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Science Policy and Implications for Sustainable Development- The Case of Jordan

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Abstract
This paper aims to review the science policy in selected countries, i.e. US, UK , Malaysia and Turkey. It intends to document best practices in STI to inform science policy in Jordan. Science policy for sustainable development will be assessed and compared in light of international experience. The necessary conditions and enabling environment needed to root science in society will be outlined.
"In the memory of the victims of Oslo and UtøyaIsland, 22nd of July 2011"

Keywords: *science policy, innovation, sustainable development, Jordan.*

Background

It is illuminating to witness how Science and Technology (S&T) can transform societies. Throughout history the innovation of coal, steel, printing and internal combustion engine had transformed the way societies do business and interact with other nations. The ICT era in early 90's contributed to evolve new business models in Science, Technology and Innovation (STI). What's crucial is to understand how some nations were able to harness STI for sustainable development and others were not able to make breakthrough.

Societal learning in STI and sustainable development is vital to build on lessons learned from countries like US, UK , Malaysia and Turkey, who were able to make success stories by investing in STI. The objective of this paper is to synthesize key drivers for STI in these countries and to see how Jordan can benefit from this international experience.

The following summarizes the evolution of STI in US, UK , Malaysia and Turkey:

Analysis of the evolution of US science policy; as documented by Brooks (1996) revealed that: there were two schools of thoughts; One that science need an autonomy and self-governance of the scientific community. The second school views that science should be linked to societal needs. The mandate for the US science policy was formed by World War II which had emphasis on three domains: defence, aerospace, and atomic energy. What should he noted is, the formation of scientific office as an entity reporting directly to the president.

In the 1960's there was a focus on social engineering programs to address national needs. There was a consolidation on science advisory which in turn was the NSF; which lead tot eh formation of National Academy of Sciences and legal amendments to re-establish the post of science advisor to institutionalize the science agenda.

In the 1970's there was a shift in research agenda towards renewable energy and energy security. There was argument about means to enhance US competitiveness by focusing on investment in civilian R&D.

In the 1980's research was focusing on bio-medical, microelectronics and optoelectronics with address of intellectual property and patents. Universities and industry research centres were well funded by federal government. Universities were referred to enhance economic competitiveness, to address unemployment, and create jobs. There was a debate about the value of basic science versus appropriable science.

In the 1990's there was an emphasis on science as an endless recourse to integrate new knowledge so as and old knowledge so as, to ensure progress. There was in mid-90's as listed in policy to have the National Labs were the principal locus for government support to enhance technological innovation.

The US policy addressing of the implication of having the priorities for universities as knowledge synthesis and diffusion functions rather that knowledge creation.
On the other hand, the UK experience in science policy was focusing recently on the last few years on research impact for society. The societal impact was a criteria for US NSF funding.
The UK science policy have repeatedly emphasized the centrality of science to economic growth and competitiveness.

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Also, the policy discourse emphasized the concept of transforming the UK into an innovation nation (DIUS, 2008b) [3]. UK science policy reforms have sought to improve the mechanisms for harnessing science to the twin goals of wealth creation and economic competitiveness. There have been reports demanding increased university – business collaboration (Lambert , 2003) [4].

On the other hand, new labour science policy focused on commercially-oriented R&D, and to address long term shortages in skilled scientific labour (Roberts, 2002) [5]. However, the EU focused on sustainability and developing social models which are led by economic imperativeness that are informed by science policy to address unemployment. Also, it repositioned strategy for competitiveness through eco-innovation investment in science during 2007-2008, final exists.

Also, science was seen as a means to enhance competitive advantage in key areas as financial service and pharmaceutical. It is important to note that the UK science policy is an extension and intrinsic part of economic and industrial policy.
Malaysia has long had the target of becoming a knowledge-based economy by 2020. Malaysia's science, technology and innovation (STI) strategy has significantly evolved since the country's independence in 1957. Over time, emphasis has shifted from rubber and tin to palm oil, combined with the greater prioritisation of information and communications technology (ICT), then to biotechnology, pharmaceuticals and other high-tech industries in more recent years (ref.)

Malaysia's macroeconomic story over the past 50 years started from a heavy reliance on primary commodities, to a focus on manufacturing and Foreign Direct Investment (FDI), to the current emphasis on knowledge and innovation— Malaysia has maintained robust economic growth for several decades. Although this success has not matched the growth of South Korea, which followed a similar trajectory (ref.).

Throughout the 1940s and 1950s, science and technology efforts were directed towards improving Malaysia's most significant economic activities: rice production, water irrigation and rubber plantations. The period between 1957 and 1970 witnessed the emergence of a more laissez-faire economy, dependent on tin and rubber as the major export commodities. New Economic Policy (NEP) was introduced in 1970, with the aim to address poverty eradication and wealth redistribution. By the early 1970s, the government had begun to encourage export-oriented industries through the creation of Free Trade Zones.

Since the early 1980s Prime Minister Mahathir refocused Malaysia's economic development on home-grown industrialisation through the creation of national car, iron and steel and cement industries and natural commodities, with palm oil replacing rubber as the main revenue source. The emergence of ICT during the 1990s provided a new impetus for an array of STI policies aimed at knowledge generation and diffusion.

The government currently aims to ensure that investment in R&D reaches at least 1% of GDP by 2015 (Government of Malaysia, 2010) [7].

Turkey (KDI, 2009) [8]:
The Turkish economy has experienced distinct growth cycles since the establishment of the Republic of Turkey in 1923. A descriptive analysis of the patterns of GDP growth reveals that we can identify five growth cycles in the Turkish economy.

The first cycle is observed from the establishment of the Republic until the Second World War. The government in the early years inclined to follow a "free-market" approach, but after the Great Recession in 1929 that also severely affected the Turkish economy and the government adopted a state-led industrialization policy. The aim of the industrial policy was to establish "main" industries (textile, food, chemicals and light engineering) by the state. This period is characterized with high but widely fluctuating growth rates generated by a weak and underdeveloped economy with almost no industry at the very beginning. During this period, the share of agriculture in GDP remained around 45 per-cent, and the share of industry increased in the 1930s, from 12.1% in 1928 to 18.8% in 1939.
The period from the Second World War to the 1960s is the period of transition towards a multi-party political system, and gradual opening of the economy to the world markets.

The period from the 1960s to 1980s is characterized by import substitution industrialization policies. The State Planning Organization (SPO) was established in 1960 to prepare five year development plans covering all aspects of economic development and the new constitution, adopted in 1961, envisaged (indicative) planning as a major tool for economic development.

The Scientific and Technical Research Council of Turkey (TUBITAK) was established in 1963 to develop science and technology policies in line with the development plans, and to support and to conduct basic and applied research in "natural sciences.". The concept of "technology policy" was introduced in the fourth 5-year development plan (1979-1983). During this period, TUBITAK put more emphasis on "scientific research" than on "technological development."

The state played an active role in developing a number of industries that produce intermediate products and machinery and equipment through state-owned enterprises (SOEs). Foreign direct investment (FDI) remained at very low levels, and technology transfer from abroad was regulated and monitored by the SPO. Growth rate of GDP per capita was quite high until the late 1970s. Poor export performance and growing import bill led to a serious balance of payments crisis, and the economy fell into a crisis in 1979-1980.

In 1980 long-term program was conducted aiming to change the structure of the economy by removing the dominance of the state in key industries, and to adopt an export-oriented "growth" strategy, till Turkey joined the Customs Union (CU) with the European Union (EU) in 1996. Manufacturing output increased rather rapidly in the 1980s. The average growth rate of real manufacturing output was slightly higher than 8% in the period 1983-1993. However, the instability has increased substantially since the early 1990s due to growing public deficits and capital account liberalization, and the economy trapped into boom-and-bust cycles in the 1990s. There were three major crises over a short time period (1994, 1999 and 2001), during which the manufacturing output declined sharply. The last crisis in 2001 was the most serious one, and marked the end of the fourth growth cycle that started in 1980.
"Science and technology policy" was not on the agenda for policy makers in the 1980s. The first comprehensive policy document, titled "Turkish Science Policy: 1983-2003" was prepared by SPO and TUBITAK in 1980. This document, together with the Seventh 5- Year Development Plan (1996-

2000), explicitly mentioned that the main aim of technology policy in Turkey should have been the establishment of a well-functioning national system of innovation (NSI), and proposed a number of new initiatives and institutions that form the NSI.

The following is, a case study of STI in Jordan based on the ATLAS report of Jordan (Jordan, ATLAS Report, 2012)

Jordan – case study (Mahroum, etal, 2012) [9]:

During the 1950s, Jordan was classified as an agricultural country. Nevertheless, several large industries including cement, petroleum refining, and the cigarette industry were established during this period. The 1960s through to the early 1990s saw Jordan developed into a semi-industrialized economy. This was aided in the 1960s by the introduction of an import substitution policy, including trade barriers, aimed at promoting economic growth and development. More recently, Jordan has established a network of free trade agreements, including signing an FTA with the United States – its main export market - and Turkey (Domrose, etal, 2009) [10].

During the 1970s, resources were directed into developing the medical and health care sectors. The 1980s saw the private medical sector flourish, with medical tourism becoming an important source of income as Jordan established itself as a regional centre of excellence.

Since the early 1990s, Jordan has sought to focus future economic development of the service sectors. By 2017 it is projected that approximately two-thirds of Jordan's GDP will be attributed to the services sector. Jordan has also implemented a policy of privatization, moving to private ownership in the transportation, communication, water, electricity, education and health care sectors. By 2010, government ownership in the education and health sectors stood at approximately 60%.

In the 1990s when Jordan's telecommunications sector was liberalised and the private sector was allowed to invest in telecommunication projects. The consequent growth in the telecommunications sector paved the way for the emergence of a broader ICT sector in Jordan.

The 2010-11 Global Competitiveness Report (GCR) published by the World Economic Forum (WEF), ranked Jordan 65 out of 135 countries. This positioned Jordan in front of its neighbouring countries of Lebanon (74), Egypt (68) and Syria (115), the Kingdom of Saudi Arabia (KSA) (26) and the UAE (27). In terms of innovation, the 2010-11 GCR ranked Jordan in 68th position, with the availability of scientists and engineers, followed by government procurement of advanced technological products listed as the strongest factors driving innovation.Table 1 summarizes key economic and social indicators for Jordan during the period 2006-2009.

Jordan's economic prosperity has always depended upon its ability to effectively develop and utilize its human capital. Accordingly, Jordan is investing in service economy, including the ICT, tourism, medical services, pharmaceuticals and biotechnology, and the renewable energies sectors. STI provide the key to the successful development of these industry sectors. Jordan's priorities within its 2006-2015 National Policy Agenda (National Agenda, 2006) [11] includes higher education, scientific research, and the development of a culture of innovation and entrepreneurship.

Thus, the Jordanian economic development strategy is based on three pillars: an economically-oriented foreign policy, a socio-development centered education policy, and a stability focused security policy. Besides, Jordan intended to improve economic performance by establishing stronger science, technology, and innovation base in order to help Jordan businesses achieve higher levels of productivity. It is also argued that developing a strong national STI system will help Jordan achieve its objectives of ensuring of food, water and energy security.

Table 1: Summary of key economic and social indicators in Jordan

Indicator:	2006	2007	2008	2009
Real GDP growth (%)[a]	7.9%	8.5%	7.6%	3.1% (2010)
GDP per Capita PPP (constant 2005 international $)[b]	4,587	4,876	5,137	5,160
GDP per Capita JD constant prices, 1994=100)[a]	1,853	2,107	2,574	2,720
FDI, net inflows (BoP, $US)[b]	3.54 bn	2.62 bn	2.83 bn	2.38 bn
FDI, net inflows (% of GDP)[b]	23.9 %	15.4 %	13.3 %	10.5%
Inflation Rate (2006=100)[c]	6.2%	4.7%	13.9 %	-0.7%
Population (million)[c]	5.60	5.27	5.85	6.249 (2011)
Population under 15 years of age[b]	36.5 %	35.8 %	35.1 %	34.5%
Unemployment [c]	13.9 %	13.1 %	12.7 %	12.3% (2011)
Internet users (per 1000)[d]	770	1163	1500	2324 (2010)
Mobile phone subscribers (per 1000)[d]	4,343	4,772	5,314	6,620 (2010)
Literacy rate (% population aged 15+)[c/e]	91.1 %	92.1 %	92.3 %	92.8%

Sources: [a] Central Bank Of Jordan; [b] World Bank; [c] Department of Statistics; [d] Telecommunication Regulatory Commission; [e] Ministry of Education

Since the 1960s, various institutional arrangements have been tested to support education and S&T endeavors, and strengthen national innovation capabilities. In 1961, the Scientific Research Council was established. The Council's mandate was to promote, plan and fund scientific R&D, identify national R&D priorities, and enhance international cooperation in S&T. The Council was subsequently replaced in 1977 by the Directorate of Science and Technology at the Ministry of Planning (Tweissi, 2009) [12]

In 1970, the Royal Scientific Society (RSS), Jordan's main industrial research institution, was established as a national, not-for-profit, non-governmental, applied research institution designed to support the socio-economic development of Jordan. Its activities vary from R&D, quality assurance, testing, certification, and calibration. Since 2003, new oganisations have been established under the RSS to support areas in entrepreneurship development, innovation, technology transfer and commercialization; these establishments constitute El Hassan Science City, which was found in 2006.

In 1978, a conference was held in Jordan ("Jordan's Science and Technology Policy Conference"), during which a recommendation was made to establish a national umbrella organization to take responsibility for planning, coordinating, financing and promoting S&T activities at a national level. This recommendation eventually led to the creation of the Higher Council for Science and Technology (HCST) in 1987.

The HCST was given the mandate to build a national science and technology base in Jordan for the purpose of achieving national economic, social and cultural development objectives. (HCST, 2010).[13,14 &15]. The HCST and its affiliated centers seek to fulfill this mandate through the provision of support and finance to institutions and projects involved in S&T activities, including R&D, training and innovation, and through the development of a national S&T strategy. The HCST developed its first national S&T strategy in 1995.

Although there has been no specific innovation policy in Jordan. National innovation policies are implicit in national policies for industrial transformation, SMEs (Small and Medium Enterprises) development, administrative reform, education and research (Annual Innovation Policy, 2005) [16].
Despite the lack of a national cluster policy, in the early 2000s, a pharmaceutical industry cluster was established to support growth of this historically important sector of the Jordanian economy.An informal ICT cluster was also formed more recently to support growth of this relatively young but successful sector. These clusters have been established in a bottom-up approach driven by industry players rather than any specific government initiatives (Ibid P 26 – 29) [17].

The establishment of EHSC in 2007 represents another cluster in which a scientific and technological base is being developed. The vision of the EHSC is to create "a world class academic and research zone with the aim of transferring knowledge to application by partnering with science and technology based enterprises that will be attracted to locate in the campus and to support young entrepreneurs to launch and grow their technology-focused start-ups". The EHSC encompasses the RSS, PSUT, and HCST in an effort to bring together a state-of-the-art science city that will build on the advancements and successes of its member institutions.

STI Indicators in Jordan
The most tangible and readily measured inputs into any STI system comprise *human capital*, in terms of R&D personnel, and *funding*, as measured by public and private sector expenditure on R&D and innovation activities.

Jordan's education indicators are amongst the highest in the region. School enrollments stand at 95% at the *primary* level and 66% at *secondary* level. However, vocational training offered within secondary level education (grades 11 and 12) has declined in recent years due to the low employability of graduates, and a persistent cultural stigma that vocational education leads to limited career opportunities.
In the 2010-2011 World Competitiveness Report, Jordan ranked 57th out of 139 countries in terms of higher education and training. UNESCO data puts Jordan second to Lebanon only among its Arab neighbours in terms of percentage of tertiary graduates in population (as shown in Figure 1).

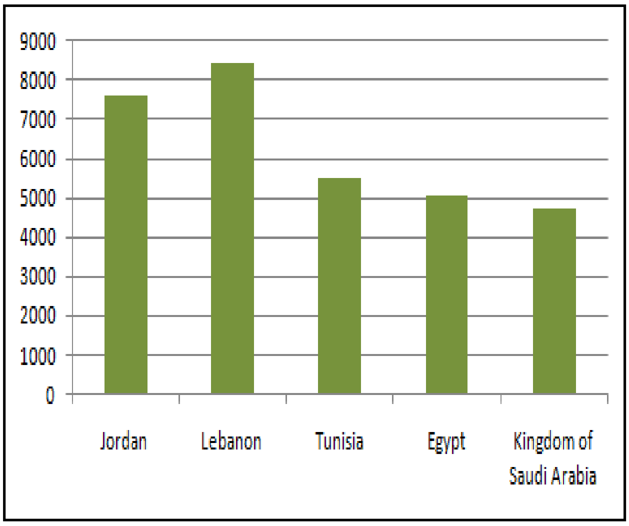

Figure 1 – Total tertiary graduates per million people (Latest values -2007 or 2009, UNESCO)

MHESR data indicate that just over 52,918 students graduated from universities with undergraduate degrees in Jordan in 2010-11, increasing slightly from previous years. In addition to undergraduate degrees, 3,962 students graduated with master's degrees, and 473 with post doctorate degrees (MHESR, 2010-2011) [18]. There is an obvious large discrepancy between the number of graduates and those pursuing advanced degrees at the Masters and PhD levels, signaling perhaps less emphasis on specific career tracks (i.e. specialization) and more on employment (i.e. generic skills). While the number of students graduating with engineering degrees increased by 23% over the period 2005-2009, the number of science graduates declined by 2%, and the number of mathematics and computer science graduates fell by almost 14%.

Data provided by the ERAWATCH Research Inventory Report (ERAWATCH, 2010) [13] indicate the total number of people working in S&T related activities in Jordan quadrupled between 1986 and 1996, and then doubled between 1996 and 2003. However, it is should be cautioned that some of the data in this report could not be verified. The Jordan Department of Statistics (DOS) estimates that approximately 11% of the employed workforce worked as "technicians", which is a very broad definition that does not necessarily reflect the core R&D workforce of the country.

Other data sources, particularly from the World Bank, estimate that in 2006-07 Jordan had around 12,687 R&D researchers, yielding a rate of around 1951 researchers per million inhabitants, or 1.9 researchers per 1,000 people.

UNESCO estimates that in 2007, Japan had 5.7 researchers per 1,000 inhabitants, and the US and UK had 4.7 and 4.2, respectively (UNESCO, 2010) [19]. In another comparison provided in the OIC Outlook 2010, OIC member countries were recorded as having on average 0.6 researchers per 1,000 inhabitants, compared to a global average of 2.5.
S&T based employment in Jordan is spread across a range of industry sectors. Jordan Engineers Association (JEA) estimates that there are approximately 94,000 licensed engineers registered in Jordan as of end of 2011.

The Global Information Technology Report 2009-10 published by INSEAD for the World Economic Forum reported that Jordan ranked 44 out of 133 countries based in terms of its networked readiness index for IT development, the same as in previous year.

R&D funding in Jordan is sourced through a range of different sources and programmes. The SRSF and HCST represent the two main government-sponsored funding programmes supporting scientific R&D in Jordan. The SRSF estimates that it has spent on average JD5 million (UD$7.1 million) each year since 2008.

According to Jordan's National Agenda 2006-2015, the Gross Expenditure on R&D (GERD) as a percentage of GDP was 0.34% in 2003. UNESCO's Science Report 2010 [20], estimated that Jordan ranked fourth highest in the Arab world in terms of GERD as a percentage of GDP. Its ratio of 0.34% compares to GERD in the Arab region of between 0.1% to 1.0% of GDP, and an average in advanced countries of over 2.5%. The National Agenda indicates the intention to raise GERD as a percentage of GDP in Jordan to 1.0% in 2012 and 1.5% by 2015. Figure 2, illustrates GERD as a percentage of GDP in Arab countries (Badran, 2003) [21]

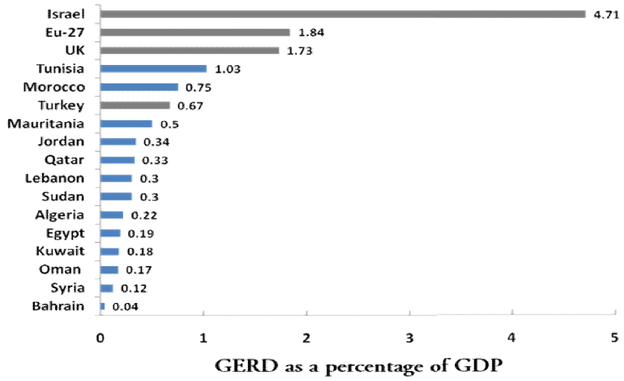

Figure 2 – R&D Expenditure in the Arab World and other regions of the world, 2007-2008

Source: for Egypt: UNDP (2007) Human Development Report 2007/08; for Algeria, lebanon, Mauritania, Oman, Qatar, S (2008) for Bahrain, Syria, United Arab Emirates: Roland (2008) Draft regional report on Arab countries: study on national rese systems. A Meta-Review presented to the Symposium on Comparative Analysis of National Research Systems. Others: World I knowledge for Development Scoreboard

A more recent study of Jordan's innovation policy by the Rapid Innovation Action Learning Team (RIAL) conducted in early 2010, estimated Jordan's total annual R&D expenditure to currently be less than US$100 million (Rischard, 2010) [22].
Data released by Thomson Reuters (Scientific) Inc., and cited in UNESCO and ESTIME reports, indicate strong growth in the past two decades in the number of scientific research articles originating from Arab countries, increasing from 7,466 in 2000 to 13,574 by 2008. However, to put this in context, the average number of articles published per million people in the Arab world remains low at 41, compared to a world average of 147. Nevertheless, in 2008 Jordan ranked third in the Arab world with 157.1 scientific publications per million people; Kuwait was in first position with 222.5 publications, positioning both countries above the global average of 147. In absolute terms, Egypt published 3,963 of scientific articles in 2008, the highest number in the Arab world, compared to 928 in Jordan UNESCO, 2010) [20], (ESTIME) [23].Data produced by Thomson Reuters also named Jordan as the most collaborative nation in the region, with 43% of the country's research papers involving an international author.

The 2010 World Economic Forum Global Competitiveness Assessment ranked Jordan 38th in the world for IP protection. Further to this, Jordan earned a 4.4 rating out of 7 in a survey of business executives conducted by the World Economic Forum (WEF, 2010) [24]. Figure 3, illustrates local and foreign patent applications and patents granted in Jordan, as registered by the Jordan Patent Office (JPO).

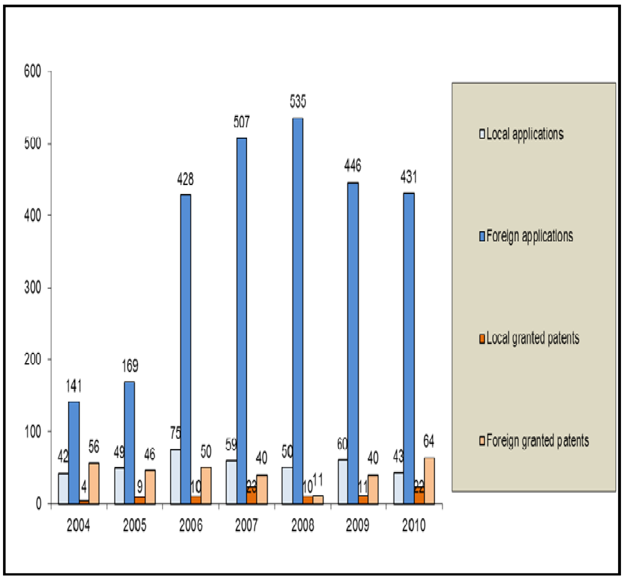

Figure 3 – Patenr Applications and Granted Patents by Jordan Patent Office (Local and Foreign)

In 2009, World Intellectual Property Organisation records indicate that Arab countries were granted 239 patents, while the Republic of Korea alone recorded 56,771 patents. Of the 239 patents granted in 2009, the highest number was granted to Egypt (65), followed by KSA (60). By comparison, Jordan acquired 53 patents that year (Afonso, etal, 2010) [25].

Growth in high-technology exports provides an indication of growth in Jordan's knowledge intensive industries including the ICT and pharmaceutical sectors.

The latest available World Bank development indicators show that in 2004 high-technology exports represented 5.3% of total manufacturing exports from Jordan. While low when compared to a world average of 21.3%, it ranks relatively well vis-a-vis other Arab countries including Lebanon (2.4%), Syria (0.8%), KSA (0.8%), and Egypt (0.6%) (SESRIC) [26].

A summary of key STI system inputs and outputs in 2003 (latest data available), together with targets for 2012 and 2017, as presented in the National Agenda 2006-15, is provided in Table 2.

Table 2: Selected Performance Indicators for Science, Research and Innovation

KPIs	**2003**	**Target 2012**	**Target 2017**
Expenditures on R&D as a percentage of GDP (domestic funding)	0.3%	1.0%	1.5%
Number of internationally published science papers as indexed by Thomson ISI	485	1,300	2,500
Number of patent applications submitted by Jordanians since 2000	246	1,300	5,000
Number of manuscripts deposited at the National Library since 1994	22,550	42,000	58,000

Source: "National Agenda, 2006-2015: The Jordan we strive for," P33.

Comparison Analysis between Jordan, Malaysia and Turkey [7-9]:

Table 3, illustrated major comparison areas between Jordan, Malaysia and Turkey in key areas as industrial STI and educations policies.

Table 3: Comparison Analysis between Jordan, Malaysia and Turkey

Focus	Country	1960's – 1970's	1980's – 1990's	2000's – 2010
Development Stage	Malaysia	Primary commodities; agriculture	Investment driven stage; shift to manufacturing	Focused towards knowledge; based/innovation economy
	Turkey	Adopted import substitution industrialization policies	Growth due to exports and technology policy	After 2001 crises – 2002-2007 medium-technology industries increased exports
	Jordan	agriculture	Semi-industrialized economy	Telecommunications, health, ICT
Industrial policy direction	Malaysia	Heavy dependence on primary export commodities. Then, Move from net oil importer to exporter.	From regulatory reforms to growth strategies favoring modernization/ industrialization.	Focus on productivity- driven growth, with greater emphasis on knowledge-based, innovative economic growth
	Turkey	Played an active role in developing a number of industries that produce intermediate products and machinery and equipment through state-owned enterprises (SOEs), with poor export performance after mid 70's	The government announced a comprehensive stabilization program. Manufacturing industry alone accounted more than half of cumulative authorized FDI in the 1980s and 1990s	
	Jordan	Large industries including cement, petroleum refining, and the cigarette industry were established	Resources were directed into developing the medical and health care sectors. Then, liberalization of Jordan's telecommunications sector	Jordan became a full member of the World Trade Organisation (WTO)

Focus	Country	1960's – 1970's	1980's – 1990's	2000's – 2010
Macroeconomic policy	Malaysia	Launching 1st Malaysia Plan (1966-1970), with new economic policy focused Malay urbanization and employment	Large investments in heavy industries, and vision 2020 was announced	National Innovation Model; second phase of 2020, focused on key strategic thrusts for sustainable growth, and Malaysian Plan (2011–2015) launched (Global economic crisis).
	Turkey	State Planning Organization (SPO) was established in 1960 to prepare five year development plans	Turkey joined the Customs Union (CU) with the European Union (EU) in 1996	The Turkish economy has bounced back rapidly after the 2001 Crisis and grew rapidly in six years in a row (2002-2007).
		Introduction of an import	Medical tourism becoming an	The global financial crises

		substitution policy, including trade barriers	important source of income as Jordan	that began to unfold during 2008
STI policy	Malaysia	Limited focus with dedication to Ministry for Science and the National Council for Scientific Research and Development (NCSRD)	First national STI policy, with establishment of national industrial technology plan	National Innovation Council, and 2010 was the Year of Innovation; Talent Corporation
	Turkey	Establishment of Scientific and Technical Research Council of Turkey (TUBITAK) in 1963 to develop science and technology policies.	The concept of "technology policy" was introduced in the fourth 5-year development plans. Issuing "Turkish Science and Technology Policy: 1993-2003.	Issuing the National Science and Technology Strategy (2005-2010) and the National Innovation Strategy 2008-2010
		State Planning Organization (SPO) was established in 1960 to prepare five year development plans	Turkey joined the Customs Union (CU) with the European Union (EU) in 1996	
	Jordan	Establishment of Scientific Research Council. Then, Directorate of Science and Technology at the Ministry of Planning. Establishment of the Royal Scientific Society	Establishment Higher Council for Science and Technology to build a national science and technology base in Jordan. Focus future economic development of the service sectors	2006 – 2015 National Agenda

Focus	Country	1960's – 1970's	1980's – 1990's	2000's – 2010
Education policy	Malaysia	Focus on basic education for all, with improving quality; system begins adjusting to economic needs	Rapid transformation/ reform; Opening of private sector/ institutions	Establishment of Ministry of Higher Education; creation of research universities
	Turkey			
	Jordan	1960 establishment of University of Jordan. 1970 establishment of the Royal Scientific Society.		Government ownership in the education and health sectors stood at approximately 60%

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