating a qualified human resources fortified by knowledge and efficiency.

Generic educational policies are at present the only way to enrich the human resources potential of the country. Tertiary Education is of high quality but the share of the population holding S&E Degrees and PhDs are very low. There are no explicit brain-gain measures but informal cooperation with Diaspora Jordanian researchers is sometimes very beneficial.

By the 1980s, Jordan was facing a labour market crisis. The country was experiencing high rates of unemployment among educated young people, particularly in medicine, engineering, and teaching. At the same time there was an acute shortage of skilled technical labour. While the government had begun to expand its vocational and technical training programmes in the 1970s-80s, skilled labourers left Jordan for lucrative jobs in the Persian Gulf and Saudi Arabia.

### **2.3 Knowledge demand**

*This section focuses on structure of knowledge demand drivers and analysis of recent policy changes.*

#### **Structure of knowledge demand drivers**

Knowledge demand is very limited in Jordan due to the structure of the business sector. Only energy and water resources make an exception.

In Jordan lack of energy resources and acute water scarcity are significant inhibitors for sustained economic growth. Traditional means and technologies for employing energy and water in the country are becoming increasingly inadequate in Jordan and Jordan must rethink how such resources are employed and conserved.

A number of Jordan's private firms recognised the challenge and approached USAID's Jordan Economic Development Program (SABEQ) to partner with it and the Government to address the energy and water challenges through a focused effort to bring the partners together in an initiative similar to the REACH initiative that built the information technology sector a decade ago. The goal is to create a clean tech and water entrepreneurship cluster in Jordan, through the identification of business opportunities, and capacity building to meet local, regional, and global needs.

To date, the partners have begun to build the foundations to support economic growth through renewable energy and water activities. The Ministry of Environment created the Environment Fund that will provide technical and financial support to accelerate the capacity of entities to comply with national environmental laws. A Carbon Trading National Plan was also put in place resulting in less time required to certify projects and sign agreements with potential buyers to increase the prices for traded carbon, and the trading opportunities.



EDAMA (which means “renewable” in Arabic) initiative – a joint private sector and public sector effort with 8 working groups that drafted comprehensive action plans in key areas to work towards innovative and environmentally sustainable solutions for energy and water independence. Now the partnerships are implementing these plans.

The initial initiatives developed are geared to yielding long term results, including creating jobs attracting foreign direct investments, establishing new clean tech firms, increasing Jordan’s energy, water, and environment productivity.

## **2.4 Knowledge production**

*The production of scientific and technological knowledge is the core function that a research system must fulfil. While different aspects may be included in the analysis of this function, the assessment provided in this section focuses on the following dimensions: quality of the knowledge production, the exploitability of the knowledge creation and policy measures aiming to improve the knowledge creation.*

### **2.4.1 Quality and excellence of knowledge production**

The knowledge- and technology-based sectors that are increasingly highlighted as the sectors of the future in the region are the sectors of today in Jordan: medical services, pharmaceuticals, information technology services, education services and cultural tourism among others. Jordan’s legacy as a leading “knowledge-driven” economy in the Arab world means that this shift in the economic landscape presents a unique opportunity for Jordan to build on its strengths. Global recognition of Jordan as a cornerstone for stability in the region is growing. Businesses and governments worldwide are increasingly aware of and interested in the Middle East as a crossroads for Europe, Africa and Asia. The world is turning to Jordan for leadership in the Middle East as its neighbours struggle with varying degrees of domestic socio-political unrest.

In 2005, Jordan introduced a law whereby 1% of the net profit of public shareholding companies was transferred to a special R&D fund to finance research. Another law has since been introduced that compels public and private universities to allocate 5% of their budgets annually to R&D.

Based on The UNESCO Science Report 2010; Status of Science, Technology and Innovation in the Arab States, there have been initiatives to boost STI in the region, such as the world-class international <sup>7</sup>SESAME synchrotron facility in Jordan. SESAME will enable scientists to work together across countries and cultures within the same research facility. UNESCO calls it a model project for other regions, as it has brought together people from nine countries and territories who do not all see eye to eye politically. In 2009, the members of SESAME were Bahrain, Cyprus, Iran, Israel, Jordan, Pakistan, the Palestinian Authority and Turkey.

El Hassan Science City, Launched in April 2007, is a conducive environment in which scientists, researchers, academics, entrepreneurs and students are given the opportunity to promote a knowledge based economy by innovating and disseminating their intellectual wealth.

Concerning the Arab private sector, by all accounts, spending is minimal. Out of 131 countries studied, Tunisia ranked 36th in terms of private companies’ expenditure on R&D. Qatar and the United Arab Emirates both ranked 42nd, and Jordan ranked 96th.

Among non-oil economies, Jordan achieves the highest score for the Knowledge Economy Index (KEI) index, closely followed by Oman and Lebanon. Morocco, on the other hand, has some way to go for the education and innovation parameters used to calculate the KEI, even though it boasts a high rate of Internet penetration. The total number of students enrolled in tertiary education has increased significantly in Algeria, Jordan, Lebanon, Oman, the Palestinian Autonomous Territories, Saudi Arabia and Tunisia.

Jordan has ten public and fourteen private universities as of 2009. The University of Jordan was the first to be established in 1964. A public university is established by a decision from the cabinet and endorsed by a royal decree. Private higher education started in Jordan in 1989, and establishing a private university requires a decision from the Board of Higher Education.

The number of graduate students in Jordan in 2009 was about 17,540; out of which, 8,025 were females, thus female ratio is about 45%. Out of the graduate students, 13,555 students were (about 77% of the total) study for the Master's degree, 2260 students (about 13% of the total) study for the Ph.D., and about 1725 students (less than 10% of the total) study for the higher diploma. If we look at the female ratios, we find that about 46% of those studying for the Master's degree are females, while the female ratio among the Ph.D. students is only about 32%. Ratio of female students in the higher diploma programmes is about 61%. The great majority of the graduate students are enrolled in public universities. Their numbers in these universities are 12,094 in the Master's programmes, 1623 in the Ph.D. programmes, and all the students in the higher diploma. Therefore, more than 78% of all the graduate students are in public universities, while those at private universities are less than 22%.

The following table shows number of applications and patents registered from Jordan as provided by the patent office/ Ministry of Industry and Trade:

Year	National Applications	International Applications	National Patent	International Patent	Total Patent	Granted
2005	49	169	9	46	55	
2006	75	428	10	50	60	
2007	59	507	23	40	63	
2008	50	535	10	11	21	
2009	60	446	11	40	51	
Oct 2010	36	344	19	52	71	

#### 2.4.2 Policy aiming at improving the quality and excellence of knowledge production

The integration of ICT not only changes the characteristics of implementing new teaching or learning forms, but also results in innovations at the micro-, meso- and macro-levels. The micro-level is the level of teaching and learning. The structure of the university is considered to be the meso-level. The macro-level is the policy level.

The Higher Education Institutions Accreditation Commission (HEIAC) was established in 2007 after its Law was issued in March 2007. This Commission replaced the

Accreditation Council, which lasted from 1999 to 2007. The Commission is autonomous, from financial and administrative points of view. The 2007 Law of the Accreditation Commission was amended in 2009 to make the Commission report to the Prime Minister instead of the Minister of Higher Education. The Commission aims at enhancing the quality of higher education, provides quality control, and encourages Jordanian higher education institutions to be open and interact with international institutes and organisations in charge of accreditation and quality control. It also aims at the development of higher education using international norms and standards. On the other hand, the reporting of the Commission does not affect the way funds are distributed to universities

The National Centre for Human Resources Development which is affiliated to the HCST played an essential role in developing qualitative programmes, supporting development policies, conducting studies, preparing special indices in the field of education and technical and vocational training aiming to advance the competitive capability of Jordanian capacities, and improving the quality of the outputs of educational and training systems in various fields.

The Ministry of Planning and International Cooperation is responsible for the overall development model. Other ministries are occasionally involved in supporting research in their respective fields of competence.

## **2.5 Knowledge circulation**

*This section provides an assessment of the actions at national level aiming to allow an efficient flow of knowledge between different R&D actors and across borders.*

### **2.5.1 Knowledge circulation between the universities, PROs and business sectors**

Tackling the challenges that societies face in the 21st century will require a multi-disciplinary approach and coordinated efforts. Many debates and conferences, e.g. the Lund Declaration recognise that such complex issues cannot be solved by single institutions, technology sectors or MS acting alone. Hence strong interactions within the "knowledge triangle" (education, research and innovation) should be promoted at all levels. Moreover, in the context of increasing globalisation, cross-border flows of knowledge are becoming increasingly important. This section provides an assessment of the actions at national level aiming to allow an efficient flow of knowledge between different R&D actors and across borders.

Determinants related to technology transfer centres, technology/science parks and clusters are rated below average. Jordan has stimulated technology transfer between researchers and industry by launching appropriate programmes, like Faculties for Factory. It aims to increase the industrial activities to become more competitive as well as to improve the technological infrastructure. In 2010, the Support to Research and Technological Development and Innovation Initiatives and Strategies in Jordan (SRTD) expanded the technology transfer centre at the Royal Scientific Society centre to be the Intellectual Property Commercialisation Office (IPCO) for the Kingdom and established eleven branch TT offices at universities, research centres and business organisations. King Abdullah II Fund for Development: KAFD seeks to justly distribute the gains of sustainable development among all governorates through establishing pioneering projects and encouraging creativity, on the backdrop of a true partnership with the private sector and civil society institutions.

The “faculty for each factory” programme was launched in year 2003, with 20 universities from the faculty of Engineering at the University of Jordan. The number of universities increased to become 36 participants from four universities in 2004. As for 2005, 64 participants from 6 universities participated in 2008, there were 152 participants in 145 companies and up until the seventh cycle in 2009, there were 125 participants in 111 companies. The participants were from different Jordanian (public and private) universities.

Spin-outs originating from research institutions are usually set up when there is no existing business to approach about a significant breakthrough in a field of work or because the work has clear possibilities to generate many products and applications and so potentially could be extremely valuable. There is no data available on the number of spin outs and their evolution.

Monojo is an example of a pioneering biotechnology company, established in 2005 as a private shareholding company and a spin-off from the National Centre for Biotechnology, which is affiliated to the Higher Council of Science and Technology.

Agreements related to scientific and technological research in collaboration with local, Arab, regional and international organisations have been increasingly signed. Among which is the S&T agreement with EU (November 2009). (More details are mentioned in section 3.6.1).

El Hassan Business Park is an example of public-private partnership between HCST and RSS contains iPARK (ICT Business Park), Queen Rania Centre for Entrepreneurship (QRCE), IPCO and Bedaya network. Bedaya network connects Angel investors keen to invest in start-ups and early stage businesses with visionary entrepreneurs in need for funding to accelerate the growth of their companies.

Bedaya effectively implements a process of matching innovative companies with investors.

The Board of Higher Education, as well the Boards of Trustees and University Councils have good representation of people from the enterprises (industry, services sectors, etc.) but only limited numbers of faculty and department councils have some (few) representatives from enterprises. Overall, involvement of employers in defining the curriculum is still very limited. Several programmes of study (especially in professional areas) include practical and/or internship component. These are indeed very useful in introducing students to the employers and this often helps good students to secure jobs right after graduation. Universities have been doing job fairs lately where they invite employers to the campus, and this provides opportunities to students to meet with potential employers. Most universities established alumni associations, and this helps keep alumni and their employers in touch with the universities and their students.

### **2.5.2 Cross-border knowledge circulation**

Jordanian institutes are in general quite open to international cooperation. Public institutes regularly send their best students on scholarships to obtain higher degrees (Ph.D. in particular) in order to come back and teach at the university after graduation. Some private universities have been doing this also but on very limited scale because of the cost factor. Where internship or elective courses are part of the study plans, universities facilitate to their students doing such periods outside Jordan if the student has financial capability to do so. In the case of German-Jordanian University, it

requires all its students to do several months internship in Germany as part of graduation requirements.

According to the Jordan International Education Fair, 2011, there are about 64,000 Jordanian Students studying abroad.

In the academic year 2000/2001, there were 31,003 Jordanians studying abroad, this number dropped to 25,220 in 2005/2006 only to rise again to 28,854 in 2008/2009. Among them, females represented around 20%. The main destinations of this emigration were the United Arab Emirates, Syria, Egypt, US, Germany, Ukraine and Russia.

As to foreign students in Jordan, this has been a common phenomenon in the last decade; especially female students. The number of non-Jordanian students enrolled in institutions of higher education was 24,669 in 2006 and increased to 27,871 students in 2009. 27.1% of all non-Jordanian students in 2006, 30.6% in 2009 were females and 20.7% of all non-Jordanian professors in these universities were women. Female foreign academics mainly originate from other Arab countries.

Universities in Jordan try to promote their institutes to attract students from other countries. They participate in academic fairs in the region for this purpose. The environment in the country and simplicity of life are attractive factors, especially for students from nearby countries. Finally, most universities in Jordan have a number of agreements or memoranda of understandings with many universities outside Jordan for the purposes of academic exchange. Some of such agreements have led to excellent cooperation over the past few decades. For example the German-Jordanian University concluded a number of agreements with main industries in Jordan and Germany to allow students do their internships and teaching faculty to spend some time at industry

Research organisations in Jordan have demonstrated some interest in the People programme and they are mainly involved in the International Research Staff Exchange Scheme (IRSES) action (described below in Section 3.5.1).

### 2.5.3 Main societal challenges

Because of the scarcity of water in the Middle East, water-related issues are invariably a source of tension among the countries. The Jordan River basin has a shortage of water, and what is there is claimed by all riparian countries—Jordan, Syria, the West Bank and Gaza, and Lebanon.

Global warming, global climate and global environment protection have become a key issue for worldwide political and industrial actions. **Water and environment technologies, Sustainable energy technologies** are the main areas of cooperation between Europe and Jordan as through its Neighbourhood Policy the EU is seeking to secure its borders by promoting a ring of well-governed countries to the East and South of Europe.

Jordan still confronts several challenges, including those that will arise from the recent global economic slowdown. Challenges include vulnerability to fluctuations in the international oil market, due to the country's high energy import dependency, high unemployment and dependency on remittances from Gulf economies and increasing pressure on natural resources, especially water. The greatest challenge (and also the largest opportunity) remains the necessity to create adequate conditions for increased private investment and improved competitiveness.



## 2.6 Overall assessment

Jordan is strategically situated at the convergence of the three continents: Europe, Asia, and Africa. It is therefore an ideal gateway for the Middle East and North Africa (MENA) region and beyond. Jordan realises the importance of capitalising on its abundant human resources to foster economic growth and development. With a population of 5.9 million that is growing at approximately 2.2% per year, Jordan boasts a relatively young population with almost 70% under the age of 30. Capitalising on its highly qualified graduate pool, Jordan has seen the emergence of several knowledge and skills centred industries such as ICT, outsourcing, pharmaceuticals, healthcare, clean tech and light manufacturing.

The public sector in Jordan has the highest percentage expenditure on R&D with expenditures of about 13,260,000 Euros (58% of GERD) as compared to around 8,308,000 Euros (36% of GERD) by the private sector. Public administration, defence and compulsory social security account for 7,268,000 Euros (55%), followed by education expenditure equals 2,251,000 Euros (17%) and business services equalling 2,009,000 Euros (15.1%). If these figures are accurate a remaining 6% flows in from abroad.

Within the private sector, manufacturing activities account for the highest expenditures on R&D with an estimate of 5,149,000 Euros (62%) followed by private education constituting (13%) and business services at 17.2%.

An appropriate awareness of needs for innovation policy exists on all levels of the Jordanian NIS. There is no written national innovation policy available yet. The HSCT is preparing the National Science and Technology and Innovation policy and strategy (2012-2016).

In Jordan Governmental funding of S&T and R&D activities is through two main governmental sources; the first is directly from the Ministry of Finance and goes to universities and other organisations such as the Higher Council for Science and Technology in the form of institutional funding. In the past few years there has been very little, if any, growth in the funds that the ministry of finance is allocating because of the pressures caused by rising energy costs and other external factors. The second source of financing for R&D activities is through the R&D fund of the Ministry of Higher Education and Scientific Research. This fund is using a special levy of publicly traded companies by 1% of their annual profits. This source of funding is distributed via competitive calls. Other less significant sources are funds allocated to R&D through international and bilateral agreements as well as donors' programmes.

**Table 1: Summary of main policy related opportunities and risks**

Domain	Main policy opportunities	Main policy-related risks
Resource mobilisation	<ul style="list-style-type: none"> <li>• Prioritisation of scientific activities via the creation of HCST</li> <li>• High percentage expenditure on R&amp;D by Public sector</li> <li>• The Higher Council for Science and Technology (HCST) funds R&amp;D projects directed towards S&amp;T priorities.</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of effective monitoring and evaluation instances</li> <li>• Low expenditure of the private sector;</li> </ul>
Knowledge demand	<ul style="list-style-type: none"> <li>• Future increase in S&amp;E graduates</li> </ul>	<ul style="list-style-type: none"> <li>• Limited demand for new knowledge, especially from the business sector</li> </ul>

	<ul style="list-style-type: none"> <li>• Raising awareness of SMEs to encourage their involvement in the R&amp;D related activities</li> </ul>	<ul style="list-style-type: none"> <li>• No risk capital availability</li> </ul>
Knowledge production	<ul style="list-style-type: none"> <li>• Need for improving university departments and research institutes' quality</li> </ul>	<ul style="list-style-type: none"> <li>• Bottlenecks in terms of infrastructure and equipment</li> <li>• Lack of interest might spur quality enclaves not necessary pertinent for the need of the private sector</li> </ul>
Knowledge circulation	<ul style="list-style-type: none"> <li>• Stimulating technology transfer between researchers and industry</li> <li>• Increase in the number of signed S&amp;T Agreements with local, Arab and international organisation</li> </ul>	<ul style="list-style-type: none"> <li>• Gap between research and industry</li> <li>• Little coordination among interested entities in both sides (research and industry)</li> </ul>

A positive sign is that great emphasis is placed on the internationalisation of research activities (bilateral and multilateral agreements, greater stimulation to participate in EU programmes, international collaboration) in the country. This may contribute successfully to strengthening the platform for higher R&D investments.

**Table 2: Main barriers to R&D investments and respective policy opportunities and risks**

<b>Barriers to R&amp;D investment</b>	<b>Opportunities and Risks generated by the policy mix</b>
Absence of an adequate institutional framework for investments to coordinate and unify investment policies	The government's ability to formulate, plan and execute economic and investment policies in a coherent and coordinated manner.
Gaps in infrastructure quality and its high costs	Investments in the Jordanian R&D infrastructure, accompanied by public funding.
Inflexible labour laws and complex tax structures.	<ul style="list-style-type: none"> <li>• Reforming taxation and tax administration</li> <li>• Providing demand-driven skills training for workers,</li> <li>• Providing greater opportunities for private employment agencies to operate in Jordan's labour market</li> <li>• Developing the capacity of insolvency administrators.</li> </ul>
No risk- or venture capital is available. Even "normal" credits by banks require complete guarantees.	A clear and stable policy as well as providing continuous funding on incubators as a central element for the support of entrepreneurship.



## 3 National policies which correspond to ERA objectives

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### 3.1 Labour market for researchers

#### 3.1.1 Stocks and mobility flows of researchers

The Ministry of Higher Education and Scientific Research worked on bridging the gap between higher education output and labour market in order to respond to the present and future needs of qualified and specialised cadres in various areas of knowledge; and to compensate for the lack of natural resources in the region by creating a qualified human resources fortified by knowledge and efficiency.

In Jordan there are 2,000 researchers per million people, while the average among the members of Organization of Islamic Conference (OIC) is 500 researchers per million people.

Generic educational policies are at present the only way to enrich the human resources potential of the country. Tertiary Education is of high quality but the share of the population holding S&E Degrees and PhDs are very low. There are no explicit brain-gain measures but informal cooperation with Diaspora Jordanian researchers is sometimes very beneficial.

The proportion of the Non-Jordanian female students enrolled in Jordanian Higher Education Institutions is higher among those who are enrolled in the “higher diploma degree” though it dropped from 51.5% in 2006 to 42.6% in 2009. On the other hand, the numbers are lower among students enrolled in doctoral programmes, despite the increase from 17.6% in 2006 to 21.9% in 2009.

In 2009, there were 7,613 academic workers in Jordanian universities, of which 11.8% were foreign and of whom 23.2% were females.

The brain drain started long time ago when Jordan was seen as a source of highly educated, productive and reliable academic cadres. However, the worsening economic situation of the academic staff served to intensify their migration especially to Gulf Cooperation Council (GCC) Countries.

#### 3.1.2 Providing attractive employment and working conditions

Most of the scientific research in Jordan is conducted by academic staff at public and private universities and at research centres affiliated to those universities. Nevertheless, a small percentage of academic staff is intensely active in research. Their research aims principally at getting promotion and most professors who get close to or the highest promotion level withdraw from research.

Universities rely on PhD holders, however, experienced people from the world of business, international organisations and civil society should be involved in teaching to produce new ideas into study programmes.

Jordanian universities have criteria for the promotion of academic staff including research output, effective teaching, learning, and the service of the community. The fact is that the most important criteria for the promotion of research staff, is research

output and the third criterion for promotion is not taken into consideration. Faculty members are promoted essentially on the basis of articles published mostly in local journals. Books published citations of journal articles, grants, awards and honours and service to the community are not given the importance they deserve.

The salaries are not attractive enough to recruit and retain Jordanian academics. By contrast, the high salaries characterising the Gulf States helped high education institutions in those countries attract scholars who were teaching elsewhere in the Arab world, and particularly from Egypt and Jordan.

Given its role in promoting sustainable development, state support for higher education and research remain essential. Funding H.E.I. by the government is no doubt a long term investment in human resources and the Jordanian government served first as the primary or sole source of funding for high education. But Jordan is no more in a position to cover the cost of public higher education institutions and the government subsidy to the budget of these universities is not sufficient and it is decreasing gradually.

Jordan's constitution protects women by explicitly stating that all Jordanians are equal before the law, have the right to assume public office and the right to work. In 1974, women were given the right to vote and the right to run in general elections. In June 1996, working mothers were provided with additional legal protection. The new labour law that went into effect includes an article that prohibits employers from terminating their jobs or giving them notice about termination if they are past their sixth month of pregnancy or on maternity leave. It also gives mothers ten weeks of paid maternity leave, compared with the previous allowance of eight weeks, as well as an hour a day for breast-feeding during the first year after delivery and a year's unpaid leave to care for their newborns.

According to the Ministry of Planning and International Cooperation, the proportion of women working in professional and technical jobs is high. In 1985 women constituted 35.4 percent of technical workers and 36.1 percent of clerical staff.

At universities, more women than men enrol in the fields of education, arts, humanities and medical sciences and at a much lower rate in social sciences, business and law, and natural sciences. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), 15,256 females and 41,534 males enrolled in technical and vocational training in the 1999/2000 academic year.

Jordanian NGOs and the donor community have established several centres for women's training in computer and business skills. Jordanian Forum for Business and Professional Women (JFPBW), in particular, also provides vocational training in non-traditional fields such as photography, plumbing and electrical skills. However, such programmes are not accessible in all areas and many Jordanian women still opt for traditional vocational courses such as secretarial and typing skills.

### **3.1.3 Open recruitment and portability of grants**

In the case of Jordan, the labour market is only semi-insulated from others in the region, many Jordanians working abroad and many non-Jordanians working in Jordan. Jordan applies stricter rules to the admission of a foreigner for purposes of work because of the socio-economic conditions prevailing in the country. Certain categories of employment such as the public and government sectors (including universities and research centres), the professions and occupations connected with national security or defence are reserved for Jordanian nationals. Article 12 of the Labour Law deals with the recruitment of non-Jordanian workers; it requires the approval of the Ministry of Labour (MOL) for this recruitment, provided that the work requires experience and capacity which Jordanian workers are lacking. According to

the Article, priority shall be given to Arab workers. The non-Jordanian worker employer must obtain a work permit from the MOL prior to his recruitment. The period of the permit is one renewable year.

In Jordan, there are no portable research grants.

### **3.1.4 Meeting the social security and supplementary pension needs of mobile researchers**

Researchers and academics have the same social security status as all civil servants: Jordan has a public pay-as-you-go (PAYG) system, as well as voluntary occupational and voluntary personal pension arrangements. Social security for researchers follows the same pattern as for everybody else: Social security was governed by the Social Security Law of 1978, which was being applied in stages to the private sector. As of 1986, all establishments employing ten persons or more came under the law's provisions. Ultimately the law will apply to all establishments employing five or more persons. The employer contributed 10 percent of salary and the employee contributed 5 percent, and the contribution covered retirement benefits, termination pay, occupational diseases, and work injuries. The plan was for medical insurance to be included eventually under the social security contribution. In April 1988, the Social Security Corporation (SSC) covered 465,000 workers employed by approximately 7,000 public and private establishments. In 2001, a new measure was passed allowing individual Jordanians working abroad to enrol in state social security. To that end, the SSC continues to call on Jordanians working abroad to subscribe to old age, disability, and life insurance under the voluntary contribution scheme.

The public PAYG pension system consists of the following tiers:

- Civil Pension System: this system is regulated by the Ministry of Finance. It covers government employees recruited prior to 1995. Since then, new employees are redirected to the Social Security Corporation.
- Social Security Corporation: the Social Security Corporation manages the national pension scheme for private sector workers, employees who joined the civil services after 1995 and military personal recruited after 2002. It is a compulsory scheme for employers with at least 5 employees. Coverage may be extended to employers with less than 5 employees in the future. The contribution rate is set at 14.5% of the employee's salary, of which 5.5% is paid by the employee. Employee contributions to the Social Security Corporation are exempted from tax; employer contributions are income tax-deductible.

### **3.1.5 Enhancing the training, skills and experience of researchers**

It is necessary to develop the capacity of faculty members in designing curricula and content as well as in research methodologies and computer use. Academic staff "need to focus on teaching students how to learn and how to take initiatives rather than being exclusively taunts of knowledge", (UNESCO World Declaration on Higher Education for the 21 Century, 1998). They have also to develop "testing that will promote not only powers of memory but also powers of comprehensive skills and practical work and creativity" (UNESCO Declaration).

The Ministry has developed a strategy for higher education and scientific research. The main components include admission policies of Jordanian universities, curricula and study plans, developing human resources, university management, quality assurance, and legislation. Practical training in industry is an excellent way for

students to apply their theoretical knowledge and develop the soft skills needed to do well, particularly in the tourism sector where being able to communicate with tourists and a hospitable attitude are vital to delivering the high quality of service that Jordan needs to offer to be internationally competitive.

The National Centre for Human Resources Development plays an essential role in developing programmes, supporting development policies, conducting studies, preparing special indices in the field of education and technical and vocational training aiming to advance the competitive capability of Jordanian capacities, and improving the quality of the outputs of educational and training systems in various fields. Its contributions were not confined to the domestic level, but encompassed the Arab region, represented in availing of the diverse qualifications at the Centre in conducting studies, organising workshops, implementing projects, and offering consulting in the fields of human development.

### **3.2 Research infrastructures**

*Research infrastructures (RIs) are a key instrument in the creation of new knowledge and, by implication, innovation, in bringing together a wide diversity of stakeholders, helping to create a new research environment in which researchers have shared access to scientific facilities.*

#### **3.2.1 National Research Infrastructures roadmap**

Based on The UNESCO Science Report 2010; Status of Science, Technology and Innovation in the Arab States, there have been initiatives to boost STI in the region, such as the world-class international SESAME<sup>6</sup> synchrotron facility in Jordan. SESAME will enable scientists to work together across countries and cultures within the same research facility. UNESCO calls it a model project for other regions, as it has brought together people from nine countries and territories who do not all see eye to eye politically. In 2009, the members of SESAME were Bahrain, Cyprus, Iran, Israel, Jordan, Pakistan, the Palestinian Authority and Turkey.

El Hassan Science City, Launched in April 2007, is a conducive Environment in which Scientists, researchers, academics, entrepreneurs and students are given the opportunity to promote a knowledge based economy by innovating and disseminating their intellectual wealth.

Jordanian Universities Network (JUNet) is the official NREN of Jordan, currently connecting 11 Universities via optical fiber and 14 Private Universities; JUNet is the Jordanian partner for EU funded projects: EUMEDCONNECT and EUMEDGRID projects. The objective of the EUMEDGRID project is to bring the less-experienced and less-resourced countries of the Mediterranean region to the level of European developments in terms of the infrastructures. With the networking infrastructure reaching stability through the EUMEDCONNECT project, the focus of the EUMEDGRID will be on Grid infrastructure and related eScience applications. The core of the EUMEDGRID approach is to establish a human network in the eScience area, enlarge and train this community, and establish a pilot Grid infrastructure supporting proof of concept regional applications.

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<sup>6</sup> SESAME: <http://www.sesame.org.jo/directorate/directorate.aspx>

### 3.3 Strengthening research institutions

*This section gives an overview of the main features of the national higher education system, assessing its research performance, the level of academic autonomy achieved so far, dominant governing and funding models.*

#### 3.3.1 Quality of National Higher Education System

The sector of higher education in Jordan plays a remarkable role in the process of comprehensive development at various levels and areas. That is, during the last ten years (in the reign of His Majesty King Abdullah II), higher education in Jordan witnessed significant progress in terms of the diversity of study programmes, patterns of teaching and learning that control both the quality and quantity and expansion of higher education institutions.

During the last two decades, the sector of higher education in Jordan witnessed a prominent development as well as progress evidenced by the increasing number of institutions of higher education, enrolled students, faculty members, administrative and academic members; size of expenditures and the financial government support to this significant educational sector.

The number of public universities as a result has reached (10), besides (19) universities that are private and (51) community colleges, this is in addition to the World Islamic Sciences and Education University. This progress in numbers of universities accompanied by significant increase in number of students enrolled to study in these universities.

The table below shows the public and private universities:

University Name	Website
<b>Public Universities</b>	
The University of Jordan	<a href="http://www.ju.edu.jo">www.ju.edu.jo</a>
Yarmouk University	<a href="http://www.yu.edu.jo">www.yu.edu.jo</a>
Mutah University	<a href="http://www.mutah.edu.jo">www.mutah.edu.jo</a>
Jordan University of Science & Technology	<a href="http://www.just.edu.jo">www.just.edu.jo</a>
The Hashemite University	<a href="http://www.hu.edu.jo">www.hu.edu.jo</a>
AL al-Bayt University	<a href="http://www.aabu.edu.jo">www.aabu.edu.jo</a>
AL-Balqa Applied University	<a href="http://www.bau.edu.jo">www.bau.edu.jo</a>
AL-Hussein Bin Talal University	<a href="http://www.ahu.edu.jo">www.ahu.edu.jo</a>
Tafila Technical University	<a href="http://www.ttu.edu.jo">www.ttu.edu.jo</a>
German Jordanian University	<a href="http://www.gju.edu.jo">www.gju.edu.jo</a>
<b>Private Universities</b>	
Amman Arab University	<a href="http://www.aau.edu.jo">www.aau.edu.jo</a>
Middle East University	<a href="http://www.meu.edu.jo">www.meu.edu.jo</a>
Jadara University	<a href="http://www.jadara.edu.jo">www.jadara.edu.jo</a>
Al - Ahliyya Amman University	<a href="http://www.amman.edu">www.amman.edu</a>
Applied Science University (Private)	<a href="http://www.asu.edu.jo">www.asu.edu.jo</a>
Philadelphia University	<a href="http://www.philadelphia.edu.jo">www.philadelphia.edu.jo</a>
Isra University	<a href="http://www.isra.edu.jo">www.isra.edu.jo</a>
University of Petra	<a href="http://www.uop.edu.jo">www.uop.edu.jo</a>
Al-Zaytoonah University of Jordan	<a href="http://www.alzaytoonah.edu.jo">www.alzaytoonah.edu.jo</a>
Zarqa University	<a href="http://www.zpu.edu.jo">www.zpu.edu.jo</a>
Irbid National University	<a href="http://www.inu.edu.jo">www.inu.edu.jo</a>
Jerash University	<a href="http://www.jerashun.edu.jo">www.jerashun.edu.jo</a>
Princess Sumaya University for Technology	<a href="http://www.psut.edu.jo">www.psut.edu.jo</a>
Jordan Academy of Music	<a href="http://www.jam.edu.jo">www.jam.edu.jo</a>
Jordan Applied University College of Hospitality and Tourism Education (JAU)	<a href="http://www.jau.edu.jo">www.jau.edu.jo</a>
Faculty of Educational Sciences and Arts-UNRWA	<a href="http://www.fesa.edu.jo">www.fesa.edu.jo</a>



Red Sea Institute of Cinematic Arts	<a href="http://www.rsica.edu.jo">www.rsica.edu.jo</a>
Madaba Private University	
Ajloun National Private University	<a href="http://www.anpu.edu.jo">www.anpu.edu.jo</a>

As a result of the development that occurred in this sector and in order to maintain the quality of higher education, the next phase required a reconsideration of the law that governs public and private universities as well as the higher education. Therefore, by the issuance of the new Law of Higher Education No. (23) for the year 2009, and The Jordanian Universities Law No. (20) for the year 2009, the Jordanian universities have become more independent in managing their administrative as well as financial matters.

The Ministry of Higher Education and Scientific Research has paid special attention to higher education in order to have it at the top of the national priorities. It has been mostly focused on monitoring and evaluation of the strategy of higher education and scientific research for the years (2007-2012) to maintain a shiny image of higher education and scientific research, its outputs, competitive capabilities; and to admit the largest possible number of young people into the Jordanian universities according to goals system that is in line with the national goals.

The number of foreign students from around the world that study at the Jordanian universities which is close to 28.000.

In higher education, quality assurance can be defined as policies, procedures and practices that are designed to achieve, maintain or enhance quality as it is understood in a specific context. It consists of both internal and external processes.

Jordan has an independent agency (the Higher Education Accreditation Commission (HEAC) for quality assurance; the role of the agency is to make decisions, granting the reviewed institution/programme permission to operate/teach at certain levels, undertake research etc. One of HEAC aims is Motivating higher education institutions to interact with national and international universities and scientific research centres as well as international accreditation and quality control commissions (TEMPUS).

### 3.3.2 Academic autonomy

Public universities are autonomous to a large extent, both from administrative as well as financial points of view. The new Law of higher education gave the universities more autonomy. Universities are entitled to develop their academic programmes, curricula, study and research plans, conduct exams, and grant degrees and certificates (including honorary degrees), in accordance with the policy of higher education. The Board of Trustees of a university, and upon the recommendation of the University Council, may establish education, training, and consultation centres and provide other services needed by the community. This Board appoints the president of a public university, and nominates the president of a private university for the approval of the Board of Higher Education. Most academic decisions are made by the Deans Council, which is chaired by the President and has the Vice-President(s) and Deans as members.

Each university has a Board of Trustees (BoT). The BoT of a public university consists of a Chairman and twelve members, while the BoT of a private university has fourteen members in addition to the Chairman. The BoT of a public university is appointed through a royal decree upon recommendation of the Prime Minister, while the BoT of a private university is appointed by the Board of Higher Education



The BoT undertakes number of responsibilities, including the following:

- Drawing the general policy of the university.
- Approving the strategic and annual plans of the university, based upon the recommendation of the University Council, and follow-up of its implementation and evaluation.
- Evaluating the performance of the university from all aspects (academic, administrative, financial, infrastructure).
- Appointing the Vice-Presidents and Deans.
- Recommending to the Board of Higher Education the establishment of faculties, departments, institutes, and centres, as well as academic programmes and specialisations.
- Determining the tuition and fees of studies, and approving the annual budget and annual report, after recommendation from the University Council.

### 3.3.3 Academic funding

In general, one-half to two-thirds of the budget of public universities comes from the tuition and fees paid by students. Most public universities introduced special programmes whereby students pay much higher fees than those students who are admitted on competitive basis, in an attempt to help in the financial situation. In addition to the fees and government contributions, universities have small income generated from services provided to public or from its own resources or investments.

The Government imposed a special tax, called *university tax*, which is collected by the relevant governmental departments on a number of services (e.g. libraries, laboratories, equipment, etc), and paid to universities through the Ministry of Finance. The amount of this tax was reasonable when Jordan had just one public university, but now with the increasing number of public universities this tax is quite small, as compared with the needs of universities.

The Board of Higher Education is responsible for the distribution of the university tax to public universities. There are no guidelines for this process, and they change from one year to the next. But in general, number of students in different faculties and new infrastructure projects are taken into consideration, when funds are distributed. Newer universities are sometimes favoured over older universities, to enable the new universities complete new buildings/complexes that are needed to match the continuously increasing number of students.

Private universities are owned by companies. Not only they finance themselves, but also they make profit that goes back to the owners. Student fees at private universities are higher than the fees at public universities.

## 3.4 Knowledge transfer

*This section will assess the national policy efforts aimed to promote the national and trans-national public-private knowledge transfer.*

### 3.4.1 Intellectual Property Policies

Jordan is a member and signatory to the Agreement on Trade-Related Aspects of Intellectual Property (TRIPS Agreement), and has enacted numerous pieces of legislation dealing with varied intellectual IP issues, including: copyright law, patent law

and trademark law, and in accordance with the US Jordan Free Trade Agreement Jordan has undertaken further IP reforms.

Reforms implemented include IP protection for academics and the University, the issuance of regulations that govern research at the Universities and the introduction of an Article in the Higher Education Law requiring Public Limited Companies to contribute part of their net profit to support R&D. Nevertheless the problem that Jordanian Universities are facing is the lack of understanding on how to commercialise the R&D carried out at the University into viable business opportunities for both the University and the academics. For example, in 2004, Jordan only granted four patents to residents of Jordan and 56 patents to foreign residents.

In 2010, The Support to Research and Technological Development and Innovation Initiatives and Strategies in Jordan (SRTD-EU) funded project helped expand a national **Intellectual Property Commercialisation Office** (IPCO) at the EI Hassan Business Park (EHBP), and established 11 **Technology Transfer Offices** (TTOs) in five universities, two research centres and four business organisations. 15 officers running these offices were trained on IP protection, exploitation and licensing.

The TTOs within universities and research centres focus on identifying which research could have commercial potential, managing the disclosure and protection of that IP and ensuring that the researcher can still publish his results.

The TTOs within business organisations focus on identifying which industrial sectors, and then which individual businesses could benefit from additional research efforts. Pharmaceuticals, chemicals and agri-business are good examples of sectors where research could add value.

In addition to the 25 patents registered from EI Hassan Science City itself (RSS), IPCO also studied, evaluated and helped in the commercialisation of 11 other disclosures from members in the TTO network.

Working with IPCO, researchers and businesses meet to begin the processes of matching business needs with research capabilities. The ultimate aim of such license negotiation is stronger businesses, built on protected intellectual property that can compete robustly in global markets.

Jordan has also stimulated technology transfer between researchers and industry by launching Faculties for Factory Programme. It aims to increase the industrial activities to become more competitive as well as to improve the technological infrastructure.

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

Knowledge transfer is a part of everyday organisational life, and a step in KM building live cycle .Knowledge can be transferred from repositories to people from teams to individuals and between individuals themselves .Transforming knowledge deals with both tacit and articulated knowledge, and the interaction between them.

It is evident that an innovation culture is lacking among individuals and firms in Jordan, firms do not recognise the positive impacts of R&D in enhancing competitiveness, Linkages between universities and businesses are weak. Although Jordan is rich in terms of its human capital, brain drain is proof of the country's weakness in recognising the potential and capabilities of its researchers and scientists.

Nevertheless, efforts were made to support the R&D base in the country and create a more conducive environment to innovation. Such efforts include working on science and technology and innovation policy and strategy (2012-2016), working to improve the information and communication capacity of the country and the alignment of R&D related legislation with international standards through the introduction of the Intellectual Property Rights Legislations and the Competition Law.

### **Spin-offs**

Jordan's knowledge-based industries are flourishing, particularly the spin-off activity resulting from innovation at the R&D incubators on the campuses of its major universities. However, there are neither evaluations nor statistics giving precise information on the number and performance of spin offs.

Monojo is a pioneering biotechnology company, established in 2005 as a private shareholding company and a spin-off from the National Centre for Biotechnology, which is affiliated to the Higher Council of Science and Technology.

Bedaya network is a business angel network that introduces entrepreneurs to technology innovators and natures a network of investors who have an interest in financing innovative companies. The main objective of the network is to link angel investors and venture capitalists with early stage technology based SMES in Jordan. Bedaya effectively implements a process of matching innovative companies with investors.

Venture capital; an important source of funds used in the formation and expansion of small innovative companies, is almost unavailable in the Jordanian economy. Unfortunately, there is no data available regarding the magnitude of the new companies created.

### **Inter-sectoral mobility**

Direct grants for intersectoral mobility are offered by the Industrial Research Fund (IRDF), which is affiliated to the Higher Council for Science and Technology and was established in 1994 with the objective of increasing the competitiveness of Jordanian industries through the utilisation of science and technology. The IRDF aims to bridge the gap and increase cooperation between industry and national research centres through financial incentives. The Fund is further expected to help expand the practical experience of local researchers and help academic organisations get practical experiences through solving industrial problems.

Technology transfer between researchers and industry was stimulated by launching Faculties for Factory which aims at increasing the industrial activities to become more competitive as well as to improve the technological infrastructure through short-term intersectoral mobility.

### **Promoting research institutions - SME interactions**

The Kulluna al Urdun or "We are all Jordan" initiative provides for a comprehensive policy framework for Jordan's future development. It targets in particular the "Higher Education and Scientific Research" field by proposing solutions for tackling unemployment among university graduates, e.g. through building and creating "technological incubators and business incubators". It targets also the "Scientific

Research” field, by pointing out the necessity to increase the number of joint research projects between local researchers and their counterparts abroad, to motivate the private sector to participate in research and development projects, to particularly support the research projects that may be developed into productive investment projects.

### **3.5 Cooperation, coordination and opening up national research programmes with the EU**

*This section assesses the effectiveness of national policy efforts aiming to improve the coordination of policies and policy instruments across the EU.*

#### **3.5.1 National participation in intergovernmental organisations and schemes**

Jordanian institutes are in general quite open to international cooperation. Public institutes regularly send their best students on scholarships to obtain higher degrees (Ph.D. in particular) in order to come back and teach at the university after graduation. Some private universities have been doing this also but on very limited scale because of the cost factor. Where internship or elective courses are part of the study plans, universities facilitate to their students doing such periods outside Jordan if the student has financial capability to do so. In the case of German-Jordanian University, it requires all its students to do several months internship in Germany as part of graduation requirements.

Universities in Jordan try to promote their institutes to attract students from other countries. They participate in academic fairs in the region for this purpose. The environment in the country and simplicity of life are attractive factors, especially for students from nearby countries.

A Scientific and Technological (S&T) cooperation agreement between the EU and Jordan was signed in November 2009. An EC-Jordan Joint Committee has been established with the aim to implement the S&T cooperation agreement. The coordination and facilitation of activities shall be performed on behalf of Jordan, by the Higher Council for Science and Technology and, on behalf of the Community, by the European Commission, acting as executive agents of the Parties. This agreement considered the European Neighbourhood Policy (ENP) and EU strategy to strengthen the relations with the neighbourhood countries, in the frame of which the parties have met and agreed on action plan, one of which priorities was “to strengthen cooperation in science and technology”. The joint action plan of ENP is in line with the Government of Jordan’s Executive Program (2007-2009) for Kuluna Al Urdun /The National Agenda, which aims to develop a sustainable socio-economic reform process. The first Joint the Joint EU-Jordan S&T Committee Meeting took place on the 23rd of November/2010.

The participation of Jordan in the Framework Programme is satisfactory considering the low number of inhabitants and researchers in comparison with other Mediterranean Partner Countries. Jordan shows the 4<sup>th</sup> highest number of applicant institutions (168), after Egypt, Morocco and Tunisia, with 34 institutions retained for fund for an EC contribution of 21 M Euro.

- Jordanian participations in 2 FP7 signed grant agreements in the field of Solar and Biofuels technologies.
- There are three partners from Jordan in two FP7 projects related to environment and climate change with a total EU contribution of around

€150.000. The first project is about cultural heritage and the second one on water availability.

- The dialogue EC-Jordan took place in the context of regional initiatives such as the Inco-nets and their activities dedicated to the environment. Priorities identified through the Mira Thematic Workshop "Environment" have been taken into account in the 2010 Call and they fed the work programme WP2011.
- The participation of Jordan in FP7-ICT is limited. Two Jordanian applicants have been retained for funding for a total EC contribution of 136.104 Euro: 1) MEDAR-Mediterranean Arabic Language and Speech Technology, 2) JOIN-MED - Establishing the EU-Mediterranean ICT Research Network.
- Jordan was successful in the project "Nano-structured TiON Photo-Catalytic Membranes for Water Treatment (NATIOMEM)". The project started in July 2010 for a period of 3 years and receives 2.99 Million EC contribution.
- Research organisations in Jordan have demonstrated some interest in the People programme and they are mainly involved in the International Research Staff Exchange Scheme (IRSES) action. In terms of number of participant institutions:
  - In 2008, 2 Jordanian participants were involved in submitted proposals. 1 was funded and has been granted 36.000 Euros.
  - In 2009, 1 out of the 1 institution which participated in IRSES proposals was funded with a total requested Union contribution of 34.200 Euros
  - In 2010, 5 Jordanian institutions were involved in submitted proposals; 1 has been retained for funding.
  - So far only 1 Jordanian institute is participating in an Initial Training Network - (ITN) but none is involved in Industry-Academia Partnerships and Pathways - Action (IAPP)
  - 2 individual researchers of Jordanian nationality have been selected in a Industry - Academia Partnerships and Pathways scheme (IAPP)

There is no available data concerning the participation of Jordanians in COST or Eureka Programmes.

### 3.5.2 Bi- and multilateral RDI agreements with EU countries

A number of agreements and memoranda of understanding were signed to establish a framework for cooperation in scientific and technological research, which will extend and strengthen the conduct of cooperative activities in areas of common interest and encourage the application of the results of such cooperation to their economic and social benefit.

The main agreements and memoranda of understanding are signed with European Union, **United Kingdom, Denmark, Spain, Sweden, Germany, France, Hungary, Malta, Italy, Finland, Ireland, Greece, Romania, Slovenia, Turkey, Poland, Cyprus, Luxemburg, Belgium, Slovakia, Netherlands, etc.** Examples of these agreements include but not limited to:

A S&T Association Agreement with the European Union was signed between The European Community and The Hashemite Kingdom of Jordan in November 2009. This agreement considered the European Neighbourhood Policy (ENP) and EU strategy to



strengthen the relations with the neighbourhood countries, in the fame of which the parties have met and agreed on action plan, one of which priorities was “to strengthen cooperation in science and technology, an Agreement on Scientific and Technological Cooperation was signed with Greece on 13 December 2006 and A Memorandum of Understanding on Cooperation in the field of Renewable Energy was signed on 13 December 2006, a Cultural and Scientific Cooperation Program for the years (2005-2008) was signed with Romania on December 2005, a Cooperation Program in the fields of Education, Science, Culture, Arts, Media, Youth and Sports was signed with Turkey on 25 November 2006, an Executive Program for Cooperation in the fields of Science, Education, and Culture (2004-2006) was signed with Poland on 1 September 2004 and a Cooperation Agreement between the German Institute for Standardization and the Jordanian Institution for Standards and Metrology was signed on 30 January 1998.

The list of the Science and Technology agreements and Memoranda of Understanding can be downloaded from the [Ministry of Planning and International Cooperation Website](#).

### **3.5.3 Other instruments of cooperation and coordination between national R&D programmes**

This is not applicable to Jordan.

### **3.5.4 Opening up of national R&D programmes**

National programmes are not currently open for third country researchers. Yet, the main goals of the Scientific Research Fund (SRF) at the Ministry of Higher Education and Scientific Research that was established in 2007 upon Royal directives, includes Collaboration with local and Arab bodies and international organisations in the coordination of scientific research support.

## ***3.6 International science and technology cooperation***

### **3.6.1 International cooperation (beyond EU)**

The Jordanian government has a long tradition and history in subscribing bilateral and multinational agreements in S&T (see section 2.5). For specific information of cooperation with the EU see section 3.5. The [Higher Council for Science and Technology](#) places great emphasis on the significance of S&T cooperation due to the related beneficial impact on the exchange of information and transfer of knowledge and technology. To this end the HCST is signatory to cooperation agreements with Arab and international bodies. Many of these culminate in joint projects that assist in developing S&T capabilities. The HCST signed an agreement on scientific co-operation with German Research Society in 2002. This agreement provides opportunities for joint funding of co-operative research work: Preparatory visits, consultative research visits, joint bilateral seminars and workshops and joint R&D projects. Another memorandum of understanding in S&T was signed with Durham University, London School of Economics and IRD centre in France, in addition to the S&T agreement signed with United States of America and Federative Republic of Brazil.



### 3.6.2 Mobility schemes for researchers from third countries

Data shows that Jordanian universities attract a good number of foreign students. Arabs and students of other nationalities enrolled in Jordanian universities in 2009 reached 27,871 including 8,536 women. Foreign universities became also common in higher education. (i.e., German Jordanian University, established in 2005, Arab Open University established in 2002 to provide continuous education for all ages, and New York Institute of Technology).

Most universities in Jordan have a number of agreements or memoranda of understandings with many universities outside Jordan for the purposes of academic exchange. Some of such agreements have led to excellent cooperation over the past few decades.

For example, the University of Jordan has hundreds of agreements mostly for student exchange programmes, of which 16 are with universities in the [United States](#), such as [Vanderbilt University](#) and [Murray State University](#).

## 4 CONCLUSIONS

### 4.1 Effectiveness of the knowledge triangle

The knowledge triangle is not fully operative in the case of Jordan. Although some coordination instances have aimed at increasing the dialogue and cooperation between the different agencies, only limited success has been achieved. As a whole, the education and research parts are significantly better developed and achieve more progress than innovation.

An appropriate awareness of needs for innovation policy exists on all levels of the Jordanian NIS. There is no written national innovation policy available yet. The HSCT is preparing the National Science and Technology and Innovation policy and strategy (2012-2016).

Policy practice in the form of separate ministries has created own objectives and ways of intervention on the different components of the triangle. In particular, the practice of competitive funding is becoming the standard intervention in the promotion of R&D and innovation (via HCST and SRSF), while block funding is the standard funding mode of research and education that concerns the public universities.

Hence, in parallel to the increasing budgets and efforts of research and education, more emphasis is needed to create bridges and reinforce the triangle.

**Table 3: Effectiveness of knowledge triangle policies**

	Recent policy changes	Assessment of strengths and weaknesses
Research policy	The HCST has since 2010 started to work on developing a National Science and Technology Innovation Policy and Strategy for the period 2012-2016.	<ul style="list-style-type: none"> <li>• Research and Development in Jordan is mainly focusing on the theoretical level, with little application of the research being put to use within Jordanian industry.</li> <li>• Inadequate science-industry dialog, therefore STI policy and strategy 2012-2016 aims at increasing productivity and competitiveness, and supporting the private sector in its Research and Development.</li> </ul>
Innovation policy	An appropriate awareness campaign concerning the needs for innovation policy exists on all levels of the Jordanian NIS. There is no written national innovation policy available yet. The HSCT started from 2010 preparing the National Science and Technology and Innovation policy and strategy (2012-2016).	<ul style="list-style-type: none"> <li>• The science, technology and innovation policy and strategy harvests a major national initiative, contributed to by a large cross section of institutions and individuals from the Jordanian S&amp;T community (ministries, governmental institutions, the private sector, universities and scientific research centres)</li> <li>• Financing of innovative business is difficult due to the risk adverse nature of most banks, little in the way of seed capital.</li> </ul>
Education policy	<ul style="list-style-type: none"> <li>• The recent education reforms started in the early 1990s. This reform process was accelerated under His Majesty King Abdullah II</li> </ul>	<ul style="list-style-type: none"> <li>• Jordan has the third lowest illiteracy rate in the Arab world. The primary gross enrolment ratio has increased from 71 percent in 1994 to 98.2 percent in 2006.</li> </ul>

	<p>in early 2001 with a vision to make Jordan the regional technology hub and an active player in the global economy.</p> <ul style="list-style-type: none"> <li>• In July 2003, the Government of Jordan launched an ambitious programme in the entire MENA region a 10 year multi-donor Education Reform for the Knowledge Economy Program (ErfKE). The goal of the programme was to re-orient the education policies and programmes.</li> </ul>	<p>Jordan has achieved a 90 percent parity in literacy and full parity in primary and secondary enrolment.</p> <ul style="list-style-type: none"> <li>• The Jordanian Ministry of Education is now making it mandatory for students to be computer literate and able to apply their studies in computers to their regular studies, most especially the scientific and mathematical courses.</li> </ul>
Other policies	<p>The Kulluna al Urdun or “We are all Jordan” initiative provides for a comprehensive policy framework for Jordan’s future development. It targets in particular the “Higher Education and Scientific Research” field by proposing solutions for tackling unemployment among university graduates.</p>	

#### 4.2 Comparison with ERA 2020 objectives - a summary

The knowledge triangle refers to the interaction between research, education and innovation, which are key drivers of a knowledge-based society. Stimulating research and innovation can be considered as one of the major tasks of a national approach to increase the wealth of a domestic economy.

An appropriate awareness of needs for innovation policy exists on all levels of the Jordanian NIS. A Jordanian national innovation policy can be implemented with little efforts, but high impact. A strong involvement of many important actors from policy, industry and academia is strongly recommended. Funding and legislation must allow innovation processes on all levels to have planning security.

**Table 4: Assessment of the national policies/measures which correspond to ERA objectives**

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
1	Ensure an adequate supply of human resources for research and an open, attractive and competitive labour market for male and female researchers	<ul style="list-style-type: none"> <li>• The government has, as a matter of policy, provided every village and community with 10 or more school-going children with a school.</li> <li>• Education is free for all primary and secondary school students, and compulsory for all Jordanian children through the age of fifteen.</li> </ul>	<ul style="list-style-type: none"> <li>• The Jordanian higher education system offers a differentiated system of higher education institutions (universities and community colleges) and patterns of ownership (public and private).</li> <li>• In Jordan, access to basic education has been emphasised in all the country’s development plans.</li> </ul>
2	Increase public support for research	<ul style="list-style-type: none"> <li>• In 2007, Jordan started a Fund for Scientific Research/ Ministry of Higher Education and Scientific Research. The budget is defined</li> </ul>	<ul style="list-style-type: none"> <li>• A total R&amp;D pot of less than 0.5% of GDP, and there is only a trickle of Jordanian patents.</li> </ul>

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
		by law as 1% of the net profits of all public limited companies (app. 10 million JD which equals 10,822,511€).	<ul style="list-style-type: none"> <li>The public sector in Jordan has the highest percentage expenditure on R&amp;D (58% of GERD) as compared to around 36% of GERD by the private sector.</li> </ul>
3	Increase coordination and integration of research funding	<ul style="list-style-type: none"> <li>A Scientific and Technological (S&amp;T) cooperation agreement between the EU and Jordan was signed in November 2009. An EC-Jordan Joint Committee has been established with the aim to implement the S&amp;T cooperation agreement and establish a roadmap between Jordan and EU.</li> </ul>	<ul style="list-style-type: none"> <li>The HCST and Ministry of Planning and International Cooperation continue to actively support Jordanian participation in different European schemes (FP7, ENPI, etc)</li> <li>The contribution of the private sector is not visible in the field of scientific research, neither directly carrying it out nor providing financial support. Since the 1950's, Jordan has made efforts to develop its indigenous science and technology capabilities, using its young, skilled labour force.</li> </ul>
4	Enhance research capacity	<ul style="list-style-type: none"> <li>The EU offers a number of instruments to assist Jordan in implementing actions and reforms set in the Association Agreement and the Action Plan. The main financial support comes from the EuropeAid Development and Co-operation Directorate-General which instruments can be divided into "Geographical" and "Thematic". The HCST is preparing the Science and Technology and Innovation Policy and Strategy (2012-2016)</li> <li>HCST is preparing the National Scientific and Technological Requirements and Potential Study which provides precise information and realistic statistical data on the S&amp;T requirements (technical services, training and research) of various institutions as well as their potential for meeting such requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Europe Aid funded <a href="#">Support to Research and Technological Development and Innovation Initiatives and Strategies in Jordan (SRTD)</a> which aimed at integrating Jordan into the European Research Area</li> <li>The national landscape of the universities appears to be complete.</li> <li>Low investment on restructuring the university system.</li> <li>There are existing barriers between universities and enterprises. Industry is not willing to spend money for research at universities.</li> </ul>
5	Develop world-class research infrastructures (including e-infrastructures) and ensure access to them	<ul style="list-style-type: none"> <li>El Hassan Science City, Launched in April 2007, is a conducive Environment in which Scientists, researchers, academics, entrepreneurs and students are given the opportunity to promote a knowledge based economy by</li> </ul>	<ul style="list-style-type: none"> <li>World-class international SESAME<sup>7</sup> synchrotron facility in Jordan</li> <li>Jordanian Universities Network (JUNet) is the official NREN of Jordan, currently connecting 11 Universities via optical fiber and 14 Private</li> </ul>

<sup>7</sup> SESAME: <http://www.sesame.org.jo/directorate/directorate.aspx>

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
		innovating and disseminating their intellectual wealth. <ul style="list-style-type: none"> <li>• The Scientific Research Support Fund at MOHE: was established in 2007 upon Royal directives, with the aim of developing human research resources and infrastructure to boost the country's competitive environment in ecological, water, and technological applications domains.</li> </ul>	Universities.
6	Strengthen research institutions, including notably universities	<ul style="list-style-type: none"> <li>• Public universities are autonomous to a large extent, both from administrative as well as financial points of view. The new Law of higher education gave the universities more autonomy. Universities are entitled to develop their academic programmes, curricula, study and research plans, conduct exams, and grant degrees and certificates (including honorary degrees), in accordance with the policy of higher education</li> </ul>	<ul style="list-style-type: none"> <li>• Universities not only encourage research, but publishing quality papers is a prerequisite for tenure at the university. Universities differ in their promotion regulations, and hence level and quality of research varies</li> <li>• All universities have modest budgets for research</li> <li>• The Ministry of Higher Education and Scientific Research as well as the Higher Council for Science and Technology have research budgets that are also available to faculty members of the universities through competitive procedures</li> </ul>
7	Improve framework conditions for private investment in R&D	<ul style="list-style-type: none"> <li>• The Government of Jordan remains committed to further enhance the investment climate in Jordan and work towards introducing new measures aimed at implementing procedures related to starting a business, dealing with licenses, registering property, employing workers, and enforcing contracts.</li> <li>• STI policy and strategy 2012-2016 is considering Increasing productivity and competitiveness, and private sector support for Research and Development</li> </ul>	<ul style="list-style-type: none"> <li>• It is a main problem for start-up companies and entrepreneurs, that no risk-capital is available. Even "normal" credits by banks require personal collaterals.</li> </ul>
8	Promote public-private cooperation and knowledge transfer	<ul style="list-style-type: none"> <li>• Jordan has also started to stimulate technology transfer between researchers and industry through the Commercialisation.</li> <li>• Launching a programme called Faculty for Factory. It aims at increasing the industrial activities to become more competitive as well as to improve the technological infrastructure.</li> <li>• A number of public-private initiatives have been launched to</li> </ul>	<ul style="list-style-type: none"> <li>• El Hassan Business Park is an example of public-private partnership between HCST and RSS contains iPARK (ICT Business Park), Queen Rania Centre for Entrepreneurship (QRCE), IPCO and Bedaya network.</li> <li>• Bedaya network connects Angel investors keen to invest in start-ups and early stage businesses with visionary</li> </ul>

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
		ensure that the outputs of the educational system meet the evolving demands of the global economy and that students are equipped with the tools to compete and excel in the market place.	entrepreneurs in need for funding to accelerate the growth of their companies <ul style="list-style-type: none"> <li>• The Support to Research and Technological Development and Innovation Initiatives and Strategies in Jordan (SRTD) by expanding the technology transfer centre at the Royal Scientific Society centre to be the Intellectual Property Commercialisation Office (IPCO) for the kingdom and establishing eleven branch TT offices at universities, research centres and business organisations</li> </ul>
9	Enhance knowledge circulation	<ul style="list-style-type: none"> <li>• Scientific Research Support Fund (SRSF) is considering international dimension in some programmes.</li> </ul>	<ul style="list-style-type: none"> <li>• Most Jordanian universities have international research collaborations and exchange programmes with international institutions.</li> <li>• Most Jordanian universities have agreements with universities in the MEDA region; such agreements discuss mutual exchange of expertise, training and joint conferences.</li> </ul>
10	Strengthen international cooperation in science and technology	<ul style="list-style-type: none"> <li>• EU-JORDAN S&amp;T agreement considered the European Neighbourhood Policy (ENP) and EU strategy to strengthen the relations with the neighbourhood countries, in the frame of which the parties have met and agreed on action plan, one of which priorities was “to strengthen cooperation in science and technology”.</li> </ul>	<ul style="list-style-type: none"> <li>• Bi-regional cooperation is strengthened by The Monitoring Committee for Euro-Mediterranean Cooperation in Science and Technology (MoCo)</li> <li>• Bilateral cooperation: Cooperation is strengthened by number of agreements with Member States (Germany, France, UK, etc)</li> </ul>
11	Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle	<ul style="list-style-type: none"> <li>• HCST is preparing the Science and Technology and Innovation Policy and Strategy (2012-2016) with the contribution of delegates from ministries and other governmental institutions alongside representatives from the private sector, universities and scientific research centres</li> </ul>	<ul style="list-style-type: none"> <li>• Little coordination is noticed among the institutions concerned with science and technology and innovation.</li> </ul>
12	Develop and sustain excellence and overall quality of research	<ul style="list-style-type: none"> <li>• The National R&amp;D priorities for the coming 10 years were determined in all scientific research fields by 14 sectoral committees. It is supposed that the funding agencies will fund R&amp;D projects that address these priorities.</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing emphasis on prioritisation of research orientation.</li> <li>• There are significant efforts to strengthen quality in certain universities and research centres, but the large majority focuses on teaching and not</li> </ul>



	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
		<ul style="list-style-type: none"> <li>• The STI policy and strategy (2012-2016) focuses in three priorities: Water, energy and food security.</li> </ul>	high quality research.
13	Promote structural change and specialisation towards a more knowledge - intensive economy	<ul style="list-style-type: none"> <li>• Introduction of sectoral policies</li> <li>• A special effort is given to establishing new technology based firms through the establishment of a network of incubators.</li> <li>• The Higher Council for Science and Technology has launched the Project for Preparation of the National Medical Biotechnology Strategy, which is one of the pillars of the "Development of the Life and Biotechnology Sciences in Jordan" initiative, launched by His Majesty King Abdullah the Second in 2005</li> </ul>	<p>The STI policy and strategy (2012-2016) is taking into consideration the Drivers of Change, with a view to help people identify and explore leading factors that will affect our world in the future. Three main drivers of change are water, energy and food security.</p> <ul style="list-style-type: none"> <li>• Jordan's National ICT Strategy outlines a number of objectives for the country to reach within the next three years, including encouraging the development of 35,000 jobs and pushing the Internet penetration rate towards 50%.</li> </ul>
14	Mobilise research to address major societal challenges and contribute to sustainable development	<ul style="list-style-type: none"> <li>• HCST has identified challenges- water, energy and food security; Water and environment technologies, Sustainable energy technologies are the main areas of cooperation between Europe and Jordan</li> <li>• King Abdullah II Fund for Development: KAFD seeks to justly distribute the gains of sustainable development among all governorates through establishing pioneering projects and encouraging creativity, on the backdrop of a true partnership with the private sector and civil society institutions.</li> <li>• EDAMA initiative is a private-sector led initiative, which means 'sustainability' in Arabic. It is comprised of eight task forces whose participants represent a wide range of private and public sector institutions in Jordan. Their goal in EDAMA is to develop a comprehensive strategy that aims to enhance and develop the energy, water and environment sector (EWE) in Jordan, with the objective of making it a regional leader in EWE productivity</li> </ul>	<ul style="list-style-type: none"> <li>• The Royal Scientific Society's International Centre for Water, Energy and Environment brought researchers from the United States and Jordan together to elaborate proposals for the development and commercialisation of new EWE technologies.</li> </ul>
15	Build mutual trust between science and society and strengthen scientific evidence for policy making	<ul style="list-style-type: none"> <li>• National R&amp;D priorities were determined by 14 sectoral committees, each comprises a group of experts representing various national institutions such</li> </ul>	<ul style="list-style-type: none"> <li>• In formulating STI policy and strategy, the HCST achieves high level goals by adopting a participatory approach with the involvement of all S&amp;T</li> </ul>

	<b>ERA objectives</b>	<b>Main policy changes</b>	<b>Assessment of national strengths and weaknesses</b>
		as public and private universities, scientific centres, ministries and public institutions, private sector and civil society.	stakeholders through multi-disciplinary and multi-institutional teams and national and international networking.

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## List of Abbreviations

FP	Framework Programme for Research and Technology Development
HEIAC	The Higher Education Institutions Accreditation Commission
MoCo	Euro-Mediterranean Cooperation in Science and Technology
HEI	Higher Education Institutions
R&D	Research and Development
SF	Structural Funds
SRSF	Scientific Research Support Fund
S&T	Science and Technology
MENA	Middle East and North Africa
HCST	Higher Council for Science and Technology
RSS	the Royal Scientific Society t
PSUT	Princess Sumaya University for Technology
SRSF	Scientific Research Support Fund
JEDCO	Jordan Enterprise for Development Corporation
SMEs	Small and Medium Enterprises
SRTD	Support to Research and Technological Development and Innovation Initiatives and Strategies in Jordan
IPCO	Intellectual Property Commercialisation Office
QIZ	Qualified Industrial Zones
NA	National agenda
QRCE	The Queen Rania Centre Entrepreneurship
NAFES	National Fund for Enterprise Support
BSO	Business Support Organizations
FFF	Faculty for Factories
AMIR	The Achievement of Market Friendly Initiatives and Results Program